THE CHICAGO EVENING POST

RADIO MAGAZINE

From *November 15th* 1923 to *February 1st* 1924

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The Chicago Evening Post

RADIO

MAGAZINE

EVERY THURSDAY

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Punch three holes through center fold of magazine to correspond exactly with openings in binder. Take a length of plain cotton store string and start thru the outside of binder at point marked 1, down the inside of magazine to point marked 2, outside of binder to point marked 3, inside to 2, outside to 1—and tie.

Just keep adding the issues of the magazine, one after the other, in same manner each week, until book contains 13 issues.

To prevent bulk at point 1 it is suggested that second week you start at point 2; following week at point 3; then back to point 1 for the fourth week; and follow same plan to completion of book.

While your magazines, bound in this manner, may not appear as impressive as books printed from back issues at the end of each quarter—or each year—they are practical, serve the purpose fully as well, and have this very great advantage—you are up-to-date at all times and have your book constantly at hand for reference.

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Chicago Evening Post—Radio Department

12 South Market Street, Chicago, Ill.

IVERSON C. WELLS
Editor
Assisted by a Staff of Regular and Special Contributing Writers.

The RADIO MAGAZINE Section is edited with the view of giving authentic news of the radio broadcasting field and authoritative information on the subjects of home construction of receiving and transmission sets, of the operation and maintenance of apparatus, and as an exchange of opinion for its readers.

THE CHICAGO EVENING POST
RADIO MAGAZINE
Published Every Thursday

THE RADIO MAGAZINE Section
Is Issued as a Weekly Supplement to The Chicago Evening Post.

The supplement is not sold as a separate publication, but is a part of the regular Thursday editions of The Chicago Evening Post. There is no increase in price for The Post on that date, and readers should see that each Thursday issue they purchase has THE RADIO MAGAZINE section.

CHICAGO, NOVEMBER 15, 1923.

Opera of We Statio

Advance Notes o

By THE NIGHT PR
Grand opera broadcastin
Auditorium by KYW (C
hold the local radiophans
tion this week as it did l
However, there are
tionally fine programs s
the coming seven days by
other local stations, but a
out-of-town stations.
The grand opera sche
be announced at this ti
Saturday night. On t
"Il Trovatore," in Italia
Raisa in the stellar role,
the air.
This popular offering al
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and likewise it will bring
hundred thousand radioph
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as this tuneful score by
grows old.

Dekalb Chorus Is Fe

WMAQ (Chicago) is fe
Dekalb Women's Club cho
evening and WDAP (Chica
Harmony Four on a ver
gram for Saturday evenin
One of the best out-o
grams for the week is th
offering by WJAX (Cleve
Oberlin Conservatory trio
featured in a quite lengti
tentious program. It is
at 7 p. m., Chicago time.
The Cleveland stati
WTAM and WHK are
off a joint stunt begin
evening at 8 o'clock an
each evening until 1
consecutive days. The
event is a co-operative
the occasion of the annua
fund drive campaign.
program
will contain some unusual features which will be announced in these columns from day to day.
There is a complete schedule or program for this evening of all stations which commonly are tuned in by Chicago radiophans published in this column, and on page 2 the reader will find not only a complete list of all broadcasting stations with their schedules, but also a tabloid schedule for the entire week of the more important stations.

Long Distance Hounds Report.

I am getting quite an outpour of long distance reports from radiophans in response to my appeal in previous issues of the daily radio department. I expect to publish these in a few days.

Some exceptional records were made

Today's Programs

Below are given the complete schedules of all the Chicago and suburban broadcasting stations and those of the out-of-town stations which are most commonly tuned by local radiophans.

These schedules will be a regular daily feature in The Chicago Evening Post.

On Thursday of each week a complete list and schedule of every broadcasting station in the United States will be published in The Chicago Evening Post's sixteen-page Radio Magazine section.

CHICAGO STATIONS

(Central Time Is Shown.)

KYW—Located in Commonwealth Edison building; 536 meters; 9:30 a. m., news and markets; 10 a. m., market reports; 10:30 a. m., financial news and comment; 10:58 a. m., naval observatory time signals; 11 a. m., market reports; 11:05 a. m., weather report; 11:30 a. m., news and comment of the financial and commercial market; 11:35 a. m., table talk by Mrs. Anna J. Peterson; 12 m., market reports; 12:30 p. m., late financial news and comment; 1 p. m., market reports; 1:20 p. m., closing market quotations; 2:15 p. m., late financial comment and news bulletin; 2:30 p. m., closing stock quotations, Chicago Stock exchange; 3 p. m., late news and sport bulletin; 4 p. m., news and sport bulletins; 4:30 p. m., late news and sport bulletins; 5 p. m., latest news of the day; 6:30 p. m., news, financial and final market and sport summary; 8:50 p. m., children's bedtime story; 8:30 p. m., musical program by courtesy of International Harvester company: Harvester octette, Josephine Kates, accompanist; C. W. Gray and W. L. Raw, first tenors; George Thomas and W. E. Alt, second tenors; W. B. Barney and George Hodge, barytones; C. L. Knapp and Fred Soderberg, basses; Alexander Legge, president of the International Harvester company; Fred Soderberg, cornetist, with Mrs. Fred Soderberg, accompanist; artists: Olive O'Donnell, soprano; A. Bouchard, violinist; Mary Elizabeth O'Donnell, soprano, and Evelyn D. Gooch, contralto. (1) (a) Lassie o' Mine (Walt), (b) The Story of a Tack (Parks), by Harvester octette; (2) address, "More Diversification on the Farm," by Alexander Legge, president; (3) Spring's Awaking (Bach), by Fred Soderberg; (4) By the Waters of Minnetonka (Lieurance), by Olive O'Donnell; (5) (a) Sweet Genevieve (Tucker), (b) Come Where My Love Lies Dreaming (Foster), by Harvester mixed quartette; (6) Waltz, Op. 34 No. 1 (Chopin), by Mrs. Fred Soderberg; (7) A Winter Lullaby (DeKoven), by W. L. Raw; (8) (a) The Barefoot Trail (Wiggers), (b) Sweet and Low (Barnby), by Harvester octette; (9) I Love a Little Cottage (O'Hara), by Josephine Kates; (10) violin solos, selected, by A. Bouchard; (11) (a) Tommy Lad (Margetson), (b) Mammy's Song (Ware), by George Hodge; (12) (a) The Garden of Your Heart (Dorel), (b) Po' Little Lamb (Parks), by Harvester octette.

WAAF—Located at Union Stock yards; 286 meters; live stock reports at 8:40, 10:30, 10:45 a. m., 12:30, 12:45, 3, 4:30 p. m.

WBU—Located on City hall; 286 meters; 3:30 to 4 p. m., address, special features and police reports.

WMAQ—Located on Hotel LaSalle; 447.5 meters; 4:30 p. m., pupils of Lyceum Arts conservatory; 7 p. m., weekly talk to Boy scouts by Rockwell Stephens, automobile editor of The Daily News; 7:30 p. m., lecture by Chas. H. Burkholder, secretary of the Art Institute of Chicago; 9 p. m., ensemble music by Hotel LaSalle orchestra; 9:15 p. m., De Kalb Woman's club chorus.

WDAP—Located on Drake hotel; 360 meters; 1:40 p. m., DrDake concert ensemble; market reports direct from Chicago Board of Trade on every half hour, beginning at 9:30 a. m. and continuing until 1:30 p. m.; 10 p. m., musical program, Vesta Russell, soprano; Alloy Gantz, piano; Fein Bay, soprano; Tony Corcoran, tenor; and Jack Chapman's Dance orchestra.

WJAZ—Located on Edgewater Beach hotel; 447.7 meters; musical program, 10 p. m. to 2 a. m.; 10 p. m., Artists, Mrs. L. M. Laughlin, soprano; Cambridge Sisters, trio; Mrs. Walter Nieman, piano; Oriole orchestra, selections to be announced.

WPAD—Located on W. A. Wieboldt & Co.'s store; 360 meters; 8 to 9 p. m., Joseph Marshall director; program furnished by courtesy of the Harold Rossiter music company and Amy Kleinofen, organist.

WSAH—Located at 4801 Woodlawn avenue; 248 meters.

WSAX—Located on Chicago Radio laboratory; 268 meters.

OUT-OF-TOWN STATIONS

Eastern Programs.
(Central Time Is Shown.)

KDKA—East Pittsburg; 326 meters; 9:30 a. m., music, markets; 10:55 a. m., noontime signals; 11:30 a. m., music, weather; 11:50 a. m., United States bureau market reports; 5:15 p. m., dinner concert by the Grand Symphony orchestra from the Million Dollar Grand theater, Pittsburg; 6:30 p. m., Weekly Chat with the Farmers, by Frank E. Mullen, radio editor of the National Stock-

(Continued on Page 12.)

Artists featured at local broadcasting stations the coming week: At the top, Jessie Royce Landis at KYW; at the left, Rosa Raisa at KYW; center, Georgene Faulkner, the Story Lady at WMAQ; at right, Jane Garnett at WPAD; at bottom, Warren K. Howe, WJAZ.

of 100,000 is predicted during the five days' exhibit. Sunday is moving day and all of the exhibits are to be in place for the opening at noon next Tuesday. The hours from 12 to 2, each day, have been set aside for the dealers. The public entertainment begins at 2 p. m. and continues until 11 p. m. daily.

Rumors of Big Deals Circulate.

A definite movement, which is said to have interested the Chicago Association of Commerce and other business interests of the city, and designed to make Chicago the radio center of the world, will be one of the aftermaths of the coming show.

Rumors of developments of tremendous business importance to the radio trade, tho unconfirmed, are current, and important commercial announcements, it may be said with certainty, will emphasize again the financial possibilities of the business.

"A radio show given by showmen," has been the slogan of the organizers. His face wreathed with smiles as final space reservations came in today, James F. Kerr, general manager, recalled the experience of the sad finish of a year ago.

"Where did Sport Herrmann get this radio fever?" an inquirer asked.

"It was all MacDonald's fault," said Kerr. "McDonald of the Zenith Radio corporation went down to New York to attend the radio show there last year and to see what all the shooting was about. The public jammed the place.

First he recalled a rush he had been in at the Cort theater and then he thought of "Sport." He wired Mr. Hermann to come to New York and

to the rural districts on trains and give the country a treat by listening in on baseball scores. Mr. Hermann, with little difficulty, induced me to abandon my business enterprise and we started in on the radio show business. What a headache. We didn't know it at the time, but we were ahead of the radio business.

"The intense interest on the part of the dealers, as well as the public, now has convinced us that the public is just beginning to awaken to the wonderful commercial possibilities of radio just as they did after a period of time to the automobile and the moving pictures.

"If Mr. Hermann and I have been pioneers we were unconscious of any heroism on our part. We believe we know the show business, however, and we believe we know what the public wants in the way of entertainment. Radio offers a great future to the theatrical business. It seems the theater and music are the handmaidens of this growing business.

De Forest to Be Guest.

Facts seem to justify the glowing advance notices of a successful show. Lee De Forest, the father of radio, heads a galaxy of well-known men who will be present. E. T. Flewelling, Maj. Armstrong and Prof. Hazeltine are expected. World famous speakers on radio subjects will add a variety to the all-star musical programs. Prize contests of various kinds and numerous popularity contests will be held. The surprising feature of the contest is that a number of women and youngsters, both boys and girls, are contributing really wonderful discoveries.

Dealers are co-operating this year in making the show a success. They have sent out thousands of letters to their trade and their advertising copy has advised customers to attend the Chicago show where the very latest devices will be exhibited.

Arrangements have been made thru E. F. McDonald, Jr., president of the American Broadcasters' association, to link up the larger broadcasting stations in Chicago with the Coliseum by means of sealed wires so that all the addresses and concerts will be broadcast. Large stages have been constructed at each end of the Coliseum and from these stages entertainment programs will be given both afternoon and evening. Admission will be 50c plus the tax.

Radio Chief Tours Country

Chief Supervisor of Radio W. D. Terrell of the department of commerce will make a swing around the country, eventually visiting each of the nine radio districts. Recently he made a trip to Detroit and Chicago, the eighth and ninth district headquarters. Later he hopes to start west to visit Seattle and San Francisco and inspect the district headquarters there. Returning by way of New Orleans, he will stop off there and in Atlanta, where the new fourth district offices recently were established. En route to Washington he hopes to stop at Norfolk. Later in the season, he will go to Baltimore, New York and Boston, thus completing a circuit of all nine district headquarters.

Mexico Joins Broadcasters

The resumption of diplomatic relations with Mexico has influenced broadcasting. A recent dispatch states that a new 500-watt radio station has been installed by "El Universal," a daily paper published in Mexico City.

DE FOREST PLANS A BIG COUP FOR CHICAGO'S SHOW

Lee De Forest, the inventor of the present-day audion tube, which made radio popular, is coming to Chicago to announce one of the most important contributions to radio science.

Just what it is that Mr. DeForest has to give to the world is not told. In fact, it is being kept a close secret to himself and his associates.

It is said, however, that the new invention will equal in importance, perhaps, his audion tube.

The first announcement is to be made in a lecture at the second annual radio show, which opens Tuesday at the Coliseum.

There are to be sessions of the radio engineers, and it is to be at one of these meetings that Mr. DeForest is

A VIEW in the new WLAW radio broadcasting station at New York police headquarters is shown here. This powerful station, employing a power of 1,600 volts, is equal to any of the largest and most elaborate broadcasting stations in the country. It marks a long step ahead in police work, for the broadcasting of descriptions of criminals and missing persons will put millions of Americans on the lookout for the "wanted."

In cases where large fires or other fatal disasters occur the names of all casualties will be broadcast, so that the police no longer will be flooded by telephone calls from anxious friends and relatives of those involved.

When not in public safety use, the apparatus will be used to broadcast concerts by the splendid police department band, lectures, and other entertainment programs. Photo shows police engineer testing control board of new WLAW station.

How to Build Reflex Set and Tune It Efficiently

By WILLIAM J. SCHNELL.
Radio Engineering Department, Electrical Research Laboratories.

AFTER more than a year of nation-wide usage under all conditions, the Erla one-tube reflex hookup still stands as one of the best for the amateur to construct. In fact, it is about the only one-tube set that will operate a loud speaker on all local and near-by stations.

Its construction is cheap and simple. A 6x14 panel gives plenty of room for all parts, and the baseboard should be 7 inches deep, so that it will fit in a standard cabinet. Here are the parts necessary in constructing the set:

One variocoupler.
Twelve switch points.
Four switch stops.
Two inductance switches.
One twenty-three-plate variable condenser (vernier).
One rheostat.
Two sockets.
One No. 1 reflex radio transformer.
One 6 to 1 audio-frequency transformer.
One crystal rectifier.
One .001 fixed condenser.
One .002 fixed condenser.
One .00025 fixed condenser.
One single circuit jack
6 binding posts.

Proper Values Necessary.

The most important factor in building this set is the selection of the proper parts. Any old junk that you happen to have around the house will not operate. This is especially true of the two transformers, coupler, crystal and the fixed condensers.

The coupler should have a stator diameter of four inches, with sixty-six turns, and the last six turns tapped at every turn. The rotor should have a diameter of 3½ inches, wound with forty-five turns of No. 24 wire. Coupling should be 1 inch from center of shaft to center of stator.

Extensive tests in the electrical research laboratories show that the tubes can be rated in the following order in regard to effectiveness: C-301A or UV-201A, C-299 or UV-199 and WD-11 or WD-12. For use with dry cells the C-299 or UV-199 are the best, while even better results will be obtained by using a storage battery and the C-301A or UV-201A tubes.

Batteries and rheostat should be selected to correspond to the requirements of the tubes to be used. If 201A or 301A tubes are used, four dry cells wired in series, or a six-volt storage battery, are necessary, and should be regulated by a 25-ohm rheostat. If 199 or 299 tubes are used, three dry cells wired in series, or a four-volt storage battery, operated thru a 30 ohm rheostat, should be employed.

As to Antenna System.

From 75 to 150 feet of an antenna gives good results. If an outdoor antenna cannot be placed, use an indoor antenna of from 40 to 150 feet of wire strun gin the attic or run around the picture moulding of the rooms. A loop is never advisable because it always cuts down your volume.

About fifteen feet of No. 12 B. & S. gauge tinned copper wire will be enough for connecting up this set.

Fix your antenna and ground binding posts at the left of the set and place your variocoupler, variable condenser and jack in a line from left to right, with the two inductance switches and the rheostat lower down on the panel, and also in line from left to right. Battery binding posts can either be mounted on the right end of the panel or on the rear of the baseboard, at the extreme right.

Keeping in mind the fact that all leads must be made as short as possible, run a wire from the aerial binding post to either of the switch levers. Connect another wire from the ground binding post to the other switch. It makes no difference which switch you connect to first. Attach coupler taps to the switch points, the ten-turn taps to go to one set of points and the one-turn taps to the other set of points.

The Coupler Connections.

A wire is next run from one of the coupler rotor connections to the stationary plates terminal of the variable condenser, and another wire attached to this same connection is run to the "G" terminal of the tube socket.

A connection is next made from the wire attached to the aerial binding post to the other terminal of the coupler rotor and also to the movable plate, or rotor, connection of the variable condenser.

Another lead is run from the movable plate connection of the variable condenser to the "G" binding post on the secondary side of the 6 to 1 audio-frequency transformer. A connection is next made from the "A" terminal of the audio-transformer to the "A minus" binding post lead.

A short piece of wire is next connected between the "P" binding post of the tube socket and the "Feminus" binding post of the socket in which the reflex radio No. 1 transformer is placed.

A lead is next run from the "G" of the reflex No. 1 transformer socket to the upper contact spring of the two-spring 'phone jack. Connection is now made from the "P" on the reflex No. 1 transformer socket to the "B" on the primary side of the audio-frequency transformer.

A lead is next run from the "F plus" post of the reflex No. 1 transformer socket to the "radio transformer side" of the fixed crystal rectifier. Another wire is run from the "audio transformer side" of the crystal to the "P" binding post on the primary side of the audio-transformer.

The .001 fixed condenser is then connected one end each to the "P" and "B" terminals of the audio-transformer.

Wiring the Filament Circuit.

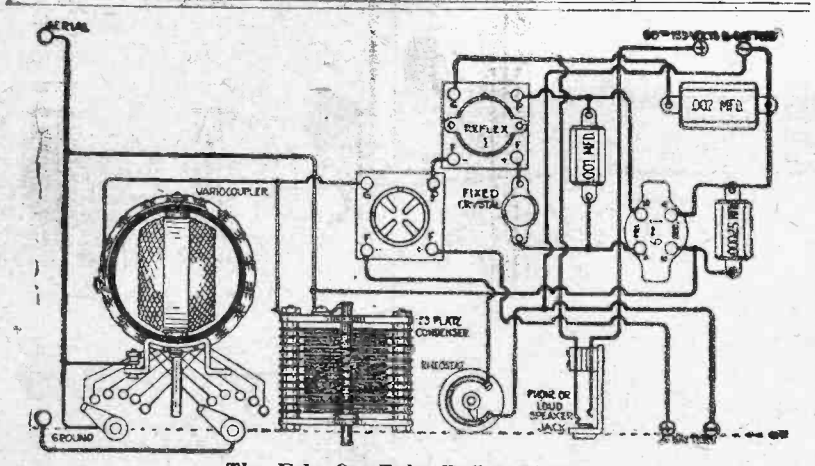
The filament circuit is next wired. A short piece of wire is connected from the "F minus" binding post of the tube socket to either of the two terminal posts of the rheostat. The other terminal of the rheostat is connected to the "A minus" binding post. A lead is run from the "A plus" binding post on the panel to the "F plus" binding post of the tube socket.

Next the "B" battery is wired. Run a lead from the "B plus" binding post to the lower contact spring of the 'phone jack. Connect a short piece of wire from the "A minus" binding post on the panel to the "B minus" binding post on the panel. Next connect the "G" binding post wire of the reflex No. 1 transformer socket to one end of the .002 fixed condenser. The other end of this fixed condenser is attached to the "B minus" or "A minus" leads on the panel. Next an .00025 fixed condenser is connected across the secondary "A" and "G" terminals of the audio-transformer.

How to Tune the Set.

This completes the wiring of the set. If you will consult your dealer and tell him the set you are going to build he can see that you get the properly tested, guaranteed parts. Then you can tune in with a sure radius of more than 1,000 miles under most any conditions, and a coast-to-coast range under favorable conditions.

To tune in, set your variocoupler at about 45 degrees. Set both inductance switches at about the center taps. Turn the variable condenser very slowly so that you do not miss any stations. If nothing is picked up, move your inductance switches a little and try again. When a signal is picked up, adjust your variable condenser carefully. Then adjust the rheostat to the most favorable position.



The Erla One-Tube Reflex Circuit.

Radio Puzzles Russians

Radio is a mystery to all Russia. Even electrical experts in that country know less about it than the average American schoolboy. The European Student relief, which reports this state of affairs, explains that it is due to the fact that Russia is ten years behind in its knowledge of technical inventions and improvements. The most recent books used in the universities and technical schools are 1914 editions.

The Leiter Stores, State and Van Buren streets, conducts a free workshop for radiophans. Full equipment of tools, work benches and testing apparatus is at the disposal of those who wish to avail themselves of the service. A competent instructor is in charge and gives free advice on construction work.

the initial letters assigned to each government for use as calls by the International Radio bureau. This booklet is sold by the superintendent of documents for 15 cents.

The amateur list includes 16,570 stations licensed to amateurs with their calls, locations and names of owners. It is sold for 25 cents a copy.

GLOW MIKE AID KYW RECEPTIO OF GRAND OPE

The broadcasting Tuesday e of the opera, "The Jewess KYW (Chicago) marked not on seceond anniversary of that s but also the introduction in Chicago radio field of the f glow microphone.

Thousands of radio and ope thusiasts who listened marve the exceptional tone quality entire production, especially clarity with which the great o choruses were transmitted.

Since the inception of radio casting radio engineers have endeavoring to perfect microp which would be the equivale the human ear, as agencies by of which material for broadc could be "picked up" witho appreciable loss in the origina ity of that material. In answ this problem comes now the microphone invented and desig Dr. Philip Thomas, research en of the Westinghouse Electric Manufacturing company.

For more than a month Thomas has been in Chicago w with Walter C. Evans, chief en at Station KYW, in an effort fect the equipment for the tra sions of the productions o Chicago Civic Opera associatio great part of the apparatu built by Dr. Thomas in an impr laboratory at the Chicago s He has been working almost and day. In this work Dr. T received invaluable assistance Mr. E. H. Moore, electrical en for the Chicago Civic Opera pany.

While the immediate possi offered by the Thomas micr are exceptionally great, its futu pears even more remarkable use of this new microphone, will be able to transmit witho tortion any material which is able. In the past the select material for broadcasting pu largely governed b mitations of "pi

The future, ho none of these pro been solved by th

cket Grid-Leak

e grid-leak can be m pencil lines on the b socket from the grid ament posts. The er of lines the less f the leak, and, by tr alue can be ascertaine

How Broadcast Stations Get Their Programs Out on the Ethereal Lanes

ON this page today you meet, face-to-face, those unseen but much-heard magicians of the ethereal spaces—the operating force of KYW station. Also you are invited by one of them—the big chief, Mr. Wetherbee—to go behind the stage and see how it is all done.—The Editor.

YOU'VE often wondered just how a broadcasting station sent out its mysterious waves. Here on this page Mr. Wetherbee tells you some of the steps he and his assistants take each day to give you entertainment. You will be interested in what he says.—The Editor.

By Wilson J. Wetherbee.
(Director of Station KYW.)

WHILE the world in general is becoming rather familiar with the operation of radio receiving sets, the mysteries surrounding a telephony transmitting station still remain more or less inscrutable.

The rapid expansion of radio broadcasting and its attending possibilities have wrought a complete change in the systems used originally, and the methods now employed in providing daily programs for tens of thousands of listeners.

Directors of stations are asked many times daily how it is possible to procure and maintain such continuity of service, such variety in the material disseminated. This curiosity is emphasized when one gives even only a cursory glance at KYW's program, which appears elsewhere in this magazine, and notes how comprehensive is this daily presentation.

I propose to satisfy the curiosity of the broadcast listeners by telling here just what happens at station KYW before an evening musical program is broadcast.

Mechanism Is First Tested.

Thirty minutes before broadcasting time, the engineering force, under the direction of Walter Evans, chief engineer of station KYW, begin testing the mechanism. The microphone, amplifiers, batteries, generators, transmitters and every part of the plant is completely "gone over."

When this is found to be in perfect working condition the station operator notifies the studio director that all is okeh. This is done by a direct telephone wire connecting the station with the studio-room. The operators between these two points constantly are in touch with each other during the evening's program.

The studio-room, located on the sixteenth floor of the Edison building, is where the regular evening concert is broadcast. This room is specially equipped acoustically for broadcasting, being heavily padded thruout to prevent echoes and the noise of footsteps from interfering with the selections being rendered.

How the Voice Is Transmitted.

To arrange and book artists for an hour's program each evening of the year is a rather difficult task, and to entertain an audience of more than a million persons is a gigantic undertaking.

When the artist sings into the microphone, the voice is carried thru six steps of specially constructed amplifiers, which are connected with the microphone by specially insulated wires incased in a copper tube. The voice carried into the amplifiers is increased in volume to several thousand times its original sound, and from there it is carried along special shielded telephone wires to the station on the roof of the Edison building. Passing thru the transmitting plant it is sent by wire to the 125-foot antenna towers above the station, where it is put on the air and sent to ever part of the United States.

Broadcasting by Direct Wire.

It is quite different when broadcasting an opera, a concert from Orchestra hall or a dance program from the College inn, Hotel Sherman. In this case, lines are run underground from the place of amusement to the Edison building and thence to the station on the roof, where it goes thru the same process of amplification and transmitting before it is sent out.

This is what is meant by the term "this concert will be broadcast by station KYW by direct wire from Orchestra hall."

The station on the roof is known as "Broadcast Central," which is the heart of the "direct wire" system. There is a veritable network of wires running underground all over Chicago which lead to "Broadcast Central," and with this artery system KYW affords the radio fans a multitude of concerts and talks which they other wire could not receive.

Working before the microphone is quite different from the usual mode of appearing before an audience, as far as the artist is concerned. This is quite evident when one watches the mannerisms and nervous twitching of our "footlight favorites," trying to broadcast the same musical numbers done in the theater. They seem to "be out of place," "uneasy" and at a loss to know what to do with their hands.

There is something about the silent microphone that throws a "fear" into the stout hearts of even our veteran performers. They say it's not like working before an audience.

Give Artists Real Audience.

One way in which the directors of KYW have partly overcome this is by supplying an audience of forty or fifty persons who sit in the broadcasting studio the same as tho they were inside a theater. This little intimate gathering shows its appreciation of the numbers rendered by applause and laughter, and in this way the artist begins to feel at ease and goes thru the routine in a workmanlike manner.

Another thing that adds to the comfort of the performers and helps instill confidence in them is the keen sense of humor and practical stage training of the chief announcer, A. W. "Sen" Kaney. He fits ideally in this capacity. Mr. Kaney has the happy faculty of making everyone "feel at home."

Courtesy and dignity are very much in evidence at the studio. Each member of the staff is "picked" for his particular position, which keeps the studio going at the highest possible efficiency.

The reception-room is in charge of Howard Sloan, who sees to it that all artists appearing on the evening program are accorded every courtesy and attention while arrangements are being made for their appearance before the microphone.

Following the procedure the artist is ushered into the broadcasting studio-room. This room is the main artery of our unit, for it is the source of our entertainment. Once inside they await their turn to give radio fans the best they have.

Westinghouse station KYW has several private telephones connected with the station on the roof of the Edison building, as well as three special phone wires running directly into the studio.

In this way, the public keeps in touch with the studio directors, showing its appreciation of numbers rendered and making numerous requests during the evening. KYW entertainers strive hard to please their hearers and willingly put on extra numbers whenever time permits.

Besides the artists who visit the studio, KYW has among its announcing staff several well-known entertainers.

Chief among the staff of regular entertainers is none other than the famous Wendell Hall, dean of radio entertainers. Ten years ago Mr. Hall started his professional career as a singer. A little later he was playing the clarinet, then the saxophone, then the trombone in orchestra and band work. He appeared later in vaudeville, doing a single act, "The Singing Xylophonist."

Becomes a Song Writer.

Mr. Hall then displayed his versatility by writing songs, both words and music. He wrote such waltz hits as "Underneath the Mellow Moon," and "My Carolina Rose." Of late he has been writing "blues" as well as ballads. Fans can recall his latest, "It Ain't Gonna Rain No Mo," which has endeared him to the hearts of the vast radio audience.

Mr. Hall returned today from an extended trip east where he made records for the Victor company. He will again be heard from KYW beginning this evening.

Another studio artist who is very popular is "Herb" Mintz. Mr. Mintz plays lively piano numbers, and is a composer of note. Then there is Sallie Menkes, known as "Our Sally." She is the official accompanist for the studio.

Let us add here another word about "Sen" Kaney. Mr. Kaney is really the studio jester. He injects "pep," comedy and good feeling into those around him, and will be found doing a little specialty act via the ether. He sings, plays the piano and accompanies himself on the ukulele, besides being the author of the first radio column known as the "Ether Wave."

Probably one of the most important men associated with KYW is one of whom the public know little. He is Harold A. Fall, assistant director of KYW and director of the studio. The arrangement of the programs and the efficiency of the broadcasting studio is under his personal supervision. Mr. Fall also broadcasts the football results direct from the field, and is popularly known as the man with the "football voice."

Here you meet face to face those who help entertain you every night in the week from KYW (Chicago). First, take a peep into the operating-room. Fig. 1 shows the control board. In the oval insert (Fig. 2) is Wilson Wetherbee, the station director. Fig. 3 is Wendell Hall, the "red-headed music-maker." Fig. 4 is H. A. Fall, assistant director. Fig. 5 is Burt Swift, assistant musical director. Fig 6, Sallie Menke, official accompanist. Fig. 7, Morgan L. Eastman, musical director. Fig. 8, A. W. (Sen) Kaney, one of the most popular announcers in the United States. Fig. 9, Walter C. Evans, chief engineer. Fig. 10, Mrs. Anna J. Peterson, who gives table talks every day.

Hears WLW on High Seas

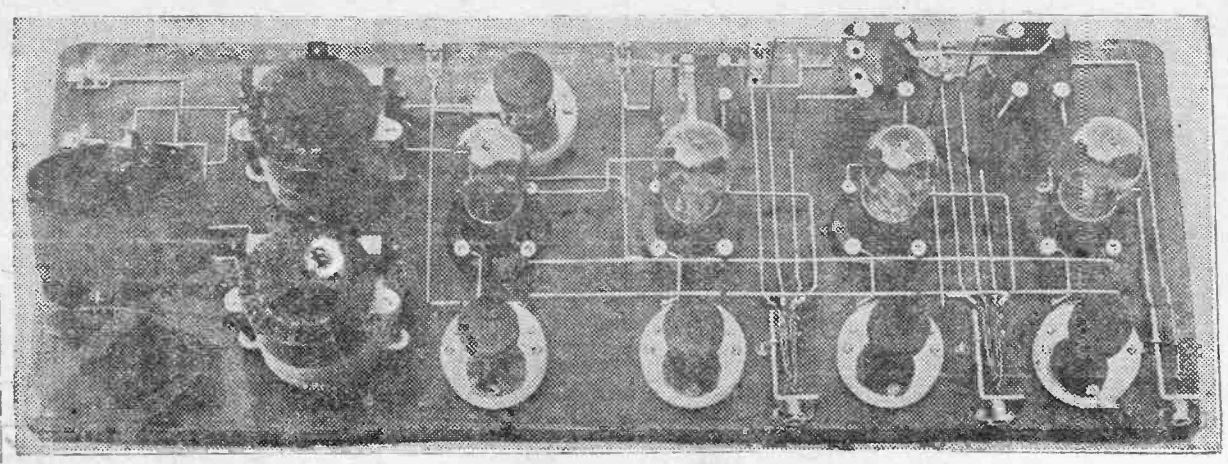
A message from Royal Sterling of the S. S. Hawaiian of the American-Hawaiian line, informed the WLW studio (Cincinnati) that it was heard about 120 miles off La Liberta Salvador. This is particularly fine, when the warm weather is taken into consideration. The program was reported exceptionally fine that evening.

Broadcasts Two Programs

British radio engineers are experimenting with a system of transmitting two programs at the same time on different wave lengths off one antenna.

Everyday Engineering for the Home Builder

BEGINNING with this issue, Mr. Cardwell starts a series of articles on "Everyday Radio Engineering," the entire series being designed to be of inestimable value to the novice or layman who wishes to construct his own set. The articles are written especially and exclusively for The Chicago Evening Post Radio Magazine and are protected by copyright. Mr. Cardwell is one of the foremost radio engineers of the United States. He is the inventor of the Cardwell receiver, of the Cardwell condensers and of numerous other radio apparatus and equipment.—The Editor.



A practical testing set. By open wiring the builder can switch connections easily, and it is ideal for trying out new circuits. Note how the tidy, clean wiring is installed.

MR. CARDWELL'S series of especially written articles for The Chicago Evening Post Radio Magazine on "Everyday Radio Engineering" will consist of seven installments, the first appearing on this page today. They are as follows:

I. The Importance of Planning the Set with Care.
II. Circuits and How to Adapt Them.
III. Sketching the Layout.
IV. Selection of Parts and How to Judge Them.
V. Wiring and Assembly.
VI. Circuit Troubles, Tube Noises, Etc.
VII. Refinements in Set Construction.

By ALLEN D. CARDWELL.
(Consulting Radio Engineer.)

THRU the courtesy of The Post Radio Magazine, I have been offered an opportunity of writing about everyday radio engineering. Being an assiduous reader of many radio articles in the various radio magazines and radio sections, I will try to give the reader as much information as I can without repeating what has been given elsewhere.

From a close personal knowledge of how amateurs often proceed to build sets, it seems that they invite upon themselves difficulties of one kind or another. Many of the hook-ups and layouts they adopt are impractical, and they often waste costly apparatus and material which, by a little straight thinking, they might avoid.

Radio engineering demands concentrated study. If you are building a set, and intend to use it for years to come, you would not make it hastily merely to be able to listen in the same day you began making it.

First, Know Your Own Mind.

My first suggestion, therefore, is to know your own mind. Are you going to build a set for a friend who is in some country town far from any broadcaster? Are you going to try out a new circuit just to see how it works? Are you making a receiver for long distance?

These are questions to ask yourself before you think of buying any parts or supplies. Once you have determined what the purpose of the set is to be, you then are in a position to estimate how you will go about achieving the results.

Regardless of what circuit or type of receiver you decide upon, you must have a general limitation on what it will cost. Here I would suggest that you do not underestimate costs or start out on too elaborate a set which will keep you broke for weeks while you are making it and cost you a great deal to operate it once it is built.

The two factors of purpose and cost will thus fix certain limitations on your design. Let me tabulate these in summary form:

PURPOSES OF THE RECEIVER.

Local reception without loud speaker.
2. Long distance reception.
3. Directional receiving.
4. Portability.
5. Simplicity of tuning.
6. Extreme selectivity.
7. Quality of reception.
8. Occasional use.
9. Specific use — market reports, time signals, etc.

AS TO COST FACTORS:

1. Storage battery operation.
2. Number of tubes.
3. Size of cabinet, panel, etc.
4. Number of controls.
5. Accessories required.
6. Aerial installation.

Take a practical example: Mr. X decides to built a set. He lives in a Chicago apartment. He believes he should have a receiver which his wife or his children or himself can operate. On this basis he feels it should not cost him much more than his phonograph, and, as he has bought a $100 phonograph, he calls this his cost limit.

As all his friends report long distance reception he is anxious to have this advantage. He also hears a good deal about interference, so he does not want that to affect his reception.

Proceeds With Confidence.

He now can select a circuit using about four tubes, can include a moderate priced loud speaker, a substantial cabinet, a storage battery and by putting up an aerial get fairly long distances. He selects a circuit, itemizes each part required, lays out the panel and can be certain before he starts that the instrument will perform faithfully, provided he is consistent.

Being an amateur radio engineer, therefore, largely is a matter of planning each step in the process of building a set, just as you would plan a house. You don't use concrete walls on residential buildings nor put leaded glass panes in chicken coops, nor would you put a parlor receiver in a soap box, nor gold-plated binding posts on a crystal set. Be consistent and you will get what you started out to get and—what is very important—waste no time, money or worry in achieving the result.

The foregoing remarks may seem vague generalizations, but I can assure you that if radio designers would plan their receiving sets with the same care and thought that they plan their business or studies they would be highly successful.

Radio engineering is good training for anyone who is still young enough to learn new habits, and we all count ourselves young until we cannot turn a dial or tune in a new station.

What Circuit to Use.

Now for the circuit to use: This is, above all, the most troublesome problem for most radio designers. We are anxious to have something a little better or different, and unless we are ambitious to make a neater set, or a simpler set, or a longer range set than our neighbor's we are losing the sporting interest in radio, for we all enjoy comparing sets and results with others.

At the same time I would caution you not to invent circuits or theorize new ways of solving old problems unless you are deeply versed in radio theory. To be competent to develop something new requires rather unusual experience. If you have that experience you will not gain by reading what I am writing because I am only thinking of the novice and am anxious to help him by practical and possibly elementary observations.

Do not attempt to build a set using an untried circuit. The amount of seasoning required to establish a rating for a new circuit is about six months after it is first suggested in the radio papers.

For example: In August, 1922, Armstrong demonstrated the super-regenerative circuit and for several months every one was busy trying it out. Those who investigated it for the sake of trying something new were repaid in the "puzzle picture" reward which comes when you finally solve it. Yet for practical use, the super-regenerative would not as yet seem to warrant its enormous publicity because it is now regarded as suitable for only limited uses.

Therefore, use only a circuit which has been proved by test of time. In this respect I am glad to see that when the editors run articles on new receivers they give the fullest specifications, as to the parts to be used, the number of turns on a coil, the size of the panel, etc., but more important, they define its resultant service in terms of selectivity, sharpness, etc.

List of Standard Circuits.

We have a number of standard circuits available today which are practical and efficient. These circuits may be grouped as follows:

1. Regenerative.
2. Radio-frequency.
3. Reflex.
4. Heterodyne.
5. Neutrodyne.

Then there are combinations or adaptations, such as the Flewelling, Cockaday, Reinartz, etc.

Practically few readers will be interested in building crystal sets, altho the venerable crystal still has its place in radio engineering. Few readers will be interested in constructing a seven-tube super-heterodyne. But most readers will like to work on a simply constructed receiver of say three tubes.

In building a standard set, I would advice the reader to count on using at least three tubes. Invariably you would like to have others enjoy the radio concerts, and there is not as yet a practical circuit which will give loud speaker volume over any very great range of stations with less than three tubes.

Here and there you may be able to find a set which will talk up well on one tube or two tubes. It can be done, but for average, good volume,

Continued on Page 8.

which has been in the limelight considerably the past year.

The circuit is so extremely simple its construction and satisfactory operation can be assured even in the hands of the most inexperienced. Indeed, in practically every instance where this circuit has been given to a novice, he has reported reception of long distance stations on the first night of its operation.

Most of the circuits that have stood the test of time fall into two classes—the single circuit regenerative tuner and the three-circuit regenerative tuner.

The former employs a single-tuned circuit. It is very simple to operate, and does not cost much to manufacture, but has one disadvantage which prevents it from becoming popular—its lack of selectivity.

On the other hand the three-circuit regenerative tuner, as its name implies, employs three separately tuned circuits. It is an extremely good receiver, capable of doing fine work in the hands of an experienced operator, possessing efficiency and selectivity to a marked degree.

Requires Knowledge of Set.

But, unless the operator knows what he is doing and why he is doing it, it is almost certain that he will obtain negligible results. Moreover, due to the several instruments used, it is rather costly and complicated, presenting difficulties in wiring, and so forth.

But, now a happy thought. Why not combine the best features of both these circuits? That is precisely what I did. Those familiar with wiring diagrams will recognize the similarity of the hookup employed with that of the regular triple coil tickler feed-back circuit—with one exception: The primary circuit is untuned and is conductively coupled to the secondary or tuned grid circuit.

The primary circuit consists simply of the first few single tapped turns on the stationary winding of a variocoupler, while the remainder of this winding is used as the secondary. The rotor or movable coil is used as the tickler. One of the 180-degree type couplers is best, as it gives a much smoother regenerative control.

Heart Is the Condenser.

But, the heart of this circuit is the secondary tuning condenser. Its maximum capacity should not be greater than .00025 mfds. However, many modifications may suggest themselves to the builder to meet his particular fancy, altho the specifications given in the instructions accompanying the circuit will produce an exceptionally good all-around receiver for both amateur and broadcast reception.

The following is a complete list of material needed for the single tube receiver:

One panel 7"x15"x3-16".
One 180-degree variocoupler.
One .00025 mfds. variable condenser.
One rheostat.
One socket (panel mounting).
One switch.
Four switch points.
Two switch stops.
Ten binding posts.
Two 3-inch dials.
One grid condenser .00025 mfds. cap.

Accessories which must be used with this set are as follows:

Phones, detector tube, 22½ volt "B" battery and 6 volt "A" storage battery. (If the WD-11 or WD-12 aeriotron tube is used a single dry battery will take the place of the 6 volt storage.)

Brings in DX Stations.

As an example of what this set is capable of bringing in, the following may serve as an illustration: In a New York city suburb, using a one-wire aerial, thirty-five feet high and 125 feet long, Chicago, St. Louis, Louisville, Atlanta, Boston, Fort Worth, Minneapolis and Havana were received in one evening.

In the practical operation of the set, more than one step of audio-frequency amplification is not recommended unless it is employed to operate a loud speaker, or unless there are no facilities for an adequate antenna. Often, however, such an addition is a hindrance to long distance reception, having a tendency to emphasize static and local interference rather than bring out the weak distant station.

WDT Stops for Repairs

Station WDT (New York city), operated by the Shipowners' Radio Service, ceased operations last Friday at midnight. It will reopen in a few weeks after repairs. The station put on the air as a farewell attraction a program presented by twenty-five singers and entertainers, and Vaughn de Leath's orchestra. Miss de Leath, the director, says that the station will reopen with more hours, better programs and a better station.

New Tube Excites Curiosity

Considerable curiosity and interest is manifested in the new "Sodion" tube which is being marketed. Beyond showing pictures of the tube and giving its trade name, the first trade paper advertising gives little information. H. P. Donle is the inventor. The tube is smaller than the UV199 and is a detector only. One of its features is that it will not oscillate.

Radio Saves Woman's Life

Broadcast appeals for a volunteer to submit to blood transfusion to save a woman's life in a London hospital brought many subjects. One of these, a woman, was accepted and gave half a pint of blood to the patient—also a woman. The operation was successful.

Haynes Gives Some Data on His Famous Circuit

By A. J. HAYNES, R. E.
(Haynes-Griffin Radio Service, Inc., New York City.)

CIRCUITS form one of the principal factors in radio broadcast reception. These lead the radio impulses from the antenna to the local battery circuits to obtain maximum detection, selectivity, regeneration and amplification.

Probably the success of no other science hinges so much on how results are accomplished as does radio. One writer has likened it unto the proper marriage of the several radio units and the tubes.

A wealth of knowledge already has come to light as the result of various hookups, and it is safe to say that a great deal more knowledge remains concealed, awaiting the probe of some inquisitive investigator.

Certainly if any radio novice or amateur wishes to experiment in radio without too great cost, he may figure out new circuits very profitably. That is, they may be new to him, altho as old as the science itself to more experienced radio men, but he will certainly learn a great deal about radio. Of that he may be sure.

Hobby Is Receiving Sets.

The writer has followed radio closely for more than ten years, first as an amateur and for the last five years as a profession. Thruout this time his hobby has been receiving circuits.

A. J. HAYNES, R. E.

The development and modification of his own personal receiving set has been more or less typical of what most practical minded radio enthusiasts experience. Indeed, the cycle of progressive development seems to be pretty well fixed.

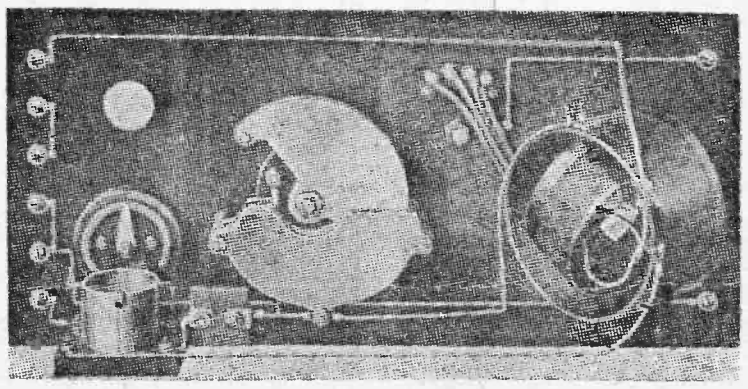
We start with a more or less simple circuit (if we are wise and have good advice) and then begin "improving" the set. We add a condenser here. "Bill says it improves the tuning," Then, perhaps, a variometer is purchased and the entire circuit changed.

If the experiment is a true one and the experimenter's money lasts, this process continues until his circuit becomes so complex and his array of dials and knobs so formidable that even he acknowledges that his outfit has gone beyond the point of practicability.

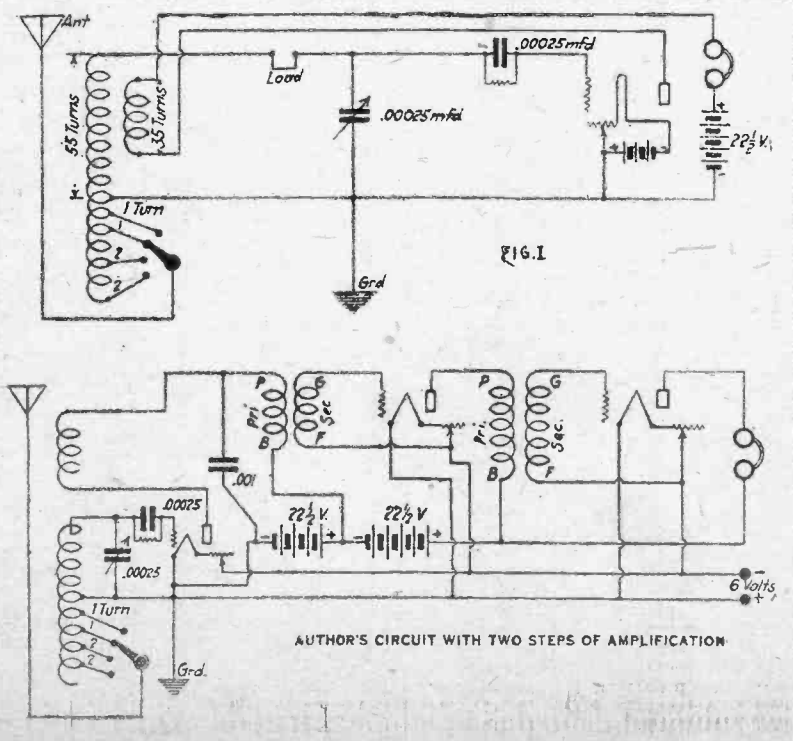
Then a reversion sets in. He succeeds in eliminating a condenser without detracting from the efficiency of his receiver in any way. Now, he is developing a true engineering instinct. "How much can I simplify this set without reducing its selectivity or efficiency appreciably?" he asks himself.

Gets Wonderful Results—in Static.

Like many other amateurs of a ten-year-ago day, I robbed the sewing machine, the telephone instrument and appropriated other contrivances and things in order to make a radio set. My first set was a wonder—I got a wonderful lot of static! But gradually I improved until—well, I followed in the manner outlined above and finally developed the Haynes DX circuit, which has been in the limelight considerably the past year.



Rear view of Haynes' receiver showing position of parts. This is a photo of a set constructed by the author.



AUTHOR'S CIRCUIT WITH TWO STEPS OF AMPLIFICATION

Studies American Methods

Monsieur Leon Deloy, famous French amateur, is in the United States studying American methods and apparatus. He hopes to return to France and with his newly gained knowledge help improve native conditions.

This One-Tube Super Hook-up Brings ir Long Distance with the Kick of a Missouri Mule

THE one-tube receiver (Autoplex) developed by M. L. Muhleman is giving the radiophans a decided jolt even in these days of multitudinous circuits. Some remarkable results have been experienced by Chicago experimenters in the last two or three weeks. This article gives some details of the circuit and operation.

By IVERSON C. WELLS.
Radio Editor The Post.

PULLING IN Pacific coast stations with a one-tube set of simple design and getting a kick out of the reception like that supplied by the rear section of a Missouri mule is a dream of all radiophans.

Chicago experimenters and many homebuilders have been doing this one thing the last few weeks.

Of course, coast-to-coast reception on a single tube is not new to midwest listeners. However, getting that reception with sufficient volume to enable one to hear it comfortably several feet away from the earphones is something else.

The little receiver that has been accomplishing this feat is the Autoplex circuit, announced a few weeks ago by its inventor, M. L. Muhleman, A. M., I. R. E. It is a modification of the Armstrong super-regenerative circuit, and a decided improvement, if the results secured in the preliminary tests become a regular habit with the circuit.

Number of Parts Near Zero.

Not only is just one tube used, but also the minimum of parts. Two variometers, a honeycomb coil, tube, socket, batteries and phones comprise the complete list of parts. You must admit that this is getting the equipment trimmed down close to the core.

Most of us who have been doing any experimenting with radio are familiar with the Armstrong super. It is a good circuit, but like most of the "supers" and "flivvers" is decidedly erratic and bucks like a Texas broncho, just when you want it to be nice and peaceful. That's one of the reasons why it never proved popular.

Mr. Muhleman seems to have eliminated all the faults of the "super" in his experiments, and to have installed some decidedly new wrinkles in his Autoplex.

The Autoplex is simple in operation. The two variometers are the only controls, and only one of them is critical. And, strange to say, the circuit is sensitive and seems to reach out into the ethereal lanes, pick up stray signals from distant stations, which have been very, very elusive, and bring them in with a vim.

Leaves Beaten Paths.

In designing his receiver, Mr. Muhleman has stepped out of the beaten paths of accepted theory in super-regeneration. He doesn't exactly take issue with Major Armstrong, but he presents some theories of his own which, to say the least, seem to contradict the inventor of the original regeneration idea in radio.

In the November number of the Radio News, Mr. Muhleman goes thoroly into his theory, and since this article is intended merely to present the circuit, and some of its peculiarities to The Post Radio Magazine readers, so that radiophans, who feel so inclined, may experiment a little, no attempt will be made here to consider theoretical aspects.

First, before I give the result of my own experiments with the circuit, let me get this one fact established in the reader's mind:

The Autoplex still is in the speculative form. No one yet has proved all of its possibilities as indicated by the first-stage experiments.

I have tried out the circuit under broadcasting conditions. It has performed marvelously. However, no opportunity has been given me to check up on the results thru laboratory equipment, and I would hesitate to unqualifyingly accept all the good things that is being said about the circuit.

Because of this lack of substantiation, all statements made here should be taken purely on a speculative basis.

Seeks Long Distant Reception.

Mr. Muhleman, in commenting upon the Armstrong super-regenerative circuit, says: "A complete study of the theory of super-regeneration leaves the individual confident that long distance reception should be possible. This has been accomplished in a number of instances, but the usual super-regenerator falls short on this point."

It was this conclusion which led Mr. Muhleman to experiment. In his search for long-distant reception he was led to his by-theory, and the design of his simplified circuit.

By reference to the two schematic diagrams, shown on this page, one showing the original Armstrong circuit, and the other the Autoplex, it will be noted that the capacity across the low frequency inductance has been eliminated, and a capacity between the aerial and ground substituted. Also the filament resistance has been left out.

There are some very peculiar actions that take place in various parts of the circuit. These may be discussed at a later date in another article.

Results of Tests Given.

As to results: A receiver was hooked up as per the accompanying sketch and photos. An outside aerial of one strand of wire, 150 feet in length, including the lead in, and a good ground was employed. The volume was good and the distance brought in exceptional.

The ground alone was used without impairing the reception or reducing the volume. In fact, the set appeared to work with a little better efficiency.

A loud speaker was operated on near-by stations—those within two or three hundred miles. The addition of one stage of audio-frequency enabled even the most distant stations to be brought in on the loud speaker.

One stage of radio-frequency improved the distance reception, and brought about sharper tuning, the set without it being rather broad in this respect when compared with the standard three-circuit regenerative circuit.

Eliminates Interference.

This addition of the radio-frequency allowed a uniform variation frequency, yet passed to this circuit the signal strength from only one station. "This," Mr. Muhleman observes, "necessarily eliminates the chance of the circuit proper automatically becoming in resonance with the wave of another station."

There is one important factor in this circuit. This pertains to the values. Unless they are adhered to strictly the results will be indifferent.

Take, for instance, the variometers. Values here make or break the set. A Chicago experimenter, who hooked up the circuit, failed utterly with it, and hastily concluded that it was overrated by its inventor and sponsor. Inquiry developed he had utilized variometers he had on hand, and that these were not adapted to the circuit. Substitution of variometers of the proper value gave satisfactory service.

The variometers should be high ratio inductance. It is very necessary that the stator coils be close to the rotary coils. Experiments with the type which have the stator windings on the outside of the coil were very unsatisfactory.

The oscillating coil in the grid circuit should be of the type that has low distributed capacity. The honeycomb, duolateral and similar types are the one to use. The inductance value of the coil should be about 125 or 150 millihenries.

As to Inductance Relation.

The inductance relation of the coil to the variometers is of little consequence. It can be fastened to the side of the grid variometer or laid in between the two variometers as is shown in the illustration.

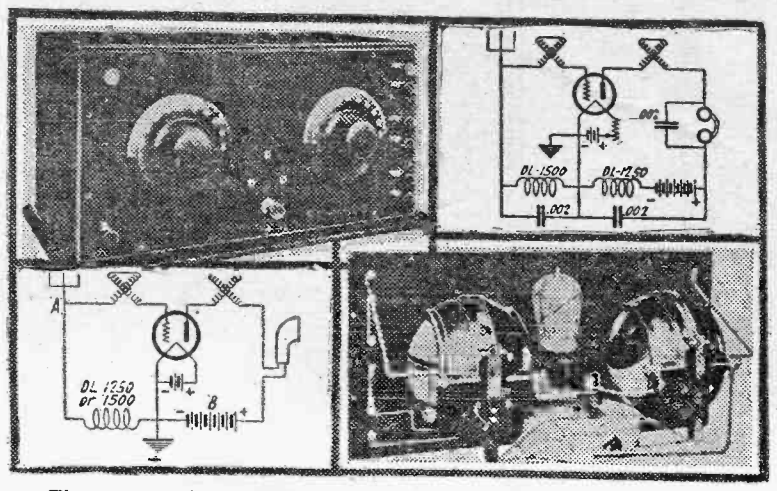
Mr. Muhleman finds that the Western Electric "E" tube, or 216-A gives the best service. My own experiments were made with C-301A and the limit of plate voltage for these tubes. I used 150 volts, which, as a steady diet for these tubes, might prove rather bad for their longevity.

In constructing the set, the nature of the circuit will permit extremely short-wiring, which is a point in its favor. The space occupied by the instruments will take very little space. The set will prove very popular with those who require or desire a portable set.

It is possible, by the use of the basket weave type variometers, on the market, and the spider-web form of inductance, to make a set which would occupy a space no larger than a cigar box, without impairing its efficiency.

Experiments are being made further in The Post experimental laboratory with the Autoplex. The findings will be published in an early issue.

The writer would like to hear from those who have built the Autoplex.



The upper left-hand picture shows how the Autoplex receiver, built by Mr. Muhleman, its inventor, looks. The diagram in the upper right-hand corner is the conventional form of one-tube super-regenerative receiver, utilizing tuned plate regeneration. The circuit in the lower left-hand corner is Mr. Muhleman's modification. The figure on the right shows how the parts are located.

Miss Jule Strong, well-known actress, is called upon by a friend to correct his radio troubles, and, after announcing that the wires were grounded, she altered the mishap and then proceeded to get in touch with the outside world. Photo shows Miss Strong listening in.

Navy Builds Big Station

The army signal corps is busy installing a radio station at Fort Douglas, near Salt Lake City, Utah, which will be the largest radio telegraph station of the army. It will have but one tube, a new 10-kilowatt radiotron developed by the General Electric company, which is building the equipment.

Another similar station is being erected at Leavenworth, Kan., but this station will operate with two tubes and will have a telephone circuit as well as the radio telegraph. The radio circuit between these two stations, the Arlington, Va., station and a land line from Leavenworth to San Francisco, will span the United States. Each of the two interior stations will be equipped with two 300 degree steel towers.

It is the plan of the army radio service not to use coastal stations, that part of the work being handled by the Naval Communications service, and the army does not desire to interfere with ship to shore communication.

Miner's Super-Heterodyne Makes Bid for All Honors

EVEN the mightiest of the mighty is threatened by newcomers in radio. Revolutions in this science are occurring so fast that the bystander can do nothing but stand aside and have patience for the final outcome.

That the science of radio is in a state of turmoil, of constant change and uncertainty, has never been so attested as it is now. Today a "superset" is hailed as the latest achievement. Tomorrow, it may be an antique.

Only a year ago, Major Edwin H. Armstrong's regenerative receiver was the last word in radio. Now it is considered only as a step toward more sensitive, more powerful and simpler "hook-ups." Beyond it are such sets as the neutrodyne circuit of Prof. Hazeltine, the Grimes reflex and others.

Now Comes New Claimant.

At the top, however, is Major Armstrong's "Super-Hetrodyne," generally acknowledged king of them all. And yet, the supremacy of this superset is being questioned.

For now comes a much smaller receiving set which has started its own revolution against the lordship of the super-hetrodyne. It is what is called the "Superdyne" receiver, invented by Robert S. Miner, famous eastern amateur.

With its four tubes, this set has been tested against the eight-tube super-hetrodyne and has proven a remarkable opponent for highest honors in radio.

Tuska Makes Tests.

Here is an account of tests made with the superdyne, by C. D. Tuska, radio manufacturer:

"The astonishing part about this outfit is that it operates without an antenna and gives signals of sufficient intensity to be heard thru the use of a loud speaker. In Hartford, Connecticut, without the use of an antenna or loop or capacity of any sort, other than the usual ground connections, we have repeatedly copied broadcasts on a loud speaker from Chicago, Davenport, Kansas City, and stations nearer to us.

"In attempting to compare the outfit with some of the sensitive sets on the market, we went to Washington and ran a series of tests. First a constant artificial source of power was set up. This was tuned on a regenerative receiver and the audibility measured around 50. With the same power, the same tubes, batteries, etc., the superdyne receiver showed an ability of over 200.

"The same two outfits were tried under similar conditions with a broadcasting station as the source of power. Here the regenerative receiver showed audibility of about 60 while under corresponding conditions the superdyne receiver showed an audibility of 10,000, which was the end of the meter.

Beats Naval Set.

"The next test was of a more practical nature. Here we compared the superdyne receiver under actual receiving conditions with the naval six-tube Universal radio-frequency amplifier. The signals with the four-tube superdyne were probably three to four times louder than with the six tubes on the navy amplifier.

"The last experiment was the most astonishing of all. In this test we compared the four-tube superdyne with an eight-tube super-hetrodyne receiver. Some of the signals on the super-hetrodyne surpassed this new circuit while in other cases the superdyne exceeded the super-hetrodyne.

"Taken all in all, and being very conservative, the best we could say for the super-hetrodyne was that the signals may have been slightly louder using the eight tubes against our four."

Read This, Radiophans

The Radio Society of Great Britain announces that the British Broadcasting company has agreed to allow a transmission to take place once a week from the London station which will deal with the meetings of the society, its policy, and other matters of general interest, says a London trade paper. Transmissions accordingly will be made on Thursdays at 7.25 p. m. Dr. W. H. Eccles, F.R.S., president of the Radio Society of Great Britain, has promised to speak. As this transmission will be made from all stations in the British Isles there should be no difficulty in all members picking it up. It would seem that the P.M.G. has tacitly agreed to widen the scope of the B.B.C.'s activities. I understand that there is now no official objection to the B.B.C. permitting private firms supplying an occasional good concert—such as was organized by Harrod's some months ago. This is excellent news, and should go a long way to popularizing broadcasting with other interests which are, at the moment, none too friendly to the B.B.C.

QUESTIONS AND ANSWERS

Neutrodyne Circuit Howls.

16—OAK PARK: I have just a five-tube Hazeltine neutrodyne set. It is full of howls and squeaks—more so than any super-regenerative set I ever heard. A friend of mine, who has been a successful radio "bug" for several years, has attempted to help me solve my problem, but met with defeat. We have checked over the circuit several times and find nothing wrong with it.

You are having the same trouble that about nine out of ten have. You fail to follow printed instructions and overlook the characteristics of the neutrodyne principles. Your set as it now stands is an oscillating set, which it should not be. Try this: Tune in your station—any station that comes in first. Get the loudest signal [illegible] condensers alone. Remove the first tube and place a small bit of paper over one of the filament contacts. Then replace the tube with the filament current also on, move the sliding sleeve back or forward on the neutrodon for that tube until the signal disappears. Don't neglect to remove the paper from the socket upon replacing the tube. Do this also with the second tube. These two steps neutralize the capacity effects in the tubes—which is the chief point in the Hazeltine circuit. With the capacity in the tubes neutralized, now turn to your condenser and proceed to enjoy real reception, which should be absolutely devoid of any noises, howls or hisses. When the set is properly neutralized do not neutrodons unless you change the tubes. Every time you change the tubes the new ones must be neutralized in the same manner as the old ones.

Cutting Out Interference.

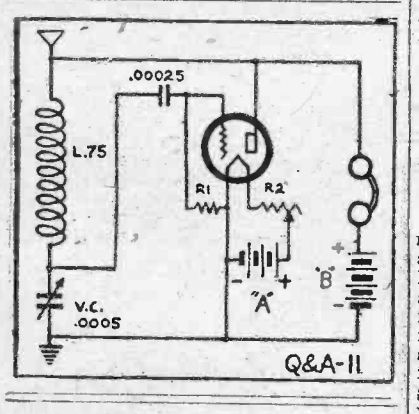
13. CHICAGO: I have a standard three-circuit regenerative set (Paragon type), which made some marvelous records last winter when I was living in a western suburb. I could plow thru any of the local stations and pick up any station I wanted. However, I have moved to the city and am in only a few blocks from WDAP and not so far away from WMAQ and KWY. I can get away fairly well from all local stations except WDAP. This simply is impossible, apparently. Is there not some way—wave traps, perhaps—that will help me?

You are unfortunate in being so close to WDAP. It is a powerful station and many broadcast listeners living miles away have trouble with it. This writer has lived within three blocks of the station for more than a year and also used as one of his favorite circuits the same one you employ. He had the same trouble you mention until experiments with various types of wave traps solved the problem. On another page (the Home Workshop Department) one of these wave traps is described and illustrated. In a subsequent early issue another one which now is being tested in The Chicago Evening Post's experimental laboratory will be described with the findings of this test.

An Ultra-Audion Hookup.

11—CHICAGO: Publish an ultra-audion circuit which employs only one tube. I understand there are such circuits which give extra volume on long-distant stations.

The circuit you ask for is shown elsewhere on this page. It is one of the best of this type receiver we have tested. It has good volume, and just such a hookup used here in Chicago has brought in regularly the Pacific coast stations. You will find it more selective than most circuits of this type, but do not expect too much of this. You will not be able to select your stations with the same efficiency as you can with three-circuit sets, but it is simple to operate, inexpensive to build and costs little to maintain.



Flewelling Circuit.

10—CHICAGO: Last winter there was a considerable furore over the Flewelling Super hookup at the beginning of the season. Interest seemed to lag, however, due, I was told, to the fact that it was noisy and troublesome. I have heard some very favorable comments this fall and am wondering if this circuit is worth trying.

Like on all new things people pass final judgment too quick on a new hookup or circuit. The Flewelling circuit was and still is noisy, as are all the super sets, but most of the trouble came from careless construction and failure to take into consideration the peculiarities of the circuit. A year's experience with the Flewelling has unfolded many improvements in construction and operation and the circuit is recognized today as one of the "regulars" in the vast army of standard circuits. Mr. Flewelling, thru his experiments with the circuit, has simplified the hookup and greatly improved the circuit in many respects. His latest circuit, still employing the characteristics of the old, is shown on this page. The gridleaks are still critical. Unusual volume is to be had with this circuit, and if the operator is patient and will learn the peculiarities of the set he will be well repaid. We would not advise a beginner to try the Flewelling any more than we would any of the other complicated circuits. Note in the accompanying diagram that the inventor has discarded last year's bank of three fixed condensers and now employs only one. There are other modifications, none of which have impaired the efficiency, but which have simplified matters.

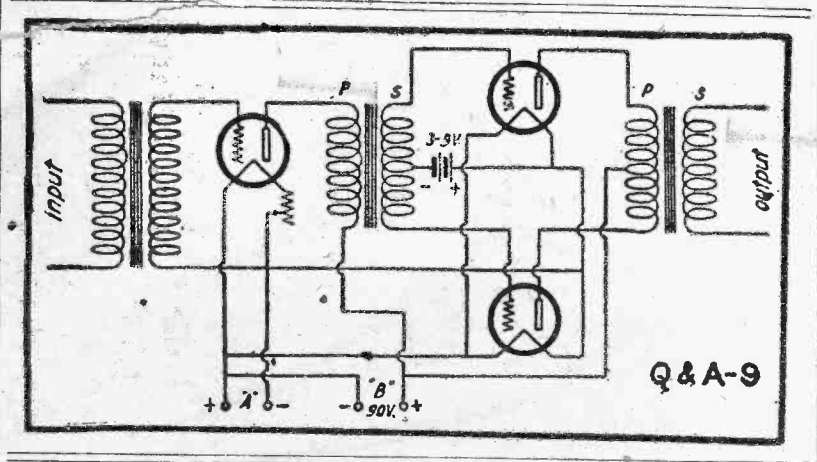
FREE SERVICE

QUESTIONS asked on any subject pertaining to radio will be answered in this department in either the daily edition or The Radio Magazine section published each Thursday. No charges are made for this service. If personal reply is desired by return mail, enclose self-addressed and stamped envelope. Write on only one side of the sheet, and where a check is desired on a faulty circuit be sure to send legible diagram as used in the hook-up.

Push-Pull Transformers.

9—CHICAGO: I wish to use a three-tube "push and pull" amplifier. Kindly give me a diagram for such a circuit. I understand this method of amplification is much better, especially for power loud speaker. Where can the transformers be obtained?

The diagram is shown on this page elsewhere. The first audio transformer may be any good transformer of 5-1 ratio or even 10-1 ratio. The "push-and-pull" transformers shown are of special make and can be obtained from any of the dealers advertising in this magazine. The circuit shown is for C301-A tubes. Power tubes may also be used if the proper voltage is employed.



Noisy Amplification.

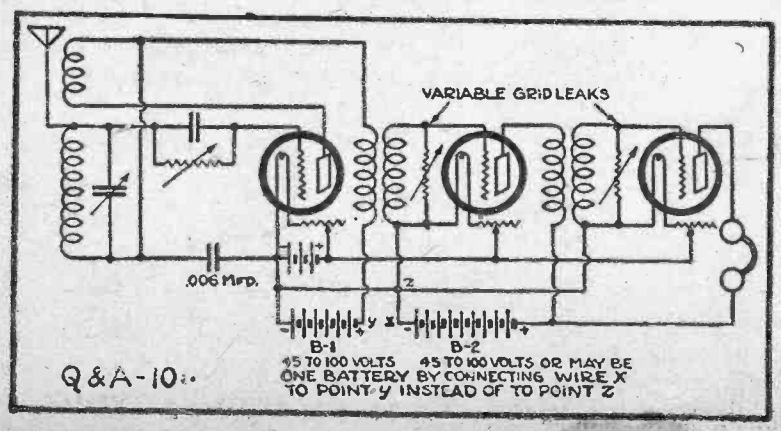
18. CHICAGO: Please check over the circuit I enclose. It works fine on the detector alone or on the first stage of amplification, but when I plug in the second stage there is considerable distortion. What is the trouble?

Your circuit is all right. Trouble may be in your transformer. Too high a ratio causes distortion sometimes. Faulty construction of transformers also gives poor output. A ratio of 5-1 in first stage and 3-1 in the second, if you are using higher ratio, may solve your trouble. You might also insert a "C" or bias battery in the grid lead of the last stage (3 to 9 volts), or shunt the transformer in the last stage with a [illegible] resistance grid leak.

Hears Manchester, .

6. CHICAGO: Recently wh[illegible]siting a broadcasting listener friend in Massachusetts we heard some station sign off using the call 2CY or 2ZY. We heard a portion of the preceding program, but it was not very clear and faded considerably. The call letters, however, were very clear. We could not find the station in any list we had available.

R. L. Beall, an amateur of Westmont second district, Quebec, Canada, has the call numbers 2CY. William H. Diehl, an amateur of Bayside, N. Y., in the second United States district, also has the same call. We do not know if these stations broadcast programs or not, but it is not likely they do. The British Broadcasting corporation of Manchester, England, has the call letters 2ZY, and since the Atlantic coast fans pick up that station occasionally it is likely it was this station you heard.



Loading Up a Set.

3—MAYWOOD: I have a three-circuit regenerative receiver using three honeycomb coils. Last winter I brought in coast-to-coast stations in a loud speaker (Baldwin unit), but am having very poor success so far this fall. I get a few of the distant stations, but not many. Even some of the local stations do not come in with the old-time volume. I thought it was my "B" batteries, which were about eight months old. New batteries made some improvement but not much. Have gone over the circuit and everything seems to be correct.

The change in the wave lengths undoubtedly is your source of trouble. You will have to "load up" your set. This is done very easily with your hookup as you are using honeycomb coils for your inductance. If you are using 35-50 and 75-turn coils try 50-75-100 coils in their stead. You may have to take off a few turns.

Polarity Tests

7. CHICAGO: My house-lighting current is direct current. I have constructed a bank of 100-watt lamps with which to charge my storage battery. How am I to tell the polarity of the lighting circuit wires, as my instructions were to be sure to attach the negative wire to the negative side of the battery and the positive side to the positive side of the battery?

Take both ends of the lighting circuit wires and hold them in a glass of water into which a spoonful of common table salt has been dropped. Gas bubbles will form around the negative wires. Keep the two wires apart in the test.

Brass Panels.

2—WILMETTE: Have conceived the idea of using a brass panel. Do you see any objections to this? I propose to ground the panel to eliminate body capacity instead of using a composition panel with the usual metal shield.

Metal panels can be and are used. However, there is danger of grounding your entire set, as each instrument must be completely insulated from the panel, which will entail considerable work and care. Why not use the popular composition panel and use thin sheet brass or copper as a shield? This material can be worked more easily and can be cut away when the instruments enter the panel, thus providing insulation. The shield then is grounded. It is wise to attach the shield in strips behind each instrument as this will minimize eddy current losses. If the set is properly wired and the instruments properly located body capacity will not disturb you. Shielding is not necessary in this case. Ground the rotors of the condensers where they are in a ground circuit and the variometers and you won't have body capacity troubles.

Hard Tubes as Detectors.

8. CHICAGO: Will a "hard" tube give efficient service as a detector? I have a hook-up which specifies a UV-201A. A friend of mine says best results are obtained with a "soft" tube.

If you had specified the circuit, we could answer your question more intelligently. There are some hook-ups where "hard" or amplifying tubes work best. The Flewelling super is one of these. However, in the standard regenerative sets "soft" or detector tubes give far the best service.

Tubes for Amplifying.

1—CHICAGO: What tubes should I use in my audio amplifier with a magnavox?

Any amplifying tube will answer. The C-301-A and UV-201-A are popular. Some prefer power tubes such as the 216-A. These, of course, give more volume, but unless the amplifying circuit is properly designed distortion is apt to spoil reception.

As to Dry Cell Tubes.

15—CHICAGO: Will the WD-11 or WD-12 dry cell tubes work efficiently in an ultra-audion circuit?

Any of the dry cell tubes will work satisfactorily.

Loud Speaker Distortion.

4. CHICAGO: Am planning to add a loud speaker to my amplification set, but practically all the speakers I have listened to give out considerable distortion and sound hoarse and "scratchy." Why is this? I have a neighbor who uses a Baldwin unit with a 50-cent fibre megaphone horn such as college boys use at football games. It is free of distortion, clear as a bell and gives sufficient volume in local stations to be heard across the street. It seems to me that the expensive power speakers should give better service.

The fault quite often lies in the amplification circuit. Too high ratio in the transformers, improperly wired transformers, poor "B" batteries, poor wiring connections and too much "B" battery voltage on the tubes frequently cause distortion. Power speakers should employ the "push and pull" circuit in the amplifiers. This writer uses a low-power speaker such as the Baldwin unit especially for home reception when using the ordinary amplification circuit. Even in this circuit the ratio of the transformers should be small. A ratio of 5-1 in the first stage and 3-1 in the second gives the most satisfactory results.

Everyday Engineering for the Home Builder

(Continued from Page 6.)

results, I will commit myself in advising three tubes.

As to Single Circuits.

The circuits which you can use will have certain problems. For example: A single circuit receiver will oscillate and the energy feed-back into your aerial cause a disturbance to neighboring receivers.

Such circuits are unquestionably sensitive and efficient, but most radio fans operate sets within close proximity to other aerials and here they should display courtesy in carefully preventing oscillation which will cause discomfort or preclude others from listening in at all.

If in an isolated spot where your aerial is a thousand yards or more from other aerials, a single circuit regenerative often is very good and permits of very simple construction and tuning.

When you go into radio-frequency you must know quite a little about what are the most efficient parts to use and how to wire them to avoid stray capacity in your circuit. You can get a good deal of help on these points from the published articles on one kind or another radio-frequency receiver, but ordinarily you must expect to use four tubes unless you make it regenerative on the detector stage, or reflex the audio thru one or two tubes.

Thus, in adopting a circuit take into account its special requirements. Does it require more skill in building than you have yet acquired? Does it require expensive units which, if improperly selected, would mean a loss of so much money? Will it get the results you want?

Get All Data in Advance.

My suggestion, therefore, is to collect all the literature you can on the circuit you intend to use. This data will be found carefully checked up in various publications or the radio editor of The Post Radio Magazine will be glad to print special circuits which you cannot find convenient.

On this point, it may be suggested that you start a little scrap book. If you read radio literature regularly, cut out the articles on the different circuits which give the constants, etc. After you have collected a dozen or so variations of one circuit you can select the particular variety you prefer.

This, you may complain, is too tedious and what you want is a circuit and to rush out and get parts and make the set and this is right where most set builders go wrong. They are too impatient and careless to engineer properly and when their sets are put together they generally reflect these conditions.

In short, if you intend to excel, it must be accomplished by devoting a good deal of time to every step.

Ask any stenographer how long it takes to learn shorthand. She will say at least six months. And, while radio is not entirely a memory and co-ordination problem as shorthand, it does require thinking and concentration.

Not Necessary to Be Technical.

However, I would not say that you must study radio theory for ten years in order to build a set any more than you would have to know how to build a condenser in order to use it in a circuit properly. In fact, you can build an excellent set without knowing the technical theory behind it. What you do need is information of a reliable character, and to do your construction work neatly and with craftsmanship.

Hence, visualize what the panel of the set you plan will be like when you look at the circuit. Study how you would place the different units to afford protection, economy and convenience. This is best done by comparison, and I give another suggestion that you take what time you can to look at standard manufacturers' receiving sets.

Also join a radio club and become acquainted with other fans. Look at their sets, and, if you can, make comparisons of their operating characteristics.

By this process you can see how to adopt this idea or that; how to avoid faults of others; how to improve on your original plans.

Value of Following Pioneers.

Copying a set from a fixed set of plans or a model often is a very satisfactory way of building a set. It saves you much labor and expense. At the same time I would encourage you to revise such plans where you have adequate training or are quick enough in picking up the refinements of radio construction.

The big interest in radio for some people comes in building one set after another. As soon as one is finished they pull it apart and reorganize it on a new circuit, and while this, unquestionably, is good amusement, it is not the objective of radio any more than running up golf scores is a function of broadcasting.

Let me close this first installment of my series of articles on the basis of your radio engineering by suggesting that you make every set with some practical view in mind, that you or the family will use it, that it may be given to a friend or to some invalid who cannot afford to purchase one, or be used as a Christmas present.

The idea of putting a lot of labor into a set and then pulling it apart is as silly as knitting different styles of neckties and then unraveling the yarn and using it in another pattern.

If you are trying to improve an old set, an overhauling is in order, but a good many radio fans go thru the "puzzle picture" stages and it is a good sport at that, only why not give some one the benefit of this labor, or sell the aparatus at cost?

RADIO IS AID TO GRAND OPERA, OFFICIAL SAYS

The Chicago Civic Opera company now sings frequently to an audience of more than 500,000 men, women and children scattered all over the North American continent. The great musical triumph of the age is the result of the co-operation of the management of the opera company and the famous KYW station on the top of the Commonwealth Edison building.

These facts developed today when a check was made of the correspondence from almost every village and hamlet in the United States which is pouring into the offices of the Westinghouse company. This shows that the work of supplying the best in musical entertainment has resulted in great commercial value to schools of music, manufacturers of musical instruments and the trade in general.

Admit Radio Helps Receipts.

Reticent at first to admit the value of the broadcasting of opera the management now declares that the box-office receipts reflect in a pronounced way the value of these entertainments.

"The fact that the management continues to permit the broadcasting of the concerts shows that it appreciates the value of the publicity and the value of the forces of the air in creating potential patrons of the opera," one of the officials suggested to The Post.

Whether radio makes the stars or the stars make radio is a much mooted question in musical and radio circles. While the battle rages and, in some instances has reached the courts, the radio broadcasting station, maintaining a dignified position, calmly goes ahead supplying the very best talent and the phans seldom hear the rumble of the controversy.

Phans Prefer Opera to "Jazz."

The broadcasting of the opera programs has been a tremendous success, according to Assistant Director H. A. Fall and Chief Announcer A. W. "Sen" Kaney of the KYW station. Thousands of letters have poured in as a response to the inquiry designed to ascertain whether the public preferred "jazz" or the opera. Just now the opera is in the lead.

AMATEURS GIVE RADIO SOME OF ITS MOST IMPORTANT IMPROVEMENTS

ALONG with radio's popularity, comes the question of popular interest in its technical development.

That, proof shows, is about as high as the new science itself. Just as every radio fan has won over others toward a greater interest in broadcasting reception, he himself has become a convert to the actual development of the science.

Thousands of fans, old and young, daily are scanning radio publications, if they're not seeking information from radio sales clerks, for ways to improve their receiving sets. Hook-ups are as popular as ever, and parts are being improved regularly.

By far the greatest interest in this branch of radio lies in the hook-up. At first it was the simple Copp circuit. Then came the regenerative circuit, which brought out the name of Edward A. Armstrong as one of the greatest radio engineers of the country.

New Circuits Follow Each Other.

But hardly had his fame reached the peak when other more complicated hook-ups were produced. There came Hazeltine's neutrodyne, considered among the most efficient hook-ups extant. Then the reflex and other arrangements of parts by which it was believed a listener could improve his receiving sets.

Among some of the other circuits which have stirred the heart of the amateur in the past twelve months are the Flewelling Super, the Harkness Ultra, the Cockaday Four-Circuit, the Autoplex and the Miloplex.

Yet this is only the beginning of the technical development of radio. Engineers are still striving to eliminate interference, and for this they experiment with hook-ups and new parts with the hope of gaining their goal this way.

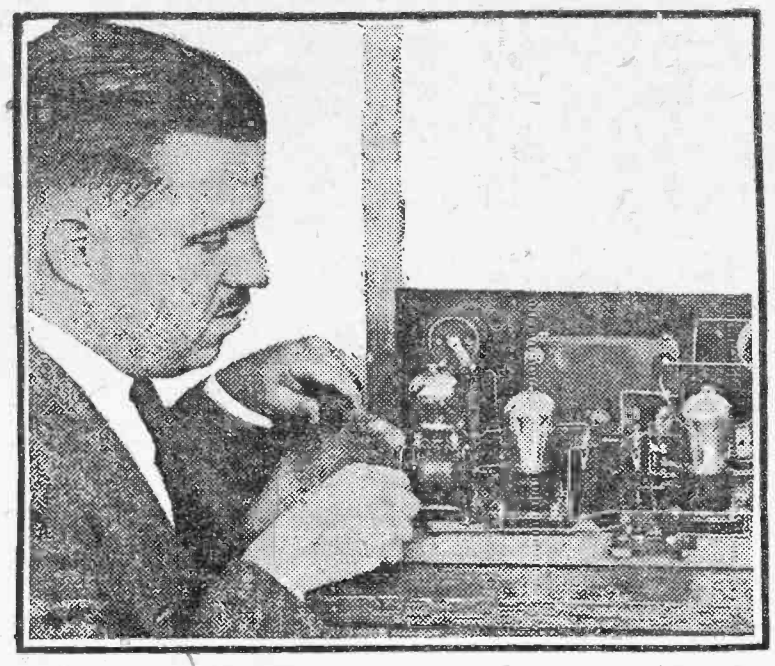
All their movements are followed zealously by the true radio fan. He is not so much interested in radio proper, as he is in the improvement of his own set. And any suggestion for improvement is eagerly snatched up and tested.

Amateur Takes the Lead.

In this, the radio ameteur is the leader. He is the one who is always tearing down and building up his set. And it is he who comes forth now and then with a new hook-up which he believes may revolutionize radio.

The Grimes reflex circuit, one of the famous hook-ups of today for which the inventor is said to have received a half million dollars, is the product of an amateur's brain. His experience is typical among young amateurs, any one of whom may come out one of these days with even a more effective hook-up.

This universal search for better hook-ups promises to maintain its popularity among the fans, at any rate until the ideal set is found. This ideal achievement, as engineers see it today, would be one that would work well under all conditions of weather and other disturbances, which would be so simple in its operation that any outsider could work it, and which would bring in distant as well as near-by stations at will.



Laurence M. Cockaday is one of the amateurs who came upon a hook-up that now carries his name. It is called the Cockaday, or Four-Circuit Tuner. He has brought out other contributions to the science, and is shown here at work on a new hook-up of his invention. The Chicago Evening Post Radio Magazine will give construction details of Mr. Cockaday's most recent circuit in an early issue.

Dealer Gossip

The United Cigar Stores are entering the radio retail field. Five stores in New York are being opened. Chicago and other cities are to follow shortly.

The Haverford company, 222 West Madison street, is centering its efforts on ready-made sets and a deferred payment plan.

The Chicago Salvage stores, 509 South State street, employ thirty salesmen, which, probably, is the largest sales force maintained by a retail radio shop in the world.

The Newark Electric company, 1226 West Madison street, has moved into new quarters, two doors east of the old stand. It is one of the niftiest retail establishments in the middle west. One of the most completely equipped repair and construction shops has been installed, and a special demonstration room is one of the features of the new home.

The Radio shop, 7545 North Clark street, reports far greater interest in radio this season by residents in its neighborhood than last season, this conclusion being arrived at by a comparison of sales this year with last year at the same time.

The Western Army stores, 227 West Madison and 410 South Wabash avenue, are carrying double the stock carried last season and report nearly a 50 per cent increase in turn-over. This would indicate a greater interest in radio by the layman.

Siegel Electric company, 154 West Washington street, is featuring knocked down sets on the popular circuits, such as neutro-dyne, reflex Cockaday, miroplex and autoplex.

The Radio Doctors, 504 South State street, offer to examine and test sets free. This store is using nine construction experts in its repair department.

Electric Service Products company, 214 West Madison street and 10 South Wells street, continues to find its Casey Radio Demon Knockdown set a big trade puller. This concern had a good run on this hook-up last year, but this season promises even a better outlook.

Atwood Electric company, 3122 West Madison street and 5746 West Division street, is featuring a Paragon receiver at both stores.

Why Variable Condenser Is an Important Factor

THERE is no more important unit in a radio receiver than the variable condenser, yet it is the one with which the public has been most consistently "gyped" by the unscrupulous "fly by night" manufacturer.

Unless the condenser is designed and constructed very carefully, the variable condenser will wreck even the most efficient circuits.

The majority of the cheap variable condensers available on the market suffer from a number of ills, any one of which is fatal.

Their plates are too thin, and easily bent out of alignment, with the result that they short circuit at certain settings, or else they are so badly spaced that there is not an even and steady variation of capacity when they are adjusted.

Insulation Causes Losses.

Another bad feature is the losses sustained thru bad insulation of the rotor from the stator plates.

In condensers which use metal end plates it is extremely important that the bushing in which the rotor shaft revolves be constructed of the highest grade of hard rubber possible. The best arrangement, of course, is hard rubber and plates.

There are two forms of contacting with the rotor plates, one by means of a spring rubbing contact and the other with a flexible joint. Of the two, the latter is by far the most positive and the most efficient. A bad rubbing contact is the cause of more losses in a condenser than anything else.

In many of the condensers of the latter type, the only contact arrangement allowed for the rotor plates is a metal extension which fits around the shaft of the rotor plates underneath the locking nut. Where the mechanical design is not absolutely accurate it is quite possible that a distinct "open" will be experienced at different points in the setting of the condenser.

Stops Aid Efficiency.

The best possible condenser design is one whereby there are positive stops provided in such manner that when the rotor plates are completely meshed inside the stationary plates they cannot be turned any further in the same direction, and correspondingly there is a stop which prevents any further movement when the plates are entirely outside the stator plates.

With such a condenser it is possible to solder a flexible copper gauze wire connection to the shaft. The other end of this flexible connector is joined to the binding post provided to enable the user to wire the condenser into his set. This type has a minimum of losses.

The majority of trouble cases in receivers can be traced to bad variable condensers. This is particularly true of sets which are very broad in tuning.

It is not possible to get good selectivity with condensers which are inefficiently designed.

Mounting Vital Point.

Another difficulty that invariably will result from badly constructed condensers is variable signal strength in the receivers. This is, of course, due to the bad contacting arrangements with the rotor plates. In fact, a lot of extraneous noise in the set can be traced to this very same source.

Just as it is important to use the best of variable condenser, so it is necessary to use every care in mounting it on the panel and wiring it into the set. The holes should not be drilled into the panel until it is absolutely sure that they are accurately placed. It is always best to use the manufacturer's template for this purpose. The slightest error in alignment of the holding screws will place a tension on the condenser and pull the rotor plates out of the true position. In time this will seriously affect its efficiency and lead to troublesome "shorts" at different degrees of setting.

Handle Small Energy.

Variable condensers are seldom used outside of the tuning circuits. In other words, their place is invariably in the aerial and grid circuits of a receiver. It is at this point that we are dealing with the smallest amounts of energy in the receiver, consequently it is necessary every possible loss should be eliminated.

Under the circumstances, therefore, it is necessary that the wiring should also be efficient. To effect this the connecting wires should be kept as short as possible and should not run parallel to each other. Therefore, it will always be well to take this point into consideration before deciding upon the lay-out of the set, and the condenser should be inserted at the point where the shortest possible connections can be made.

COPIES M'MILLAN ON PACIFIC COAST FOR TWO HOURS

By Maj. Lawrence Mott.
(Sig-ORC-USA-Radio 6XAD-6ZW.)

IT IS with a pardonable degree—I hope—of pride that I chronicle the fact that between the hours of 1:15 a. m. and 3 a. m. on Oct. 25 my station was in communication with WNP, which are the call letters of Dr. MacMillan's expeditionary ship the Bowdoin.

Waiting for Australia.

Charles Shumaker, formerly a radio officer in the navy, and now in the employ of the Santa Catalina Island company, and I were very much "on the job" that particular evening, as I had an arranged-for test with Australian and New Zealand stations. I was to transmit to them for an hour and then listen for their signals.

My station has been reported for many months by these far-flung operators, and it is my ambition to be the first to do two-way work with them.

Shumaker was on watch. Everything was silent in the operating-room

"WNP, by the lord!" Shumaker whispered, turning an ear phone over for me to listen. And there was Dr. MacMillan's ship! The signals were very clear, at times very loud, and then fading completely out.

For nearly two hours we took the messages and press reports from Don Mix, his operator, and one of the best in the American Radio Relay league.

Reports His Position.

The following message gives the gist of practically all of them:

Press, from WNP.—Winter here with weather below zero and very heavy snow, the sun was up for a few minutes today, and for the last time, all well. We are eleven degrees from the North Pole.
Signed, MacMillan.

I fully expect to supply the newspapers with polar expeditionary news all winter, as Mix has a standard schedule of working on certain wave lengths, at certain hours, every night throughout the voyage. Messages for WNP will soon be routed thru 6XAD-6ZW! The Bowdoin has only 100-watts power, making the reception all the more noteworthy.

It might be added that 6AD-6ZW is the first United States-Pacific coast station to hear WNP, and the second among all stations in the United States, the first having been 1ANA, at Chatham, on Cape Cod Mass., which worked the Bowdoin for some time after she left American waters, northward bound.

ALLOTS SIGNAL CODE LETTERS IN WORLD WORK

HARTFORD, Conn., Nov. 15.—Looking forward to the time when radio amateurs of all nations will communicate wtih one another as easily as do amateurs in the several states of our own country, the American Radio Relay league announced today thru Charles A. Service, assistant secretary, that it has prepared an international amateur call letter plan, that is to be launched for trial at midnight, Dec. 15.

The new system provides for the insertion of identifying letters between the call of the station addressed and the station sending, definitely locating the stations according to their countries. The plan has been so simplified that, in most instances, the initials of the various countries are used for this intermediate sign. For example, if French 8AB was calling Canadian 3BH he would send "3BP 3BP 3BP cf 8AB 8AB 8AB k" and the answer would come back with the intermediate letters reversed, "8AB 8AB 8AB fc 3BP 3BP 3BP k."

Not New on This Side.

An arrangement of this kind has been long in vogue among amateurs on either side of the Canadina border, Mr. Service explained, but then it was not thought that international communication would become common in so short a time. Since the plan involves all countries that have radio amateurs, it was not accepted by officers of the league until eleven different nations, representing hundreds of foreign amateurs, had been consulted and many opinions canvassed. It was agreed that a feasible working plan should not increase the length of the calling now used between amateurs of various countries; should make identification, both of call and nationality, reasonably sure; should not employ arbitrary signals; must be capable of use by amateurs of all nations; must identify amateurs of the same country working each other, when heard by amateurs of another country; should take care of present and future requirements for several years, or until such time as the next International radio telegraphic convention meets and assigns a better scheme on the basis of the present commercial assignment of calls.

Signals Allotted to Countries.

Whenever possible the initials of the various countries have been selected as the intermediate signals, but when conflicts have occurred, arbitrary initials have been selected, phonetically suggestive of the country, which makes it that much easier. They are: A—Australia. B—British Isles. C—Canada. I—Italy. M—Mexico. N—Netherlands. O—South Africa (letter selected arbitrarily). P—Portugal. Q—Cuba (phonetic initial). R—Argentine (phonetic initial). S—Spain. U—United States. Z—New Zealand.

This arrangement leaves twelve letters which may be assigned when amateurs become active in other countries. League officials advise amateurs when calling another amateur in their own country to insert between the two station calls the initial of that country, so that listeners in other nations may identify the operator sending.

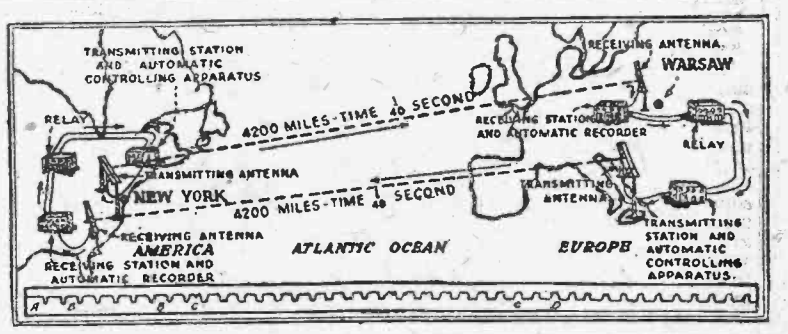
CODE TRAVELS 8,400 MILES OVER AUTOMATIC LOOP

ROUTE of radio signal which automatically speeded back and forth between Warsaw and New York at the rate of 1-20th of a second per round trip of 8,400 miles in recent epoch-making tests by the Radio Corporation of America.

In this brief period a signal started in New York passes over a telegraph line in Boston, travels seventy miles to the radio station proper at Rocky Point, Long Island, and is hurled with the speed of light across the 4,200 miles of water and land before reaching Warsaw.

It is then intercepted at the Warsaw receiving station, amplified and transferred to a land wire system to the central postoffice in Warsaw, thence conducted to the transmitting unit, ten miles outside of Warsaw before transmission as a radio wave to the shores of America.

Telegraph wires then conduct the impulse, after amplification at the Riverhead, Long Island, receiving station, into the central radio office in the heart of New York city. Tape record reproduced in lower narrow box is exact copy of original tape.



New Station Comes In

WBAK (Harrisburg, Pa.) is being heard regularly in Chicago by many broadcast listeners. It is operated by the Pennsylvania state police. It is on 400 meters. C. M. Wilhelm is the director. It broadcasts daily, except Sunday, on the following schedule, which is Central time: At 9:30 a. m., school program and police reports; 4:45 p. m., educational and markets; 11 p. m., police tests.

Broadcasts Popular Plays

WJZ (New York City) is giving broadcast listeners treats this season by putting the popular musical shows, comedies and even dramas on the air as a part of that station's regular weekly programs. The shows are broadcast direct from the theaters. Chicago radiophans enjoy the programs just as much as those in Gotham. WJZ is on 455 meters.

New Transatlantic Tests

British and French organizations are negotiating with American amateurs for another series of transatlantic tests this winter.

Uses Swinging Door as Inside Loop Aerial

A simple method of arranging an aerial on a door should prove useful to flat dwellers and others whose space is limited.

At the top and bottom of the inside of the door a piece of wood is attached having twenty-three saw cuts in it, spaced one inch apart. No 20 single cotton-covered wire is then wound from top to bottom.

The wood strips are each half an inch thick, two inches wide, and twenty-seven inches long. It is necessary to start the winding on the outside edge of the bottom strip, so that the last winding will bring the free end at the inside of the upper strip. Plenty of slack should be left at this free end, to connect with the aerial terminal of the set.

In actual operation it was found that there was considerable directional effect when used in connection with distant stations, and to overcome this effect, a spring was attached to keep the door closed. A stout cord attached to the door enabled the operator to pull open the door as far as required to bring in the desired station. This arrangement has been found successful, and has brought in distant stations.

OFFER COOLIDGE RADIO AUDIENCE FOR MESSAGES

President Coolidge, without leaving the White House, can come in closer personal touch with more people than any other President has been able to do by traveling over the country. This is made possible by the plan which has just been suggested to Mr. Coolidge by E. F. McDonald Jr. of Chicago, president of the National Association of Broadcasters.

Mr. McDonald offers the President an audience of 15,000,000 persons any evening that he cares to talk to them. In his letter sent to President Coolidge he recalls the statement of George B. Christian Jr., secretary to President Harding, in which he said that traveling and hand-shaking largely were to blame for the breakdown and death of President Harding.

All the Nation as Audience.

"Broadcasting has progressed to such an extent," Mr. McDonald has written to the President, "that by co-operation of a half dozen or more stations an address delivered in the White House can be heard all over the country at one and the same time.

"Listeners in the largest of auditoriums number less than 30,000, but an ordinary radio audience for any one of the big broadcasting stations on an ordinary occasion is 300,000. But in the event of the President of the United States making an address over radio, there would be an audience of at least 15,000,000 people.

"As a mark of respect, and by way of co-operation, any station not actively engaged in broadcasting your speech as it was being spoken would remain off the air so that you could be heard the country over without interference.

"The President, to most people, is rather remote. Hearing the President over radio would put an entirely different interpretation on him as an individual and would lend vibrant meaning to his words. Radio will draw you close to the American fireside, for you will be speaking to your people as they sit in their homes and your voice will resound in their dwelling place. Your voice and your personality will become familiar to them, and, in consequence, the American people will be able to understand you better and you will mean even more to them.

Offers Concerted Effort.

"The National Association of Broadcasters is functioning as an organized unit, and, thru me, proffer their services, jointly and individually, to you. There is so much in favor of your making radio a definite part of your presidential program that all of us broadcasters take much pleasure in anticipation of the service that we can be to you. We shall be delighted to go further into this matter with you to the end of making arrangements for the broadcasting of any and all of your messages."

Mr. McDonald asserts that with 15,000,000 persons hearing the President's voice and as many more seeing him in motion pictures, there is no use of Mr. Coolidge, or any future President, wasting strength and energy in traveling about the country appearing before and talking to comparatively small groups in various places.

Locates Static Source as Being in Mexico

Mexico is noted for static conditions. Shipowners claim it is one of the worst regions in the world for this form of radio trouble.

One ship operator reports that while in the vicinity of the Mexican coast his ship was out of communication with shore for four days owing to static. And yet the ship's set was capable of night transmission under normal conditions of 2,000 miles.

Clears Up Distortion

Where high plate voltage in the amplifier circuit is employed it is necessary to use a "C" or bias battery to prevent distortion. The tubes will stand up to 45 volts, but beyond that the bias battery should be inserted. Up to 67½ volts "B" use three volts "C"; up to 90 volts "B" use 4½ volts "C"; up to 90 to 120 volts "B" use 6 to 9 volts "C." The "C" battery may be the usual dry cells or flashlight cells. The negative of the "C" usually is connected with the F negative post of the secondary side of the transformers. The positive of the "C" goes to the rheostat.

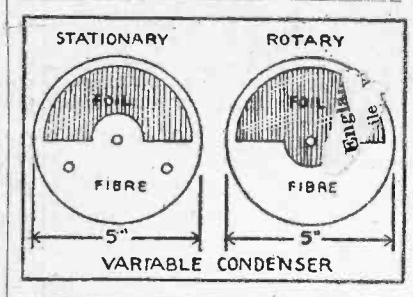
THE HOME WORKSHOP

Simple, Home-Made Variable Condenser

There may come a time when a variable condenser is needed and one is not accessible. A fairly efficent one may be made for a few cents out of scrap material in a few minutes.

Procure pieces of one-eighth inch fiber board. Cut two disks, each five inches in diameter. One disk or plate has three holes bored as shown in illustration. The other has one hole. The center holes are for the shaft. The two holes in one disk are for the panel mounting, screws or bolts.

Pieces of tinfoil are cut in half disks as shown in illustration. These



are glued to the fiber disks with collodian. Do not use shellack or glue.

Fasten the piece with the three holes on the panel. Run a threaded brass bolt thru the panel and disk in the center hole. Attach a knob and dial or a pointer on the front end of the bolt outside of the panel. Run a nut on the bolt up to the first plate. Then put on the other fiber disk and then another nut. Take a lead from each plate. The lead from the rotary plate may be attached to the bolt.

This construction makes a good variable condenser of low capacity, which also may be used as a vernier to a larger condenser by shunting it across the same. By adding additional rotary plates a larger condenser may be built.

How to Prevent Eddy Losses in Condensers

Eddy currents are set up in the metal shields and plates of a variable condenser, and to keep the losses low a coal mounted near a shield or condenser should have its axis parallel to the metal plates.

The eddy currents set up in a metal plate react on the coil, and so change the tuning of the circuit.

In one of the single-circuit tuners developed a vernier for tuning is made by mounting a thin copper plate at the center of the tuning coil. When this plate is parallel to the axis of the coil, it has practically no effect. When perpendicular to the axis, it decreases the wave-length considerably. By connecting the metal shaft to the ground, body capacity is eliminated.

Such a plate causes some loss of energy, but the loss is not great. The plate is simply a thin disk of metal of such a size that it turns easily within the tube on which the coil is wound.

Copper is the best material for the plate; but a telephone diaphragm has been mounted upon an axis and used in this way with good effect.

Eliminates Sectionalism

An instance of radio's influence in obliterating sectional lines and creating a national community spirit thruout America is cited in a visit paid to Station WSB (Atlanta, Ga.) not long ago by a Pennsylvania fan. Harvey S. Rahiser, a Pittsburg, Pa., architect, made the trip solely to further a friendship fostered via the ether for more than a year. The Quaker state fan was met by a delegation at the train, was officially welcomed by the mayor of Atlanta, listened at first hand to a concert in his honor, was dined profusely on fried chicken and left Georgia three days later singing the praises of the home of "The Voice of the South."

Adjust Detector Tube

Detector tubes are sensitive and their proper adjustment is necessary for long-distance reception. Increased volume and clarity of signals are best obtained by manipulation of the rheostat, which should be of the vernier type. The slightest movement of the rheostat, if it is a good one, will bring in or shut out a weak signal. On a three-circuit regenerative set, using C-300 detector tube and a Bradleystat rheostat, the writer has brought in five stations with only a slight adjustment of the resistance.

Talks to Millions

David Lloyd George, England's war premier, returned to his native land after his American tour with the knowledge that in his brief sojourn in the states he talked to audiences that reached into the millions. Radio made this possible. Most of his important speeches were broadcast. The illustrious visitor said he was accustomed to talking to large audiences, but a million listeners at one time was appalling.

DX Crystal Hook-Up

With the crystal hook-up shown the writer has received clear signals 225 miles distant. The aerial was 83 feet in length and consisted of a single wire mode of seven strands of small copper wire and two of No. 22 gauge. The lead-in was 25 feet and the ground lead-in 35 feet.—J. J. FOGARTY.

Prize Awards For Useful Suggestions

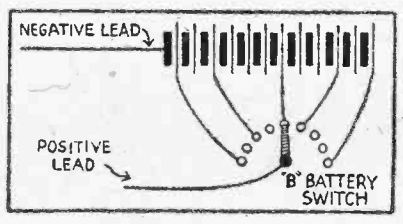
THE POST offers $1 for every accepted and published suggestion made by readers which will enable the home builder to improve his work.

A special prize of $3 each week is made for the best of these suggestions.

Send your entries to Workshop Editor, care Radio Dept. Chicago Evening Post. Inclose pencil sketch if necessary to convey idea.

Saves "B" Battery

A panel-mounted switch attached to the "B" battery circuit is much more convenient and efficient than the usual wire and clip. The switch, however,



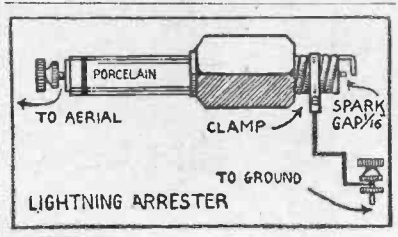
must be of special construction. If an ordinary switch is used the arm or lever strikes two points in passing one to another. This causes a short circuit which will break down the low amperage of the battery cells. To overcome this, place an extra switch point between the regular ones. These will have no connection with the battery or switch. Only half of the points are in the circuit. The switch arm jumps from a dead point to a live one.

List of Calls Heard

(Amateurs are invited to send in list of calls heard. Address Amateur Editor, Radio department. The Chicago Evening Post.)

Spark Plug Makes Lightning Arrester

A highly efficient lightning arrester may be made from an automobile spark plug which has a porcelain insulator. The spark gap already is



fixed to take care of the electrical discharge should lightning strike the aerial. One wire from the aerial is fastened to the center electrode of the plug and a wire from the ground fastened to the body of the plug. After the plug is wired it should be inclosed in a glass tube to remove all danger from fire.

Blames Fading Signals to Barometric Pressure

"Fading" effects in radio reception are due to variations in barometric pressure, according to Donald Clare Wallace (9ZT) of Minneapolis, Minn.

Radio waves, says Mr. Wallace, have a tendency, in his belief, to follow isobars or lines (on a map) of equal pressure. They travel better, he says, in low-pressure areas than in high-pressure areas. In low-pressure areas reception is very good. In the high-pressure areas very poor.

Mr. Wallace has collected considerable data to support his theory. As an example, he cites an experience. Recently, owing to the passage of a tornado thru Louisiana, a low-pressure-area was provided in that state. At the same time in the northern section of the country there was no disturbance and a high-pressure area existed.

The result was that in Minneapolis on the night in question listeners-in were unable to hear any transmission from any stations located more than 100 miles distant.

A peculiar fact noticed by operators is that frequently there is an absence of static from sunrise to noon, after which it increases steadily until midnight, rendering anything short of high-power short-range communication impossible.

Some experts hold that all the long-distance static in the United States originates in Mexico.

This same observer gives other examples which tend to support his theory, and concludes with the statement that ninety per cent of "fading" on short-wave length communication is due to radio waves following lines of equal barometric pressure.

French Journal's Station Aids Amateur Research

The French wireless journal, T. S. F. Moderne, is establishing a wireless station for the encouragement of amateur research. The station is located on the outskirts of Paris. It is equipped with two transmitters—one of 100 watts and the other of 1,000 watts. The call sign is 8AE.

The station is designed as headquarters for amateurs and will serve many useful purposes for experimenters. Technical talks and news of special interest to amateurs will be sent out from time to time and occasionally code messages will be sent out at slow speed to encourage beginners.

Technical questions will be answered by broadcast. Concerted research on short-wave transmission and reception is on the program of activities. The wave length of the station will be 200 meters.

Home Radio Aids

When the secondary condenser on your set does not tune either the rotor of the variocoupler is "open," or there is an imperfect connection between the coupler and condenser or between the grid and grid-return filament leads.

Keep the kinks out of your headpiece wires. The slender wires are broken easily. Since they are covered with insulation and a silk covering you are not likely to discover the cause of trouble.

Vacuum tubes should not be burned any brighter than is necessary to produce a maximum clear signal. When tuning it is best to turn tube of detector on bright at the start and then reduce until reception is clear.

If you have a two-stage amplifier and local or closeby stations come in too loud, reduce volume by turning down the tube lights with the rheostats.

Frequent charging of storage batteries keeps them in good shape. When you retire at night connect up the home-charger. If this is done at short intervals an overnight charge will give you full batteries always ready for efficient service.

Much of the so-called "static" comes from imperfect "B" batteries. One battery in a series may be faulty and cause the familiar cracking. Test your batteries with a small high-resistance voltmeter and replace any you find weak. Volume and clarity, largely, come only from good batteries.

Gas pipes, steam pipes and iron pipes enclosing electric wires make poor ground connections. Run your ground lead to your house water pipes even if you have to use a lead from one end of the house to the other. It is best to have a short lead, of course, but long lead and a good ground connection are much better than a short lead and a poor connection.

Radio Frequency Explained

By John V. L. Hogan, C. E.
(Former President Institute of Radio Engineers.)

A QUESTION of particular interest seems to be the relation between the frequency of the radio wave and the frequency of the electric currents in radio transmitters and receivers.

The first point to bear in mind is that electric currents in radio stations are just the same as electric currents everywhere else.

There are only two general classifications of electric currents. One of these is called direct current and represents electric flow that continues indefinitely in the same direction thru an electric circuit. The other kind is called alternating current, and this is simply a flow of electric energy every so often in the electric circuit.

Direct current, then, flows continuously thru its circuit and back to the generator. Alternating current starts off in one direction, then reverses, then reverses again, and so on indefinitely, traveling around the circuit first one way and then the other.

Frequency Explained.

Since alternating currents ordinarily reverse their direction of flow regularly, the number of times they change or alternate may be measured and stated as a frequency.

Ordinary commercial alternating currents have frequencies of 25 to 60 cycles a second. That is to say they turn around and back in their circuits twenty-five times or sixty times every second.

If a generator of 60-cycle alternating current is connected to an ordinarily telephone receiver a sound quite like that of the second C below middle C on the piano will be produced.

A 500-cycle generator will similarly produce a sound corresponding in pitch to that of the C above middle C.

Currents of higher frequencies will produce sounds of higher pitch so long as the frequency is not greater than 10 or 15 kilocycles.

If a generator of still higher frequency is connected between a wire leading up into the air and one that is connected to the ground, it is easy to make it force quite large electric currents of its own frequency to flow in the circuit back and forth from the aerial wire to the ground connection.

Generator Controls Frequency.

If a generator of 610,000 cycles or 610 kilocycles frequency is connected in this way, it will produce currents of 610 kilocycles frequency.

These alternating currents flowing in the aerial wire system will create radio waves having a frequency of 610 kilocycles and these waves will shoot out in all directions from the generating wire at a tremendous speed.

By changing the frequency of the generator we can change the frequency of the currents it produces and therefore the frequency and the waves that are sent forth into space, but the frequency of the waves will always be the same as the frequency of the generator that produce them.

Thus, while the vacuum tube generator at station WEAF is arranged to produce currents and waves of 610 kilocycles frequency, the transmitter at the Providence station, WJAR, generates currents and waves of .833 kilocycles frequency, and so other broadcasting stations are arranged to generate alternating currents and waves of other frequencies.

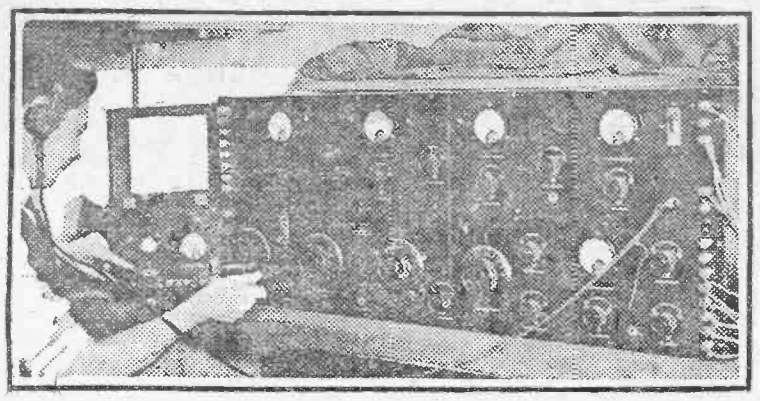
Alternating Current Waves.

The radio waves that carry broadcast programs to you, then, are created by alternating currents that flow in an elevated or aerial wire. One of the most interesting things about these waves is that they possess a sort of reverse ability to produce new alternating currents in other aerial wires that they pass by.

Radio waves from WEAF are at this moment generating radio frequency currents of 610 kilocycles frequency in your aerial or antenna arrangement, and thus 610 kilocycle currents are passing thru your tuner to your detector, where they are converted into lower frequency currents that reproduce my voice.

It is the consistence with which the radio frequency vibration holds to its own frequencies thruout the transmitter, the waves in space and in the receiver right down to the detector that makes it so desirable for you to think of and speak of radio waves in kilocycles frequency instead of meters' wave length.

Bear in mind that radio waves are created by alternating currents at the transmitting currents in every receiver. The transmitter current that produces the current and the receiver durrent that is produced by those waves have the same frequency and the waves have that same frequency wherever they go.



This fourteen-tube superhetrodyne receiver is merely an enlargement of Armstrong's original eight-tube set. Its high cost is a disadvantage, altho it is comparatively simple to operate. It is to be shown at the Radio show, Coliseum, next week.

Reserves Rooms by Radio

Patrons of the Alamac hotel, New York city, can reserve rooms and accommodations by radio. This hotel has installed a complete radio service, which is said to be the first of its kind. Guests, wherever they may be in the United States, only need to get in touch with some amateur and give him their message. The amateur transmits it direct or by relay to the Alamac hotel and the room will be reserved as requested. Patrons also can have rooms with radio receivers, as the hotel is equipped thruout.

New Bible on Ether

KYW (Chicago) is broadcasting the American translation of the New Testament on Sunday evenings. This is the translation made by Dr. Edgar J. Goospeed of the University of Chicago and is made possible for broadcasting thru The Chicago Evening [illegible] which has the Chicago rights of [illegible]tion.

How to Tune In Your Set to Get Best Reception

By HARRY A. BREMER.
(Vice President and Chief Engineer Bremer-Tully Manufacturing Company.)

GREAT has been the discussion and endeavor toward selectivity in receiving circuits. This feature, unquestionably, is an important one. However, many radio fans will agree that half their trouble with interference is due to neighboring fans who do not know how to tune their sets, or deliberately "hog the air."

If the average novice would devote as much time and effort toward learning the characteristics and proper operation of his circuit as he does in building and trying new circuits, undoubtedly he would reap greater reward, and so would his neighbors.

It is the purpose of this article to review briefly, in very nontechnical terms, how to tune a regenerative circuit and determine when it is functioning properly.

The Fundamental Control Dial.

A nonregenerative circuit, such as an ordinary crystal receiver, has only one dial adjustment, or control, namely wave length. The wave-length control dial is the fundamental adjustment of all receiving circuits. The wave-length dial is used to adjust the receiving circuit to the same wave length, or frequency, as that of the desired station, just as a violin string is tuned to a note sounded on the piano.

Replacing the crystal with a vacuum tube we have the nonregenerative plain audion circuit. The vacuum tube, in order to operate, must have a battery to heat its filament, just as any electric light or bulb. This filament must be heated to a certain temperature.

In order to control this temperature a rheostat must be placed in this "A" battery circuit. The rheostat acts just as a valve in a steam pipe, permitting more or less current to flow to maintain the filament at the temperature desired.

The vacuum tube, also, requires a "B" battery for the plate or phone circuit, but this need not be considered in tuning, unless a potentiometer is used in the circuit.

These Give No Interference.

Receiving circuits of the above type do not retransmit or cause any interference with neighboring receivers. In practically all present-day receiving sets, however, some of the amplified energy in the phone circuit is fed back to the antenna circuit to strengthen the original impulses picked up by the antenna, thereby greatly increasing the volume of the signal.

Such a circuit is called a regenerative circuit. The energy thus fed back is referred to as a regeneration, reaction or feedback, and the dial controlling it may be referred to as regeneration, reaction, tickler or plate.

This feedback is accomplished by various methods, but for tuning purposes it only is necessary to know which dial controls this feed back. This feedback dial controls the amount of energy fed back to the antenna coil or circuit, just as the faucet on your kitchen sink controls the flow of water from the city main, which, in that case, represents the "B" battery.

Vacuum Tubes Also "Spill Over."

Carrying this analogy further, if sufficient water is released by means of the faucet control, the sink will overflow, because more water is fed into it than its connections are able to carry away.

Altho a crude analogy and not strictly in accord, the same is true in your receiving set. If too much energy is fed back, the tube "spills over," in amateur language, or, rather, it breaks into oscillation, and in that condition the receiving set is, in fact, a transmitting set. Were a microphone connected at the proper point, you could broadcast within certain limits and your wave length would be that at which the wave-length dial was adjusted.

Regardless of a microphone, a receiving set in this condition is transmitting a wave, the frequency or wave length of which may be varied thruout the wave-length range of your receiver by means of the wave-length dial or control.

Owing to its high frequency this wave is not audible, but as the wave-length dial is rotated until this wave approaches the frequency of some other transmitting station, the two waves produce a beat upon each other. This beat becomes audible at a high pitch, decreasing to a very low pitch and disappearing when they are in tune, occurring again at a low pitch and increasing to highest audible pitch as they are brought out of tune by rotating the wave-length dial.

Sounds Warning Whistle.

Such a beat or whistle indicates that your receiving set is oscillating. In other words, too much energy is being fed back. Reduce the feedback until this beat just disappears when crossing the signal with wave-length dial.

Whenever you hear this beat in crossing a signal with your wave-length dial, you may be sure that any neighbor who is listening in on that station or signal, also, will hear this beat and that you are destroying his reception. Reduce the feedback until this beat just disappears when you cross the signal and you will not interfere with your neighbor's reception.

One receiving set operating in an oscillating condition, and poorly tuned to a certain station, may make it impossible for anyone in your neighborhood to properly receive that station.

Whenever your receiver is tuned to a station and you hear the characteristic beat of varying pitch coming into tune and again going out of tune with a signal, it is due to some neighbor operating his receiver in an oscillating condition. Find him and tell him to reduce the feedback.

A beat of unvarying pitch, which cannot be tuned out, is caused by two stations operating on very nearly the same wave lengths, producing a beat on each other. One of these may be a neighboring receiving set in an oscillating condition, improperly tuned to the station.

A signal which is carrying a beat caused by another station cannot be cleared up by means of the receiver.

In general, keep in mind that all regenerative circuits have two controls. First, wave-length control, used to select the station desired. Second, feed-back control, used to increase the audibility of the signal up to a certain point.

Maximum undistorted reception is secured just below the point of oscillation.

The rheostat acts as a rough feedback control. Increasing filament temperature increases feed-back to a certain point. Reducing temperature reduces feed-back. Operate at lowest temperature consistent with good volume. Cut down the feedback. Operate just below the point of oscillation. Request your neighbor to do likewise.

Burgess "B" Battery.

It is very convenient to be able to slip a B battery into the back of a set instead of having to set it out on the table. Consequently the small sizes have been very popular. But for use with four or five tubes having fairly high plate currents their lives are extremely brief. This battery is an intermediate one made up in exactly the same size as the usual square dry cell, two and one-half inches square and six inches high. The shape gives it room for much more capacity than the smaller size with very little increase in floor space. It is well adapted for use with dry cell A batteries in portable sets.

The battery is held in a thick, moisture-proof, cardboard container. Each of the fifteen small cells has its own moisture-proof compartment. The battery is one of those few radio parts in which apparently every possible thing has been done to make it give satisfactory service. The B batteries have an enviable record of performance with radio sets.—Manufactured by the Burgess Battery company, Madison, Wis.

Turn Off Crystal

When a crystal set is not in use it should be disconnected from the attenna. If this is not done sensitiveness will be destroyed gradually by continued splashes of static and loud signals.

Post Laboratory Tests

PARTS AND EQUIPMENT sent by manufacturers to The Chicago Evening Post laboratory for tests and publication of findings in this department should be carefully packed with copies of printed instructions (if issued) and statement of claims. No charge is made for this service. Photo of the parts also should accompany the shipment. Address Laboratory, Radio Department, The Chicago Evening Post.

"Scientific" Headset.

Most headphones have their direct current resistance stamped on them and radio fans, having heard that high resistance is desirable, are apt to judge a phone entirely by its resistance. This is unfortunate. A high resistance merely gives an indication that the windings are long enough to give a large inductance. Once this value of inductance is large enough, there is no reason why it should be further increased.

The higher resistance does not necessarily mean a better phone. In fact, the chances are just about even that a 2,000-ohm headset will be as good or better than a 3,000-ohm set. In order to get away from this method of designation, these phones are labeled 20,000 turns.

Since the inductance depends on the number of turns more than it does on the resistance, this gives a better indication of its performance than the resistance. It has the same disadvantage that the term kilocycle had when it first began to be used. People were more familiar with the other term. They do not know the number of turns on other makes of phones and so they are unable to make any comparisons.

The only real way to judge phones is on their performance. They should be able to reproduce both words and music without distortion and make weak signals audible. Since the ear does not remember the quality and volume of a sound very well, this is not easy to do.

The resistance of the headset is 1,840 ohms. Their performance under test shows that they will operate efficiently in a radio receiving set.—Manufactured by the Scientific Electric works, Boston, Mass.

Variotenser Catswhisker.

This multiple catswhisker is a welcome addition to the radio parts which make crystal operation easier. Fourteen fine gold strands are twisted together into a miniature cable. The variotenser replaces the usual single wire catswhisker. The end which touches the crystal is frayed slightly. Thus there are fourteen fine points to feel over the surface with a corresponding increase in the chances for finding that most sensitive spot quickly.

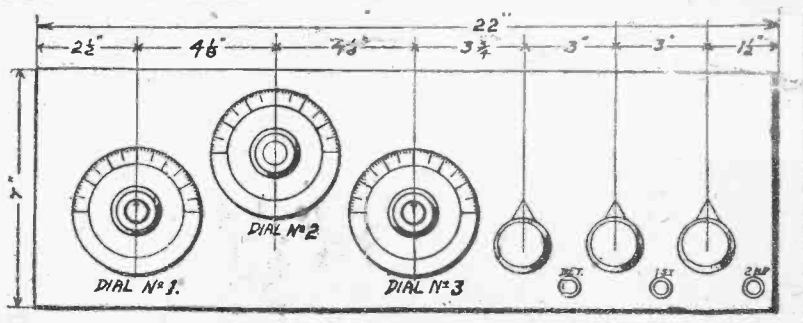
The wires are so flexible that they adapt themselves to the irregularities of the surface very easily. The one or two which happen to strike insensitive points and so contribute nothing to the detection do not interfere with the others or detract from the signal strength. This would not be true if the impedance of the crystal were lower. As it is the amount of signal which is bypassed thru the dead points is negligible.

The advantages of using gold strands are that they are extremely flexible and do not rust or corrode.—Manufactured by the Foote Mineral company, Philadelphia.

Defies Music Trust

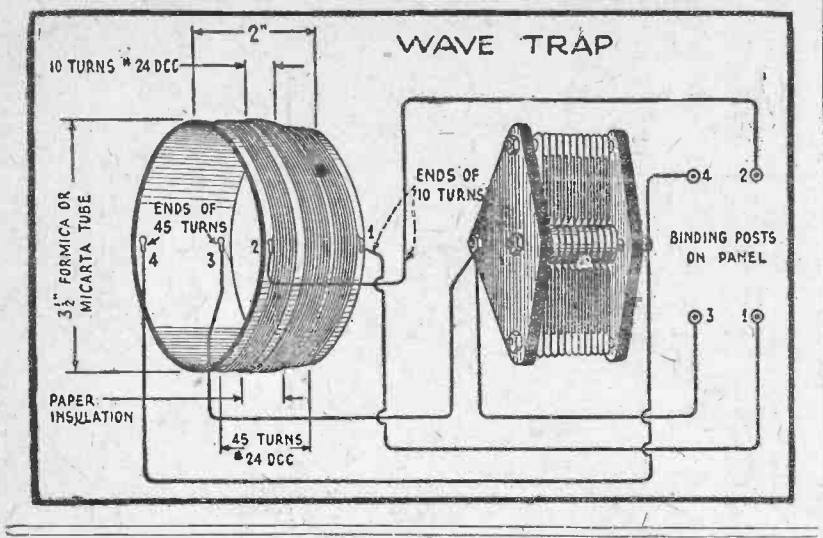
The musical comedy "Caroline" was broadcast from Station WNAC (Boston) last week, despite a protest from the American Society of Composers, Authors and Publishers that broadcasting the music upon which they held copyrights would be in violation of the copyrights. The Shuberts hold performing rights to the music, and it was on this basis that the broadcasting was done.

The Atlas Cut Rate Shop company now is operating three stores. The latest addition was opened up a few days ago at 319 West Madison street. The other two establishments are at 133 North Dearborn street and 345 South Clark street. The last-named place was one of the first of the "cut-rate" shops in Chicago.



Radio Aids Deaf

Dr. Paul V. Winslow, consulting ear surgeon of the New York State hospital, recently gave an address from WOR, Newark, N. J., on "Radio and the Deaf." Dr. Winslow, who is president of the Round Table for Speech Improvement, brings forward some new and startling theories relating to deafness and its cure. He has made a considerable number of experiments with radio, and is of the opinion that it can be employed to advantage in helping to cure deafness. Many people ordinarily quite deaf can hear distinctly in the headphones, and his speech was heard and appreciated by thousands of such.



This Simple Wave Trap Cuts Out Interference

HERE'S a wave trap that cuts out local interference. It consists of a coil of approximately forty-five turns of medium-size copper wire, generally wound on a cylindrical form about 3½ inches in diameter, with a variable condenser of about .0005 mfds. capacity connected across it, the combination forming an oscillating circuit.

A second coil of about ten turns is wound on top of the first winding so as to be in inductive relation to it, but insulated from it. The two circuits are not physically connected in any way. In the usual hook-up for the trap, the outside coil is connected between the antenna lead-in and the receiving set, as shown in the illustration.

With the specifications given, no difficulty should be found in constructing this wave trap after reference is made to the diagram.

It will be noted that the wave-trap is designed with four binding posts which allow it to be used in many different ways in various circuits and combinations. The most common and useful hook-up makes use of only binding posts Nos. 1 and 2, either of these being connected to the antenna lead-in while the other connects to the aerial post on the receiving set.

After the wave-trap has been constructed, its operation comparatively is simple.

The receiving set should first be tuned approximately to the interfering station which it is desired to eliminate. Then the wave-trap dial should be varied slowly until the signal from the interfering station disappears or is reduced to minimum strength. The dial is then left in this position and the receiving set is retuned to whatever station it is desired to receive.

Unless interfering stations are very close or other unusual conditions obtain, it will generally be found that an interfering station cannot again be found on the tuning dials of the receiving set until the trap has again been adjusted to receive it.

A unit of this kind usually will eliminate but one interfering station at a time. If there is more than one station creating interference, two or more traps may be used in series. By eliminating all local stations successively in this manner, it becomes possible to work thru to long distance without local interference of any kind.

BRINGS IN DX ON SPEAKER WITH ONLY ONE TUBE

R. E. WOLF.

R. E. Wolf, vice president and general manager of the Standard Radio corporation, is a warm exponent of Muhleman's new autoplex circuit, described on page 7 of this magazine.

Mr. Wolf hooked up a one-tube receiver the other night and the results he got convinced him that the circuit has many possibilities.

Working only one tube, and while the powerful local stations were jamming up the air, keeping other less sensitive sets from reaching outside of Chicago, Mr. Wolf tuned in WGY (Schenectady); WOC (Davenport); WTAS (Elgin); WGR (Buffalo), and KDKA (Pittsburg).

One Tube Runs Speaker.

These stations were tuned in in the order named and with sufficient volume to operate a loud speaker, and be heard anywhere in the apartment. No antenna was used other than the ground connection.

"In chosing the variometers for the circuit," Mr. Wolf says, "a type of low distributed capacity should be chosen, and the primary and secondary windings should be as close together as possible.

"The 1,250 turn honeycomb coil used is the ordinary unmounted type. The position of this coil with respect to the variometers is immaterial. Care should be taken in chosing the variometers that they will at least respond to a wave length at least 600 meters. In case your variometers will not tune this high, an unmounted honeycomb coil 75 or 100 turns may be added in the circuit at the point marked "X."

Requires No Rheostat.

"The operation of the vacuum tube is not critical in this set, and, therefore, no rheostat is required. Simply insert a battery switch or filament contact jack for turning off or on the battery. The best types of tubes for this circuit are the VT-2 or Western Electric 216A, and the UV-201A. The V battery voltage should be from 60 to 150 volts. This set may be used with the ordinary antenna and ground, or may be used with the ground only. In the latter case, the ground connection should be attached to the aerial binding post on the set.

"It is well worth any amateur's time to construct this set. You will be surprised at the enormous volume from a single tube, not only on local but long-distance stations as well."

Experiments Prove Value of Single-Wire Aerial

Recent exhaustive tests with one wire antenna on merchant vessels have demonstrated the practicability of using a single wire for low-power transmitting purposes as well as for receiving.

Aboard ships this feature would eliminate cost, space and weight. It would make the necessary lowering of the aerials on cargo vessels during loading much easier, and reduce the necessary insulators, wire, spreaders, etc. Also the single wire aerials could be hoisted higher than a three or four-wire antenna.

Amateurs who have no facilities or cannot afford to erect masts high and strong enough to carry a heavy four-wire aerial, should find the single wire of considerable benefit when using 1 KW or less power; for 2 KW transmission, it is said the single wire antenna is not to be compared with larger antenna.

Most every one knows that the single wire aerial picks up less interference. Its efficiency in transmitting is not quite as great as a four-wire aerial, but experts believe the decrease in cost, weight and ease of handling would compensate for loss in efficiency.

The recent tests included the use of both inverted L and T type aerials, and several forms of wire. A four-strand wire cable twisted over a manila rope core was found most satisfactory.

A Gold-Mounted Set for a Prince

Among the countless wedding presents received by the Duke and Duchess of York was a wonderful gold-mounted radio receiving set. It is a portable loop receiver, mounted on a mahogany tea wagon, complete in every detail, with loud speaker and even a charger for the storage battery attached to the shelf beneath.

Broadcasts Lecture

Twice recently Dr. Russell H. Conwell of Philadelphia has broadcast his lecture, "Acres of Diamonds," a lecture familiar to two generations of lyceum and Chautauqua attendants all over the country which has earned for Dr. Conwell more than $10,000,000, nearly all of which he has spent in the cause of popular education.

Crystal Sets Are Clear

No tube set ever has improved upon the bell-like tones of a crystal detector. The belittled crystal may not reach out and bring in the far ones nor it may not be very strong on loud-speaker work, but what it does do it does well.

GETTING RID OF REFLEX HOWLING IN TRANSFORMER

W. H. FARR.

Radio Engineering Staff, Electrical Research Laboratories.

When the duo-reflex circuit was first announced it was found that some experimenters obtained excellent results while others, who, apparently, had used just as good material and had taken just as much care in building their sets, were somewhat disappointed with the results obtained.

A considerable number of sets which were not giving satisfaction were examined carefully and tested in the Electrical Research laboratories, thus giving the engineering staff a splendid opportunity to study the functioning of apparatus of different makes in the reflex circuit. In these sets were variocouplers, condensers, rheostats and transformers in an almost endless variety of combinations.

Gradually, as a result of these tests, some very definite conclusions were reached as to the characteristics which must be possessed by the more essential pieces of apparatus used in this circuit in order to insure maximum efficiency.

Fail to Reflex Properly.

From the very first it was observed that there was a very great variation in the performance of different audio transformers. Many transformers, altho apparently well designed and carefully manufactured, would refuse to reflex properly, even tho they might work perfectly in a simple audio-frequency amplifying circuit. Furthermore, transformers of the same make were not always found to be uniform, and had to be selected by actual test in a reflex circuit to insure satisfactory performance.

One of the earliest discoveries was the howl which is produced in the single tube reflex circuit when the crystal detector is opened, which may be accomplished either by lifting the "cat's whisker" from the crystal, or by disconnecting the detector from the circuit.

The aerial and ground are disconnected from the set for the latter test. This "reflex howl" proved to be very useful, as it was found to be a dependable test as to whether the audio transformer was reflexing properly.

It later was proved that the howl was due to a feed-back of radio-frequency and audio-frequency transformers, the connection in this case being unilateral, into the grid circuit of the same tube.

An extended study was made of the effect of ratio of turns, impedance, core design, arrangement of terminals, etc., on the performance of a transformer.

Experiments Lead to Design.

Finally a design was evolved which embodies the characteristics found to be most desirable in reflex work. The core used is one possessing almost ideal magnetic properties, among which are low hysterisis loss, low magnetic leakage and high saturation point. The coils have a low capacity winding, are wound with wire of ample current carrying capacity and are thoroly impregnated. The shell provides thoro magnetic shielding, which is necessary to permit compactness in the arrangement of the apparatus without danger of interaction between the various circuits.

When the design of the new radio transformer had been perfected in the laboratories, the next task was that of insuring quality under factory production. This was accomplished in two ways: First, standardization of the various manufacturing processes, and second, by a schedule of inspections and tests.

The customary inspections of material are made during assembly and defective parts are thrown out. Then when completed each transformer is given a four-fold test. One of these locates open or short circuits in the wiring. A second detects grounds between windings and the core. In the third the transformer is connected in a reflex circuit and tested for the "reflexhowl". Lastly it is tested on actual radio signals to insure proper amplification and tone quality. After these tests the inspector must certify each transformer by initialing the inspection label.

"Broadcaster" Announcers

Why do announcers insist on saying their station "broadcasted" such and such a program? The word is not in any of the dictionaries.

Radiophans' Mail Box

Indorses Kostner's Plan.

Editor Radio Post—I noted in The Post Radio department Tuesday that Ald. Kostner is going to start a movement that will relieve the jam among the broadcasting stations every night. It is a commendable idea.

I have a fairly selective set and can manage to "get away" from most of the local stations when I wish, but I know that most broadcast listeners are not so fortunate.

It is almost impossible for anyone with the usual type of receiver to escape the confusion of three or four powerful stations jamming away at the air all at one and the same time.

And the crystal set owner, whose name is legion, certainly is up against it for fair.

Why can't the broadcast stations come to some agreement and schedule their evening programs so as not to conflict? It seems they would do it for their own good. Certainly as it now is 70 per cent of the Chicago phans cannot get any of the stations clearly. They all come in with confusion.

Why broadcast if no one can hear you?

I hope Ald. Kostner's program will be successful.—A. N. T.

Long Distance Work.

Editor Radio Post—It is my experience that not one out of ninety owners of radio receivers are able to get any outside stations, altho they have expensive sets and make every effort to do so.

The trouble, in my estimation, lies not in the set but in the way it is handled.

I had a friend who invested $200 in a well-known manufactured set which has an excellent reputation for DX work. Yet he could only get Zion and Elgin last Monday evening when all local stations were silent.

Last night I went over to look at his set and see if I could suggest anything to help him. The circuit was all right and all connections in good condition. In fact, I could find nothing at fault.

Then the secret was out. My friend sat down to tune in a station for me at my suggestion. He sent the dials on a merry spin and kept them going at the swift pace. First this way and then that way he turned one control after another.

Of course he was passing over signal after signal. Then I took his chair before the panel and in quick succession brought in Schenectady, E. Pittsburg, St. Louis and Cincinnati without any effort whatever, and all while KYW (Chicago) was broadcasting opera.

When I left my friend along about 11 p. m. he was tuning in Kansas City, and later got Fort Worth and Dallas.

It was just a case of proper tuning. That was all.

It would be a good thing if the Westinghouse people would open up a school of tuning. It would make more and better radiophans, which is what this concern wants, I should think.—C. B. S.

Wants DX Contest.

Editor Radio Post—I hope The Post Radio magazine will inaugurate a long distance contest. Several of the magazines published in the east do this but they are too far away.

Your Radio magazine is just what we phans need and have needed all along. We've had to depend too much on the monthly publications for our information and help.

I think these long distance contests whet one's ambition. It is all thru competition anything worth while is uncovered.

You don't have to offer prizes but just devote the space to DX reports. What say?—GEO W. M.

(Editor's Note—Your suggestion is part of a plan which is our intention to put into effect shortly. Send in your DX records and we will allow them space. Be sure, however, to describe circuit or send diagram.

Programs for Tonight

Continued from Page 3.

man and Farmer; 7:15 p. m., farm program continued; 7:30 p. m., concert by Mrs. Ethel Rawstherne Trick, soprano; Mrs. Alan B. Davis, pianist and accompanist; Ernest W. Wright, tenor; Edward W. Koontz, pianist; Jack Thompson, humorist; program, soprano solos, (a) "Joy" (Gaul); "Sonny Boy" (Curran); "The Lord Is My Light" (Allitson); piano solos, "Moment Musicale" (Schubert); "Danse Negre" (Scott); humorous selections to be announced by radio; tenor solos, "Maperi" (Martha), (Flotow); "Nom Ezer" (Mattei); (a) "Sylvia" (Speaks); (b) "I Cannot Help Love Thee" (Johns); (c) "Memory's Rose" (Huerter); (d) "Dream Tryst" (Cadman); 10:30, midnight frolic.

WBZ—Springfield, Mass.; 337 meters; 10:55 a. m., noontime signals, weather, markets; 5 p. m., dinner concert to be announced by radio; 5 p. m., dinner concert by the WBZ quintet; 6 p. m., "More Game—Better Shooting," an outing story from Field and Stream; talk by Herbert Myrick, editor-in-chief of Farm and Home; 6:30 p. m., "Story Openings and Endings," ninth lecture of a course in short-story writing, by Dr. J. Berg Esenwein; farmers' period—letter from the New England Homestead; 7 p. m., concert by Myrtle Atchinson, pianist; Alwyn Bach, barytone.

WEAF—New York city; [illegible] meters; 5:30 to 8 p. m., concerts.

WGI—Medford Hillside, Mass.; 360 meters; 11 a. m., music; 11:40 a. m., weather; 11:45 a. m., markets; 5:10 p. m., code practice, lesson number 162; 5:35 p. m., Boston police reports, Boston police headquarters; late news flashes, sports news; 5:30 p. m., Boston police reports, Boston police headquarters; 5:40 p. m., code practice, lesson number 163; 6 p. m., evening program. (1) "Bits of Wisdom," by George Brinton Beal, prominent newspaper man; (2) musical program arranged by George Brinton Beal and friends.

WGR—Buffalo; 319 meters; 9:45 a. m., weather; 12 n., agriograms; 3 p. m., tea time music from the Palm room, Hotel Statler; 6 p. m., Boy scout radiograms, industrial employment bulletin, The American Boy story.

WGY—Schenectady, N. Y.; 380 meters; 5 p. m., produce and stock market quotations; news bulletins; 1 p. m., music and address, "The Club Woman of the Twentieth Century," by Mrs. Edward P. Pressy, president of Schenectady Federation of Women's club; 3:15 p. m., weekly report on conditions of roads in New York state; 6:45 p. m., musical program furnished thru courtesy of Cluett, Peabody & Co., Inc., Troy, N. Y.; address, "A Goose Shooting Incident," Henry S. Watson, editor of Field and Stream; piano solo, "Etude Melodique" (Rogers), Margaret Conklin; male chorus selection, "The Rosary" (Nevin), Arrow double male quartet, Charles Felter, Frank Irwin, first tenors; William Simmonds, John Christopher, second tenors; Henry Leffingwell, James Baker, barytones; Robert Lang, William Fowler, basses; T. G. Protheroe, director; Gertrude Cooper, accompanist; violin solo, "Melody" (Dawes), Raymond F. Rooney; tenor solo, "A Little Pink Rose" (Bond), Charles Felter; address, "Sugar," C. A. Kelsey, Power and Mining department, General Electric company; male chorus selections, (a) "Lullaby" (Brahms); (b) "Plantation Lullaby" (Geibel), quartet; piano solos, (a) "Feu Follet" (Rogers); (b) "High Flies the Crane" (Hungarian Folk Song), Margaret Conklin; Barytone solo, "On the Road to Mandalay" (Speaks), Henry Leffingwell; violin solo, "Legende" (Bohm), Raymond F. Rooney; piano solos, (a) "Evening" (Dillion); (b) "Presto" (Stiehl), Margaret Conklin; male chorus selection, "Winter Song" (Bullard), quartet.

WJZ—New York city; 455 meters: 2 p. m., afternoon auditorium concert by direct wire from the Wanamaker auditorium; 3 p. m., two one-act plays by Threshold players; 3:45 p. m., Theodore Van Yorx concert; 5 p. m., "Jack Rabbit Stories," by David Cory, 6:30 p. m., the world's work; 6:45 p. m., recital by Mary Biffin, soprano; 7:05 p. m., "Income Taxes," by Frank Shevit; 7:15 p. m., Wanamaker Organ concert, program by J. Thurston Noe; 8 p. m., recital by Edna Fields, soprano; 8:15 p. m., "Food," by Mr. Willock; 8:30 p. m., recital by Edna Fields, soprano; 9 p. m., concert by J. P. Robertson, basso, accompanied by Robert Childe, pianist; 9:30 p. m., dance program by the Hotel Commodore orchestra under the presonal direction of Bernard Levitow.

WJY—New York city; 405 meters; 2 to 4 p. m., concert program.

WOO—Philadelphia; 509 meters; silent night.

WOR—Newark, N. J.; 405 meters; 7 to 9 p. m., concert program.

Midwest Programs.

WCX—Detroit, Mich.; 517 meters; 2 p. m., news bulletins; 2:15 p. m., stock quotations; 2:50 p. m., weather; 4:15 p. m., music; 7 p. m., musical program.

WDAF—Kansas City, Mo.; 411 meters; 3:30 to 4:30 p. m., concert, sport news; 5:55 p. m., markets and weather; 6 to 7 p. m., educational features and musical program; 11:45 p. m., to 1 a. m., "Nighthawk" Frolic and Coon-Sanders [illegible] at Hotel Muehlebach.

WHB—Kansas City, Mo.; 411 meters; 12:40 p. m., concert; 2 p. m., concert; 7 p. m., concert.

DJAX—Cleveland; 390 meters; concert furnished by the Cleveland News.

WLAG—Minneapolis, Minn.; 417 meters; silent night.

WOC—Davenport, Iowa; 484 meters; 3:30 p. m., educational program, lectures by Karl G. Stephan. (Musical numbers to be announced.) 8 p. m., musical program, one hour, P. S. C. orchestra, Gerald M. Barrow, director; V. B. Rochte, barytone soloist, featuring "China Eyes," "Sunflower Maid," "Georgia Moon," "Island Nights," "Waltz Me to Sleep in Your Arms," "The Cat's Whiskers" and "If You're Sorry."

WOS—Jefferson City, Mo.; 441 meters; 8 to 9:30 p. m., concert program.

WWJ—Detroit, Mich.; 517 meters; Michigan night, 7 p. m., Detroit News orchestra; town crier; Howard C. Lewis, barytone; Anna Rosser Lewis, pianist and contralto; Margaret H. Foy, soprano; 10 p. m., music.

NWTAM—Cleveland; 390 meters; 7 to 8 p. m., musical program.

Southern Programs.

KSD—St. Louis; 546 meters; silent night.

WBAP—Fort Worth, Texas; 476 meters; 7:30 to 8:30 p. m., concert by the thirty-piece band of the North Texas Junior Agricultural and Mechanical college of Arlington, Texas. (E. L. O. announcing.) 9:30 to 10:45 p. m., concert of orchestra, novelty and solo numbers by the University club of Fort Worth. (G. C. A. announcing.)

WGM—Atlanta, Ga.; 429 meters; 6 to 7 p. m., concert; 9:30 to 10:30 p. m., concert.

WGV—New Orleans; 350 meters; 7 to 8 p. m., concert.

WFAA—Dallas, Texas; 476 meters; Shriners' day; 12:30 to 1 p. m., address, Judge Hiram F. Lively on "The Man in Fellowman"; 8:30 to 9:30 p. m., Masonic musical program.

WHAS—Louisville; 400 meters; 4 p. m., concert by the Strand theater orchestra, reading, "Just Among Home Folks"; selections played on the Alamo theater organ; 7:30 p. m., the ten best Foster songs, especially arranged and dedicated to WHAS by Zuddie Harris Reinecke, and sung by The Courier-Journal quartet: Miss Fannie Bess Morton, soprano; Mrs. K. W. Surman, contralto; K. W. Surman, tenor; Albion S. Cornwall, barytone; Mrs. Albion S. Cornwall, accompanist; reading, "An Interesting Historical Episode"; sports bulletins.

WLW—Cincinnati; 309 meters; 8 p. m., Oberlin Conservatory trio: Mrs. William Mason Bennett, piano; Mr. Maurice Kessler, violin, and Frederick Goerner, cello; Mrs. Florence Hall, soprano, is the soloist; (1) second trio, op. 92 (Saint-Saens), Allegro non troppo, Andante con moto, first and second movements; (2) Soir d'Automne (Waefelghem); (3) Plaisir d'Amour (Martin); (4) Romance, Viola d'Amore Soli: (a) Dedication (Franz); (b) A Pastoral (Veracini); (5) When Love Is Kind (Mrs. Hall), Old English; (6) second trio (Sant-Saens), Gracioso poco allegro, Allegro non troppo, third and fourth movements; 9:15 p. m., last half of the symphony concert of the Cleveland orchestra, Nikolai Sokoloff, leader; Tschaikowsky's symphony No. 5, E minor, op. 64.

WMC—Memphis; 500 meters; 11 p. m., concert.

WSB—Atlanta, Ga.; 429 meters; 12 to 1 p. m., musical program for industrial workers; 2:30 p. m., weather forecast; 4 p. m., Howard relay; 5 to 5:30 p. m., markets, news and sports; 5:30 p. m., bedtime story; 8 to 9 p. m., popular concert; 10:45 p. m., Transcontinental Radiowl concert.

Pacific Coast Programs.

KFDB—San Francisco; 509 meters; musical program from midnight to 1:30 a. m.

KGW—Portland, Ore.; 492 meters; midnight to 1 a. m., vocal; 2 a. m., hoot owl frolic.

KHJ—Los Angeles, 395 meters; evening broadcasting hours, 10:45, 11:30 p. m.; 1 a. m.

KPO—San Francisco; 423 meters; evening broadcasting hours for concert, midnight to 1 a. m.

SUBURBAN STATIONS

(Central Time Is Shown.)

WCBD—Zion, Ill.; 345 meters; 8 to 10 p. m., concert by Zion band and orchestra, vocal selections, instrumental solos.

WIAB—Rockford, Ill.; 252 meters; 8 to 9 p. m., concert.

WRM—Urbana, Ill., University of Illinois; 360 meters; 8:50 to 9:30 p. m., lectures and news.

WTAS—Elgin, Ill.; 275 meters; 7:30 p. m., musical program.

Burn Tubes Low

Operate your tubes on as little current as will give good reception. It will lengthen their life considerable.

Broadcasting Stations and Schedules

Central, or Chicago time, is shown on all stations. If necessary to ascertain local time on any station deduct two hours from time shown for Pacific coast stations, one hour from time shown for the Rocky mountain stations and add one hour to those stations using eastern time. Hawaiian island time is four hours and a half slower than Chicago time. In the list the call number of the station is first given, followed by the location, the owner's name, wave length used and broadcasting schedule in order named.

AA3, Denver, Colo. Fitzsimmons General hospital. (Educational department, United States army). 440 meters. Friday, 9-10 p. m., music, entertainment.

AQ6, Canton, Ohio. Headquarters 135th field artillery, O. N. G. 425 meters. Wednesday, Friday, music. Sunday, church services.

AS6, San Antonio, Texas. United States army, Fort Sam Houston. 360 meters. Monday, Thursday.

AV7, St. Paul, Minn. 6th Infantry, Minnesota National Guard, St. Paul armory. 400 meters.

AW5, Dayton, Ohio. McCook field, United States army. Experimental work.

BE1, Tacoma, Wash. Camp Lewis, United States army, third signal corps. 400 meters. Discontinued indefinitely.

KDKA—Westinghouse Electric and Manufacturing company, East Pittsburg, Pa. 326 meters. Daily except Sunday, 9-9:15 a. m., 11:30-12 noon, music; 7-8:55 p. m., news features, markets, concerts; 10:55-11 p. m., time signals. Sunday, church services, 12 noon and 9 p. m.; bible story, 3:30 p. m.; concert, 3:45 p. m., and in winter; vespers at 5:45 p. m., and organ recital from Carnegie Music hall at 5 p. m.

KDPM—Westinghouse Electric and Manufacturing company, Cleveland, Ohio. 270 meters.

KDPT—Southern Electrical company, San Diego, Cal. 242 meters. Daily except Sunday, 9-9:30 p. m. Tuesday and Saturday, 10-12 p. m., concert. Sunday, 1-2 p. m., sermon.

KDYL—Telegram Publishing company, Salt Lake City, Utah. 360 meters. Daily except Sunday, 9-10 p. m., concert.

KDYM—The Savoy theater, San Diego, Cal. 280 meters. Monday, Wednesday, Friday, 10-12 p. m. Saturday, 4-7 p. m.

KDYQ—Oregon Institute of Technology, Portland, Ore. 360 meters. Educational programs.

KDYS—The Tribune, Great Falls, Mont. 360 meters. Wednesday, Saturday, 10 p. m.

KDYW—Smith Hughes & Co., Phoenix, Ariz. 360 meters.

KDYX—The Star-Bulletin Publishing company, Honolulu, Hawaii. 360 meters. Daily except Sunday, 3:15-4 p. m. Daily except Saturday, Sunday, 9:30-10:30 p. m. Sunday, 2-3:15 p. m., church service.

KDZB—Frank Seifert, Bakersfield, Cal. 360 meters. Daily except Sunday, 10-11 p. m., music. Sunday, sacred program.

KDZE—Seattle Radio association, Seattle, Wash. 360 meters.

KDZF—Automobile Club of Southern California, Los Angeles, Cal. 278 meters.

KDZI—Electrical Supply company, Wenatchee, Wash. 360 meters.

KDZK—Nevada Machine and Electric company, Reno, Nev. 360 meters.

KDZQ—Nicholas Academy of Music, Denver, Colo. 360 meters.

KDZR—The Bellingham Publishing company, Bellingham, Wash. 261 meters.

KDZT—Seattle Radio association, Seattle, Wash. 360 meters.

KDZU—Western Radio corporation, Denver, Colo. 360 meters.

KDZV—Cope & Cornwell company, Salt Lake City, Utah. 360 meters.

KEB—Marine Exchange, San Francisco, Cal. 360 meters.

KFAD—McArthur Brothers Mercantile company, Phoenix, Ariz. 360 meters.

KFAE—State College of Washington, Pullman, Wash. 360 meters. Monday, Wednesday, Friday, 9:30-10:30, lectures, readings, music, news.

KFAF—Western Radio corporation, Denver, Colo. 360 meters. Monday, Tuesday, Wednesday, Friday, Saturday, 9-10 p. m. Thursday, 8:30 p. m.

KFAJ—University of Colorado, Boulder, Colo. 360 meters.

KFAN—The Electric Shop, Moscow, Idaho. 360 meters.

KFAP—Standard Publishing company, Butte, Mont. 360 meters.

KFAQ—City of San Jose, San Jose, Cal. 360 meters.

KFAR—Studio Lighting Service company, Hollywood, Cal. 280 meters.

KFAT—Pacific Radio company, Eugene, Ore. 275 meters.

KFAU—Boise High school, Boise, Idaho. 270 meters.

KFAV—Abbott-Kinney company, Venice, Cal. 258 meters.

KFAW—The Radio Den, Santa Ana, Cal. 360 meters. Daily except Sunday, 5:30-6 p. m., news, sports, music. Monday, Tuesday, 7:30-8:30 p. m., concert.

KFAY—Virgin's Radio Service, Medford, Ore. 360 meters. Monday, Friday, 10-11 p. m. Wednesday, 10 p. m.-1 a. m.

KFBB—F. A. Buttrey company, Havre, Mont. 360 meters. Daily except Sunday, 1:30 p. m. Tuesday, Friday, 9-10:30 p. m., music.

KFBC—W. K. Azbill, San Diego, Cal. 278 meters.

KFBE—R. H. Horn, San Luis Obispo, Cal. 360 meters. Monday, Wednesday, Friday, 6:30-7:30 p. m.

KFBG—First Presbyterian church, Tacoma, Wash. 360 meters.

KFBK—Kimball-Upson company, Sacramento, Cal. 283 meters. 8-8:45 p. m; Wednesday, 10-11 p. m.

KFBL—Leese Bros., Everett, Wash. 224 meters. Daily except Sunday, 9:15-10:15 p. m. Sunday, 4-5 p. m.

KFBS—Chronicle News Gas and Electric Supply company, Trinidid, Colo. 360 meters.

KFBU—Bishop N. S. Thomas, Laramie, Wyo. 360 meters.

KFCB—Nielsen Radio Supply company. 238 meters. Phoenix, Ariz. Daily, 8-8:30 p. m.

KFCD—F. S. Barton, Salem, Ore. 360 meters.

KFCF—Frank A. Moore, Walla Walla, Wash. 360 meters.

KFCH—Electric Service Station, Inc., Billings, Mont. 360 meters.

KFCK—Colorado Springs Radio company, Colorado Springs, Colo. 360 meters.

KFCL—Los Angeles Union Yards, Los Angeles, Cal. 360 meters. 12-12:30 p. m.; 3:15-4:45 p. m.; 6:30-7 p. m.; 10-10:10 p. m.

KFCM—Richmond Radio shop, Richmond, Cal. 244 meters. Daily except Sunday, 3-4 p. m. Monday, 10-11 p. m.

KFCP—Ralph W. Flygare, Ogden, Utah. 360 meters.

KFCV—Fred Mahaffey Jr., Houston, Tex. 360 meters.

KFCY—Western Union college, Le Mars, Iowa. 360 meters.

KFCZ—Omaha Central high school, Omaha, Neb. 258 meters. Monday, Tuesday, Thursday, Sunday, 7-9 p. m., concerts.

KFDA—Adler's Music store, Baker, Ore. 360 meters. Daily except Sunday, 7-8 p. m.

KFDB—California Mercantile Trading company, San Francisco, Cal. 509 meters.

KFDC—E. V. Craney, Spokane, Wash. 285 meters.

KFDD—St. Michael's cathedral, Boise, Idaho. 252 meters. Sunday, 12:15-1:30 p. m. 9-10:15 p. m., church services.

KFDF—Wyoming Radio corporation, Casper, Wyo. 360 meters. Daily except Sunday, 2:30 p. m., weather, stocks. Wednesday, Friday, 10-11 p. m., concert. Sunday, 10-11 a. m.; 1-1:30 p. m., church services.

KFDH—University of Arizona, Tucson, Ariz. 360 meters. Tuesday, Thursday, 9:30-10:30 p. m.

KFDJ—Oregon Agricultural college, Corvallis, Ore. 360 meters.

KFDL—Knight-Campbell Music company, Denver, Colo. 360 meters.

KFDO—H. Everett Cutting, Bozeman, Mont. 360 meters.

KFDP—Hawkeye Radio and Supply company, Des Moines, Iowa. 278 meters. Daily, 3 p. m., police reports, musical program. Monday, Thursday, 9 p. m., musical program.

KFDR—Bullock's Hardware and Sporting Goods store, York, Neb. 360 meters.

KFDS—John D. McKee, San Francisco, Cal. 360 meters.

KFDU—Nebraska Radio Electric company, Lincoln, Neb. 240 meters.

KFDV—Gilbrech & Stinson, Fayetteville, Ark. 360 meters.

KFDX—First Baptist church, Shreveport, La. 360 meters.

KFDY—South Dakota College of Agricultural and Mechanical Arts, Brookings, S. D. 360 meters. Monday, Saturday, 8:30 p. m., concert. Tuesday, Thursday, 11 a. m., lecture.

KFDZ—Harry O. Iverson, Minneapolis, Minn. 360 meters.

KFEC—Meier & Frank Co., Inc., Portland, Ore. Daily except Sunday,, 6-7, concert; 8:30 p. m., weather, markets, Thursday, 11 p. m.-12 a. m., concert. Saturday, 1-2 p. m., children's hour.

KFEJ—Guy Greason, Tacoma, Wash. 360 meters.

KFEL—Winner Radio corporation, Denver, Colo. 360 meters. Daily except Sunday, 10 a. m.-12:45 p. m., stock reports; 4-5 p. m., concert. Monday, Friday, 10-11 p. m., concerts. Sunday, 10-11 a. m., church services.

KFEQ—J. D. Scroggin, Oak, Neb. 360 meters.

KFER—Auto Electric Service company, Fort Dodge, Iowa. 231 meters.

KFEV—Radio Electric shop, Douglas, Wyo. 263 meters. Daily, 12:05 p. m., weather; 9:10 p. m., concert.

KFEX—Augsburg seminary, Minneapolis, Minn. 275 meters. Monday, Wednesday, Friday, 10:30-11 a. m., concert. Tuesday, Saturday, 5-7 p. m., lectures. Sunday, 9-10:30 p. m., church services.

KFEY—Bunker Hill and Sullivan Mining and Concentrating company, Kellog, Idaho. 360 meters. Daily except Sunday, 10-11 p. m.

KFEZ—American Society of Mechanical Engineers, St. Louis, Mo. 360 meters.

KFFA—Dr. E. O. Shelton, San Diego, Calif. 244 meters. Daily, 8-9 p. m., concert.

KFFB—Jenkins Furniture company, Boise, Idaho. 273 meters. Daily except Saturday, Sunday, 10-11 p. m., concert.

KFFE—Eastern Oregon Radio company, Pendleton, Ore. 360 meters. Daily except Sunday, 10:30-11:30 p. m., concert.

KFFO—Dr. E. H. Smith, Hillsboro, Ore. 229 meters.

KFFP—First Baptist church, Moberly, Mo. 275 meters. Sunday, 10:45 a. m.-8 p. m., church services.

KFFQ—The Marksheffel Motor company, Colorado Springs, Colo. 360 meters. Daily, 9:15 a. m., weather; 5-6 p. m., concert.

KFFR—Jim Kirk, Sparks, Nev. 360 meters. Wednesday, Friday, 9-10 p. m., concert.

KFFV—Graceland college, Lamoni, Iowa. 330 meters. Wednesday, 9:20 a. m., concert. Thursday, 8 p. m., entertainment.

KFFX—The McGraw Co., Omaha., Neb. 278 meters. Daily, 2:30-4 p. m.

KFFY—Pincus & Murphy, Inc., Alexander, La. 275 meters.

KFFZ—Al. G. Barnes Amusement company, Dallas, Tex. 226 meters.

KFGC—Louisiana State university, Baton Rouge, La. 254 meters.

KFGD—Chickasha Radio & Electric company, Chickasha, Okla. 248 meters. Daily except Sunday, 11:30-12 a. m. 9-9:30 p. m., concert.

KFGF—Buchanan, Stevens & Co., Mount Vernon, Wash. 360 meters.

KFGH—Leland Stanford, Jr., university, Palo Alto, Calif. 360 meters.

KFGJ—National Guards Mo., St. Louis, Mo. 266 meters.

KFGL—Arlington garage, Arlington, Ore. 234 meters.

KFGP—Cheney Radio company, Cheney, Kan. 229 meters.

KFGQ—Crary Hardware company, Boone, Iowa. 226 meters.

KFGV—Heidbreder Radio Supply company, Utica, Neb. 224 meters.

KFGX—First Presbyterian church, Orange, Texas. 250 meters. Sunday, 11 a. m., 7:30 p. m., church services.

KFGY—Gjelhaug's Radio shop, Baudette, Minn. 224 meters.

KFGZ—Emmanuel Missionary college, Berrien Springs, Mich. 268 meters.

KFHA—Colorado State Normal school, Gunnison, Colo. 360 meters. Daily except Sunday, 9:30 a. m. Tuesday, 9:30 p. m., concert.

KFHB—P. L. Boardwell, Hood River, Ore. 280 meters. Daily except Monday, 6:20-6:35 p. m., sporting news. Sunday, 1-1:45 p. m., concert.

KFHC—University of Oklahoma, Norman, Okla. 360 meters.

KFHD—Utz Electric company, St. Joseph, Mo. 226 meters. Daily except Sunday, 5:30-6 p. m. Monday, Thursday, Saturday, 8-9:30 p. m., concert.

KFHF—Central Christian church, Shreveport, La. 266 meters.

KFHH—Ambrose A. McCue, Neah Bay, Wash. 283 meters.

KFHI—Charles V. Dixon, Wichita, Kan. 224 meters.

KFHJ—Fallon company, Santa Barbara, Cal. 360 meters.

KFHP—Radio Bulk Products company, Kearney, Neb. 246 meters.

KFHQ—Curtis Bros. Hardware store, Los Gatos, Cal. 242 meters.

KFHR—Star Electric and Radio company, Seattle, Wash. 270 meters.

KFHS—C. J. Dow, Lihue, Hawaii. 275 meters.

KFHU—M. G. Sateren, Mayville, N. D. 261 meters.

KFHY—R. S. McEwan, Trinidad, Colo. 242 meters.

KFI—Earl C. Anthony, Inc., Los Angeles, Cal. 469 meters. Daily except Sunday, 7-7:30 p. m. Monday, Wednesday, Friday, 10-11 p. m. Daily except Sunday, 7:30-10 p. m. Daily, 11 p. m.-12 a. m. Sunday, Tuesday, Thursday, 10-11 p. m. Monday, 12 p. m.-1 a. m. Wednesday, Friday, Saturday, 1-2 a. m.

KFIB—Franklin W. Jenkins, St. Louis, Mo. 244 meters.

KFID—Ross Arbuckle's garage, Iola, Kan. 246 meters. Daily, 5:15-5:45 p. m. Monday, Thursday, Saturday, 7:30-8 p. m. Tuesday, Saturday, 9-10 p. m., concert.

KFIF—Benson Technical Student body, Portland, Ore. 360 meters.

KFIK—Gladbrook Electric company, Gladbrook, Iowa. 234 meters.

KFIL—Windisch Electrical Farm Equipment company, Louisburg, Kan. 234 meters. Daily except Sunday, 9:35-11:35 a. m., market, weather report. Monday, Wednesday, Friday, 7:30-8 p. m., lecture. Wednesday, 8:10-30, concert. Saturday, 8-9 p. m. concert. Sunday, 11 a. m.-12 m., church services; 1-2 p. m., concert.

KFIO—North Central high school, Spokane Wash. 252 meters.

KFIQ—Yakima Valley Broadcasting association, Yakima, Wash. 224 meters. Daily except Sunday, 9:30-10 p. m., weather, markets. Monday, Friday, 10-11 p. m., concert.

KFIU—Alaska Electric Light and Power company, Juneau, Alaska. 226 meters. Monday, Wednesday, Friday, 9:30-11 p. m.

KFIV—V. H. Broyles, Pittsburg, Kan. 240 meters.

KFIX—Reorganized Church of Jesus Christ, Independence, Kan. 240 meters.

KFIY—Brott laboratories, Seattle, Wash. 236 meters.

KFIZ—Daily Commonwealth, Fond du Lac, Wis. 273 meters.

KFJA—Central Power company, Grand Island, Neb. 244 meters.

KFJB—Marshall Electric Company, Marshalltown, Iowa. 248 meters.

KFJC—Seattle Post Intelligencer, Seattle, Wash. 233 meters. Daily except Sunday, 6-7 p. m., 10:30-11-30 p. m.

KFJD—Weld County Printing and Publishing company, Greeley, Colo. 236 meters. Daily, 11:30 a. m., 1:30 p. m., 3:30 p. m., 7:30 p. m. Tuesday, Friday, 10-11 p. m.

KFJF—National Radio Manufacturing company, Oklahoma City, Okla. 252 meters.

KFJH—The Sugar Bowl, Selma, Cal. 273 meters.

KFJK—Delano Radio Electric company, Bristow, Okla. 233 meters.

KFHS—Clifford J. Dow, Lihue, Kauai, T. H.

KFJI—Liberty theater, Astoria, Ore. 252 meters.

KFJJ—Carrollton Radio shop, Carrollton, Mo., 236 meters.

KFJL—Hardsacg Manufacturing company, Ottumwa, Iowa. 242 meters.

KFJM—University of North Dakota, Grand Forks, N. D. 229 meters.

KFJQ—Valley Radio division of Electric Construction company, Grand Forks, N. D. 252 meters.

KFJR—A. C. Dixon company, Stevensville, Mont. 258 meters.

KFKA—Colorado State Teachers college, Greeley, Colo. 248 meters.

KFKH—Denver Park Amusement company, Denver, Colo. 226 meters.

KFLE—National Educational service, Denver, Colo. 268 meters.

KFZ—Doerr-Mitchell Electric company, Spokane, Wash. 283 meters. Tuesday, Friday, 9:30-11 p. m., concert. Sunday, 8-9 p. m.

KGA—The Tribune, Oakland, Cal. 250 meters.

KGB—Tacoma Daily Ledger, Tacoma, Wash. 360 meters. Daily except Sunday, 9-11 p. m. Sunday, 7-9:30 p. m.

KGG—Rallock & Watson Radio service, Portland, Ore. 360 meters. Daily except Sunday, 7-8 p. m. Wednesday, Sunday, 11-12 p. m. Saturday, 10:30 p. m.

KGN—Northwestern Radio Manufacturing company, Portland, Ore. 360 meters.

KGO—Altadena Radio laboratory, Altadena, Cal. 280 meters.

KGU—The Honolulu Advertiser, Honolulu, Hawaii. 360 meters. Daily, 10:30 p. m. to 1 a. m.

KGW—Oregonian Publishing company, Portland, Ore. 492 meters. Daily except Sunday, 5-5:30 p. m., lecture. Daily except Sunday, Monday, 10-11 p. m., dance program. Sunday, 9-10 p. m., concert. Monday, Wednesday, Friday, 10-11 p. m., vocal. Monday, Friday, 1-2 a. m., Hootowl frolics.

KGY—St. Martin's college, Lacey, Wash. 258 meters. Tuesday, Friday, Sunday, 10:30-11:30 p. m., concert.

KHJ—Times Mirror company, Los Angeles, Cal. 395 meters. Daily except Sunday, 2:30-3-15, 8:45, 9:30, 10:10 p. m. Sunday, 12-2 p. m., 10 p. m. to 12 m.

KHQ—Louis Wasmer, Seattle, Wash. 360 meters.

KJQ—Gould the Light Man, Stockton, Cal. 360 meters. Daily except Sunday, 7-8 p. m. Monday, Wednesday, 11 p. m., 12 m.

KJR—Northwest Radio Service company, Seattle, Wash. 270 meters. Monday, Wednesday, Friday, 9:30-10:30 p. m. Daily except Sunday, 7:30-8:15 p. m.

KJS—Bible Institute of Los Angeles, Los Angeles, Cal. 360 meters. Tuesday, 9-9:30 p. m. Thursday, 10-11 p. m., lectures. Sunday, 1-2:30 p. m., 8-8:45 p. m., 10-11 p. m., church services.

KLN—Monterey Electric shop, Del Monte, Cal. 261 meters. Daily, 2-3 p. m., weather, markets, news; 9-10 p. m., concert. Tuesday, Friday, 9-9:30 p. m., 10-10:30 p. m., concert.

KLS—Warner Bros. Radio Supply company, Oakland, Cal. 360 meters. Daily, 1:30-3 p. m. Friday, 10-11 p. m. Sunday, 2-3 p. m., church services.

KLX—Oakland Tribune, Oakland, Cal. 360 meters. Daily except Sunday, 5:30-7:15 p. m., 9-9:30 p. m., news. Tuesday, 10-11 p. m. Friday, 11 p. m.-12 m., concert. Sunday, 12-1 p. m., church services.

KLZ—Reynolds Radio company, Inc., Denver, Colo. 360 meters. Daily except Thursday, Sunday, 8:30-9 p. m. Thursday, Sunday, 9-10 p. m.

KMJ—San Joaquin Light and Power corporation, Fresno, Cal. 360 meters. Daily except Sunday, 10 p. m.-12 m.

KMO—Tacoma Times, Tacoma, Wash. 360 meters. Daily except Sunday, 8-9 p. m., 11:15 p. m.-12 m., concert.

KNJ—Roswell Public Service company, Roswell, N. Mex. 250 meters.

KNT—Grays Harbor Radio company, Aberdeen, Wash. 263 meters. Daily except Sunday, 9-10 p. m.

KNV—Radio Supply company, Los Angeles Cal. 360 meters.

KNX—Electric Lighting Supply company, Los Angeles, Cal. 360 meters.

KOB—New Mexico college agriculture and mechanical arts, State college, New Mexico. 360 meters. Daily, 12:55-1 a. m.; 10:55-11 p. m Monday, Wednesday, Friday, 8:30-9:30 p. m., concert.

KOP—Detroit police department, Detroit, Mich. 283 meters. Daily, except Sunday, 1 p. m., 6:30 p. m., reports.

KPK—California Examiner, Los Angeles, Cal. 469 meters.

KPO—Hale Bros., Inc., San Francisco, Cal. 423 meters. Monday, Tuesday, Thursday, Saturday, 2 p. m. (noon time signals), 2-4 p. m., 6:30-7:30 p. m., 10 p. m.-12 m., concert. Sunday, 1-2:30 p. m., church services; 10:30-12 p. m., concert.

KQI—University of California, Berkeley, Cal. 360 meters.

KQP—Apple City Radio club, Hood River, Ore. 360 meters. Monday, Wednesday, Friday, 8:30 p. m., concert. Wednesday, 11 p. m., special program.

KQV—Loudleday-Hill Electric company, Pittsburg, Pa. 360 meters. Daily, except Sunday, 11-11:30 p. m., 3:30-4 p. m., concert. Monday, Wednesday, Friday, 9-9:55 p. m., concert. Friday, 3:30-4:15 p. m., children's program.

KQW—Herrold laboratory, San Jose, Cal. 360 meters. Daily, except Sunday, 2-3:30 p. m. Wednesday, 10-11 p. m.

KRE—Berkeley Daily Gazette, Berkeley, Cal. 278 meters. Monday, 10 p. m.-12 m. Wednesday, 11-12 p. m.

KSD—St. Louis Post-Dispatch, St. Louis, Mo. 546 meters. Daily, 8:40, 9:40, 10:40, 11:40 a. m., 12:40, 1:40, 2:40 4:40 p. m. Daily except Thursday, Sunday, 8 p. m., concert.

KSS—Prest & Dean Radio company, Long Beach, Cal. 229 meters.

KTW—First Presbyterian church, Seattle, Wash. 360 meters. Sunday, 12 m.-2:30 p. m., 5-6:30 p. m., 9-11:30 p. m., church services.

KUO—San Francisco Examiner, San Francisco, Cal. 360 meters. Daily except Sunday; 11 a. m.-12 m., 4:30-8:30 p. m., lecture: 11 a. m, 2 p. m., 8:45 p. m., weather. Sunday, 11 a. m.-12 m. and 8 p. m., news.

KUS—City Dye Works and Laundry company, Los Angeles, Cal. 360 meters. Daily except Sunday, 9:30 a. m., calisthenics; 2-2:30 p. m., concert. Monday, Thursday, 1-4:30 p. m., features. Wednesday, Friday, 8-8:45 p. m., concert.

KUVQ—Kreetan company, Johnswood Drummond Island, Mich. 450 meters.

KUY—Coast Radio company, El Monte, Cal. 360 meters. Wednesday, 6-6:30 p. m. Saturday, 5-6 p. m.

KWG—Portable Wireless Telephone company, Stockton, Cal. 360 meters. Daily except Sunday, 6-7 p. m., markets. Tuesday, Friday, 10-11 p. m., concert. Sunday, 4-5 p. m., concert.

KWH—Los Angeles Examiner, Los Angeles, Cal. 360 meters. Daily except Sunday, 3:30-3:40 p. m., 7-7:30 p. m., 8-8:15 p. m., 10:20-11 p. m., concert. Sunday, 10:30-11 p. m., church service.

KXD—Modesto Herald Publishing company, Modesto, Cal. 252 meters. Daily except Sunday, Monday, 8:30-9 p. m. Monday, 9-11 p. m. Sunday, 2-5 p. m., church services.

KYQ—Electric shop, Honolulu, Hawaii. 360 meters.

KYT—Therle Music company, San Diego, Cal. 360 meters.

KYW—Westinghouse Electric and Manufacturing company, Chicago, Ill. 536 meters. Daily except Sunday, 9:30 a. m., financial market; 10 a. m., market; 10:30 a. m., news; 10:58 a. m., time signal; 11 a. m., market; 11:05 a. m., weather; 11:30 a. m., news, market; 11:35 a. m., table talk, 12 m., market; 12:10 p. m., Saturday, final market; 12:30 p. m., news; 1 p. m., market, except Wednesday, Saturda; 1:20 p. m., closing quotations except Wednesday, Saturday; 2:15 p. m., news; 2:30 p. m., closing quotations; 3 p. m., news and sport bulletin; 4 p. m., news; 4:15 stock reports; 4:30 p. m., news and sports; 5 p. m., news; 6:30 p. m., financial summary; 6:50 p. m., bedtime stories; 8 p. m., musical program; 8:58 p. m., time signal; 9 p. m., weather; 9:05 p. m., special features. Tuesday, Thursday, 2:35-3 p. m., 9-9:25 p. m., concert. Friday, 10-11:30 p. m., late show. Saturday, 9-9:25 p. m., reading. Sunday, 11 a. m., church services; 6 p. m., concert, Evening Post program.

KZM—Western Radio institute, Oakland, Cal. 360 meters. Daily except Sunday, 8:45-9 p. m., news.

KZN—Desert News, Salt Lake City, Utah. 360 meters. Daily except Sunday, 10-11:30 p. m., concert.

KDZQ—Pyle & Nichols, Denver, Colo. 360 meters.

KZV—Wenatcheee Battery and Motor company, Wenatchee, Wash. 360 meters. Daily except Sunday, 5:30-6:15 p. m., weather. Mondya, Wednesday, Friday, 10:45-11:30 p. m. Sunday, 9:50-11 p. m., church service.

WAAB—Valdemar Jensen, New Orleans, La. 268 meters.

WAAC—Tulane university, Mechanics institute, New Orleans, La. 360 meters.

WAAD—Ohio Mechanics insttiute, Cincinnati, Ohio. 360 meters.

WAAF—Chicago Daily Drovers' Journal, Chicago, Ill. 286 meters. Daily except Sunday, 8:40 a. m., 10:30 a. m., 10:45 a. m., 12:30 p. m., 12:45 p. m., 3 p. m., 4:30 p. m., live stock and weather reports.

WAAH—Commonwealth Electric company, St. Paul, Minn. 360 meters.

WAAK—Gimbel Bros., Milwaukee, Wis. 280 meters. Daily except Sunday, 10 a. m., 11:10 a. m., 12:10 p. m., 1:25 p. m., 3 p. m. Daily except Wednesday, Saturday, 7:15 p. m., 7:30 p. m.

WAAM—I. R. Nelson company, Newark, N. J. 263 meters. Daily except Sunday, 8:15-8:45 a. m., market report. Daily except Saturday, Sunday, 10 a. m., 11 a. m. Monday, Tuesday, Wednesday, Thursday, 7-9:30 p. m., concert.

WAAN—University of Missouri, Columbia, Mo. 254 meters.

WAAP—United Electrical company, Wichita, Kan. 360 meters. Daily except Sunday, 12-12:30 p. m., [illegible]:30 p. m., weather. Tuesday, Friday, 8 p. m., concert.

WAAW—Omaha Grain exchange, Omaha, Neb. 360 meters. Daily, 8:45 a. m., 9:45-10:45 a. m., 11:45 a. m., 12:15 p. m., 12:45 p. m., 1:15 p. m., markets; 8-9 p. m., concert.

WAAZ—Hollister-Miller Motor company, Emporia, Kan. 360 meters. Tuesday, Thursday, 7-8 p. m.

WABB—Dr. John B. Lawrence, Harrisburg, Pa. 266 meters. Monday, Tuesday, Thursday, 7:30 p. m., concert.

WABC—Fulwider-Grimes Battery company, Anderson, Ind. 229 meters.

WABD—Parker high school, Dayton, Ohio. 283 meters.

WABE—Y. M. C. A., Washington, D. C. 283 meters.

WABF—Mount Vernon Register News company, Mount Vernon, Ill. 234 meters.

WABG—Arnold Edwards Piano company, Jacksonville, Fla. 248 meters. Daily, 5-6 p. m., lectures, sporting; 8-9 p. m., concert.

WABH—Lake Shore Tire company, Sandusky, Ohio. 240 meters.

WABI—Bangor Railway and Electric company, Bangor, Maine. 240 meters.

WABJ—Radio laboratories, South Bend, Ind. 240 meters.

WABK—First Baptist church, Worcester, Mass. 252 meters. Sunday, 9:30 a. m.-12 m., church service.

WABL—Connecticut Agricultural college, Storrs, Conn. 283 meters. Daily, 11 a. m.-12 m., 5-7 p. m., special programs to farmers.

WABM—F. E. Doherty, Automotive and Radio Equipment company, Saginaw, Mich. 234 meters.

WABN—Waldo C. Grover, La Crosse, Wis. 254 meters.

WABO—Lake Avenue Baptist church, Rochester, N. Y. 252 meters. Sunday, 9:30 a. m.-11 a. m., 6:30-8 p. m., church service.

WAH—Midland Refining company, 30 South Main street, El Dorado, Kan. 1399 meters.

WAJV—Indian Pipe Line corporation, Princeton, Ind. 360 meters.

WBAA—Purdue university, West Lafayette, Ind. 360 meters. Monday, Friday evening.

Continued on Page 14.

CHICAGO EVENING POST
TABLOID RADIO PROGRAMS

These stations are those most commonly tuned in every evening by the Chicago broadcast listener. The time given is central standard. Pacific coast time is two hours earlier, mountain time one hour earlier and eastern time one hour later than the time given here.

STATION	Met.	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
CFAC, Calgary	430	8:45- 9:45	8:45- 9:45	8:45- 9:45	11:30-12:30	8:45- 9:45	8:45- 9:45	
CFCA, Toronto	425	9:00-10:00	9:00-10:00	6:30- 7:00	6:30- 7:00	6:30- 7:00		8:00- 9:00
CFCF, Montreal	440	6:30- 8:00		6:30- 8:00		6:30- 8:00		
CFCN, Calgary, Alta	440	12:00- 1:00		11:00- 2:00			11:00- 1:00	
CKAC, Montreal, Que	430		6:00- 8:30		6:00- 8:30		6:00- 8:30	3:30- 4:30
KDKA, E. Pittsburg, Pa	326	5:00- 9:00	4:00- 8:00	5:00- 9:00	5:00- 9:00	5:00- 9:00	5:00- 9:00	6:30- 7:30
KDZE, Seattle, Wash	455	10:30-12:30		10:30-12:30		10:30-12:30		
KFAF, Denver, Colo	360	9:00-10:00	9:00-10:00		8:30- 9:00	9:00-10:00	9:00-10:00	
KFI, Los Angeles, Cal	469	8:45- 1:00	8:45- 1:00	8:45- 2:00	8:45- 1:00	8:45- 2:00	8:45- 2:00	10:00- 1:00
KGW, Portland, Ore	492	10:00-12:30	10:00- 1:00	10:00- 1:00	10:00- 1:00	10:00- 1:30	10:00- 1:00	8:00-10:30
KHJ, Los Angeles, Cal	395	8:45-12:00	8:45-12:00	8:45-12:00	8:45-12:00	8:45-12:00	8:45-12:00	10:00-12:00
KPO, San Francisco, Cal	423	10:00-12:00	10:00-12:00		10:00-12:00		10:00- 2:00	10:00-12:00
KSD, St. Louis, Mo	546	8:00-10:00	8:00- 1:00	8:00- 1:00		8:00-10:00	8:00-10:00	
KYW, Chicago, Ill	536		8:00- 9:00	8:00- 9:00	8:00- 9:00	8:00- 9:00	8:00- 9:00	
NAA, Radio, Va	435	5:45- 7:20	6:05- 7:20	6:25- 7:40	5:45- 7:40	7:05- 7:40		
PWX, Havana, Cuba	400			8:00-10:30			8:00-10:30	
WBAP, Fort Worth, Texas	476	7:30-10:30	7:30-10:30	7:30-10:30	7:30-10:30	7:30-10:30	7:00- 7:30	5:00- 6:00
WBAV, Columbus, Ohio	390	7:00- 9:00						
WBZ, Springfield, Mass	337	6:30- 8:00	6:30- 8:00	6:00- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:30	7:30- 8:30
WCAP, Washington, D. C.	469		5:30- 6:30		8:45-11:00		5:30-11:00	5:20- 8:00
WCBD, Zion, Ill	345	8:00-10:00				8:00-10:00		2:30- 5:30
WCX, Detroit, Mich	517	7:30- 9:00	7:30-11:00	7:30- 9:00	7:30- 9:00	7:30- 9:00		6:15- 7:15
WDAF, Kansas City, Mo	411	8:00- 1:00	11:45- 1:00	8:00- 1:00	11:45- 1:00	8:00- 1:00	11:45- 1:00	4:00- 5:00
WDAJ, College Park, Ga	258	7:30-11:30	7:30-11:30	10:30-11:30	7:30-11:30	7:30-11:30	7:30-11:30	7:30-11:30
WDAP, Chicago, Ill	360		7:00- 1:00	7:00- 1:00	7:00- 1:00	7:00- 1:00	7:00- 1:00	9:15-11:15
WDAR, Philadelphia, Pa	395	6:30- 9:55	6:30- 7:00	6:30-10:00	6:30- 7:00	6:30-12:00	6:30- 7:30	
WDT, New York, N. Y	405			6:00- 7:00		10:00-11:00		
WEAF, New York, N. Y	492	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30-10:00	6:30- 9:00
WFAA, Dallas, Texas	476	8:30- 9:30	8:30-12:00		8:30- 9:30	6:30- 9:30	8:30-12:00	9:30-11:00
WFI, Philadelphia, Pa	395	6:00- 6:30	6:00- 8:00	6:00- 6:30	6:00- 8:00	6:00- 6:30	6:00- 6:30	6:30- 7:30
WGI, Medford, Mass	360		6:00- 7:30	6:30- 8:00	6:00- 7:30	6:30- 8:00	6:30- 8:00	7:30-10:00
WGR, Buffalo, N. Y	319	5:30- 9:00	5:30- 7:45	5:30- 9:00	5:30- 7:45	5:30- 9:00	5:30- 7:45	
WGY, Schenectady, N. Y	380	6:45- 9:00	6:45- 9:00		6:45- 9:00	6:45-10:30		5:30- 6:30
WHA, Madison, Wis	360	7:30- 8:30		7:30- 8:30		7:30- 8:30		
WHAS, Louisville, Ky	400		7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	4:00- 5:00
WHAZ, Troy, N. Y	380	8:00- 9:30						
WHB, Kansas City, Mo	411		8:00-10:00		8:00-10:00			8:00-10:00
WHK, Cleveland, Ohio	360	5:00- 5:30	5:00- 5:30	5:00- 8:55	5:00- 5:30	5:00- 5:30	5:00- 5:30	7:00- 8:55
WHN, New York, N. Y	360	6:30-11:00	8:30-11:00	6:30-11:99	8:30-11:00	8:30-11:00	6:30-11:00	8:00-11:00
WIP, Philadelphia, Pa	509	5:00- 6:30	5:00-11:00	5:00- 6:30	5:00-10:00	5:00- 6:30	5:00-11:00	3:30- 4:30
WJAX, Cleveland, Ohio	390		6:30- 8:30		7:00- 9:30			
WJAZ, Chicago, Ill	448		10:00- 2:00	10:00- 2:00	10:00- 2:00	10:00- 2:00	10:00- 2:00	6:00- 9:00
WJZ, New York, N. Y	455	6:30-10:30	6:30-10:30	6:00-10:30	6:30-10:30	6:30-10:30	6:30-10:30	7:00- 9:30
WKAQ, San Juan, P. R	360		7:00- 8:30				7:00- 8:30	
WLAG, Minneapolis, Minn	417	7:30-10:00	7:30-10:00	7:30-12:30	7:30-10:00	7:30-10:00	7:30-12:30	7:45- 8:45
WLW, Cincinnati, Ohio	309	8:00-10:00	10:00-12:00	8:00-10:00	10:00-12:00			
WMAQ, Chicago, Ill	448		7:00-10:00	7:00-10:00	7:00-10:00	7:00-10:00	7:00-10:00	4:30- 5:00
WMC, Memphis, Tenn	500	8:30- 9:30	8:30-12:00		8:30- 9:30	8:30-12:00	8:30- 9:30	
WNAC, Boston, Mass	278		7:00- 9:00	8:00-10:00	7:00- 9:00	7:00- 9:00	8:00-10:00	5:30- 7:30
WOAI, San Antonio, Texas	385		9:30-10:30		7:30- 8:30		9:30-10:30	9:30-10:30
WOAW, Omaha, Neb	526	9:00-10:00	9:00-10:00		9:00-10:00	9:00-10:00	9:00-10:00	9:00-10:00
WOC, Davenport, Iowa	484	8:00- 9:00		8:00-11:00	8:00- 9:00	8:00- 9:00	9:00-10:00	7:00-10:00
WOO, Philadelphia, Pa	509	6:45-10:00				6:45-10:00		
WOR, Newark, N. J	405	5:15-10:00	5:15- 6:30	5:15-10:00	5:15- 6:30	5:15- 6:30	5:15-10:00	
WOS, Jefferson City, Mo	441	8:00- 9:30		8:00- 9:30		8:00- 9:30		
WRC, Washington, D. C	469	7:00- 9:00		7:00- 9:00		7:00- 9:00		
WSAI, Cincinnati, Ohio	309		8:00-10:00		8:00-10:00		10:00-12:00	
WSB, Atlanta, Ga	429	8:00-12:00	8:00-12:00	8:00-12:00	8:00-12:00	8:00-12:00	8:00-12:00	7:30- 9:15
WSY, Birmingham, Ala	360	8:00- 8:45		8:00- 8:45		8:00- 8:45		8:00- 9:00
WTAM, Cleveland, Ohio	390			7:00- 8:30			8:10-10:00	
WWJ, Detroit, Mich	517	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30-11:00	7:30- 9:00		4:30- 5:30

Broadcasting Stations and Schedules

Continued from Page 13.

WBAD—Sterling Electric company, Minneapolis, Minn. 360 meters.
WBAF—F. M. Middleton, Moorestown, N. J. 360 meters.
WBAH—The Dayton company, Minneapolis, Minn. 360 meters. Daily except Sunday, 1-1:30 p. m. Saturday, 11-11:30 a. m. Wednesday, 8-10 p. m.
WBAN—Wireless Phone corporation, Paterson, N. J. 244 meters. Daily except Sunday, 8-10:30 a. m., 1:30-4:30 p. m. Sunday, 9-11 a. m., 1-4 p. m., 6:30-9:30 p. m.
WBAO—James Milliken university, Decatur, Ill. 360 meters.
WBAP—Fort Worth Star Telegram, Fort Worth, Texas. 476 meters. 9 a. m., opening market; 10 a. m., market; 10:57 a. m., time signals; 11 a. m., market, weather; 12 m., 1 p. m., 2 p. m., 3 p. m., markets; 3:45 p. m., financial review; 5:30-6:30 p. m., sporting; 7:15 p. m., concert; 8 p. m., sports review; 9:30 p. m. daily except Saturday, Sunday, concert; 7 p. m., Saturday only, Sunday school review; Sunday, 11 a. m., church services; 5:30-6:30 p. m., sporting. Silent nights, Saturday, Sunday.
WBAU—Republican Publishing company, Hamilton, Ohio. 258 meters.
WBAV—Ernor & Hopkins Co., Columbus, Ohio. 390 meters. Daily except Sunday, 12:30-1 p. m. Monday, 7-9 p. m.
WBAW—Marietta college, Marietta, Ohio. 246 meters.
WBAX—John H. Stenger Jr., Wilkes-Barre, Pa. 360 meters.
WBAY—American Telephone and Telegraph company, New York, N. Y. 492 meters. Experimental station.
WBBA—Newark Radio Laboratory, Newark, Ohio. 240 meters. Daily except Saturday, Sunday, 6:30-7:30 p. m. Sunday 1:30-4 p. m.
WBBC—Sterling Radio Equipment company, Sterling, Ill. 229 meters.
WBBD—Barbey Battery Service, Reading, Pa. 224 meters.
WBL—T. & H. Radio company, Anthony, Kan. 261 meters. Monday, Wednesday, Saturday, 8-10 p. m. Sunday, 10 a. m., church service.
WBS—D. W. May, Inc., Newark, N. J. 360 meters. Daily except Sunday, 10-11 a. m., 12 m., 1:15 p. m., 1:15-1:30 p. m., concert. Tuesday, Thursday, Saturday, 6:30-8:30 p. m., concert. Sunday, 8-9:30 a. m., church service; 12 m.-2 p. m., concert.
WBT—Southern Radio corporation, Charlotte, N. C. 360 meters. Daily except Sunday, 10 a. m., weather; 11 a. m.-4 p. m., concert; 7 p. m., markets. Monday, Wednesday, Friday, 8 p. m., concert. Sunday, 10 a. m., 7 p. m., church services.
WBU—City of Chicago, Chicago, Ill. 286 meters. Monday, Wednesday, Friday, 3:30-4 p. m. Wednesday, Friday, 7:30-8 p. m.
WBZ—Westinghouse Electric and Manufacturing company, Springfield, Mass. 337 meters. Daily except Sunday, 11:55 a. m.-12 noon, time signals; 6 p. m., sporting; 6:30 p. m., bedtime story; 7 p. m., concert; 8 p. m., sporting. Monday, Wednesday, Friday, 5-6 p. m., WBZ Trio. Sunday, 6:30-7:30, church services.
WCAC—John Fink Jewelry company, Fort Smith, Ark. 360 meters.
WCAD—St. Lawrence university, Canton, N. Y. 280 meters.
WCAE—Kaufman & Baer Co., Pittsburg, Pa. 462 meters. 11:30 a. m., news; 2:30 p. m., concert; 3:30 p. m. stocks; 5:30 p. m., sporting; 6:30 p. m., sporting; 7:30 p. m., concert; 9:30 p. m., late news and sporting.
WCAF—Michigan Limestone and Chemical company, Rodgers, Mich. 360 meters.
WCAG—Clyde R. Randall, New Orleans, La. 268 meters.
WCAH—Entrekin Electric company, Columbus, Ohio. 286 meters. Daily, 11:30-12:30 p. m., concert. Tuesday, 7-9 p. m., concert. Sunday, 10-12:30 p. m., church services.
WCAJ—Nebraska Wesleyan university, University Place, Neb. 360 meters. Daily, 10:30 a. m., weather. Tuesday, 7 p. m., children's hour. Thursday, 8 p. m., concert. Sunday, 11 a. m., church service.
WCAK—A. P. Daniel, Houston, Texas. 360 meters. Daily except Sunday, 7-7:30 p. m., concert. Wednesday, 8-9 p. m., concert Sunday, 3-4 p. m., features.
WCAL—Department of physics, St. Olaf college, Northfield, Minn. 360 meters.
WCAM—Villanova college, Villanova, Pa. 360 meters.
WCAO—Sanders & Stayman company, Baltimore, Md. 360 meters. Daily except Sunday, 11-12 noon. Mon, Wednesday, 7-8 p. m.
WCAP—Chesapeake & Potomac Telegraph company, Washington, D. C. 469 meters.
WCAR—Alamo Radio Electric company, San Antonio, Texas. 360 meters. Monday, Thursday, Saturday, 8:30-9:30 p. m., concert.
WCAS—William Hood Dunwoody Industrial institute, Minneapolis, Minn. 246 meters. Monday, 9:30-11 p. m., concert. Monday, Wednesday, Friday, 6:30-7 p. m., code instruction.
WCAT—South Dakota School of Mines, Rapid City, S. D. 240 meters. Daily except Sunday, 10:30 a. m., 11 a. m., 4 p. m., weather reports. Wednesday, 8:15 p. m., concert.
WCAU—Durham & Co., Philadelphia, Pa. 286 meters. Daily, 10:45 a. m. Tuesday, Friday, 6:30-7 p. m., concert. Sunday, 8:55 a. m., church services.
WCAV—Dice Electric company, Little Rock, Ark. 360 meters.
WCAX—University of Vermont, Burlington, Vt. 360 meters.
WCAY—Kesselman-O'Driscoll Music house, Milwaukee, Wis. 261 meters.
WCAZ—Robert E. Compton and Carthage college, Carthage, Ill. 360 meters. Special concert every Tuesday.
WCBA—Charles W. Haimbach, Allentown, Pa. 280 meters. Wednesday, Saturday, 11 a. m.-1 p. m. Sunday, 1-3 p. m.; 6-8 p. m.
WCBB—K. & K. Radio Supply company, Greenville, Ohio. 240 meters.
WCBD—Wilbur Glenn Voliva, Zion, Ill. 345 meters. Monday, Friday, 8-10 p. m., concert. Wednesday, Friday, 2:30-3:45 p. m., church service. Sunday, 9-9:45 a. m., Bible class; 2:30-5:30 p. m., church services.
WCE—Findley Electric company, Minneapolis, Minn. 360 meters.
WCK—Stix-Baer-Fuller, St. Louis, Mo. 360 meters. Monday, Wednesday, Friday, 7-8 p. m. Daily, 12-12:30 p. m., sporting.
WCN—Clark university, Worcester, Mass. 360 meters.
WCM—University of Texas, Austin, Texas. 360 meters.
WCX—Detroit Free Press, Detroit, Mich. 517 meters. Two p. m., news; 2:15 p. m., stock; 2:20 p. m., Thursday only, Sunday school lesson; 2:50 p. m., weather, markets. (485 meters). 4:15 p. m., sporting; 4:30 p. m., sporting; 4:50 p. m., concert and sporting. Monday, Wednesday, Thursday, Friday, 8:30-10 p. m., alternate weeks; 7-8:30 p. m., alternate weeks. Tuesday only, 10-12 p. m., the Red Apple club. Sunday, morning and evening church service.
WDAD—William Louis Harrison, Lindsborg, Kan. 360 meters. Tuesday, Thursday, Friday, 9:30 p. m., concert. Sunday, 3:30 p. m., church services.
WDAE—Tampa Daily Times, Tampa, Fla. 360 meters. Wednesday, Friday, 7-9 p. m., concert.
WDAF—Kansas City Star, Kansas City, Mo. 411 meters. Monday, Wednesday, Friday, 8-9:30 p. m. Daily except Sunday, 3:30-4:30 p. m. Daily except Sunday, 5:55-6 p. m., weather. Daily except Sunday, 11:45 p. m.-1 a. m., concert.
WDAG—J. L. Martin, Amarillo, Texas. 263 meters. Tuesday, Thursday, 8-10 p. m., concert.
WDAH—Trinity Methodist Church, South, El Paso, Texas. 268 meters. Wednesday, Thursday, Sunday, 7:30-8:30 p. m.
WDAI—Hughes Radio corporation, Syracuse, N. Y. 246 meters. Daily except Sunday, 11 a. m., market report.
WDAK—The Courant, Hartford, Conn. 261 meters. Saturday, 6-9 p. m.
WDAL—Florida Times Union, Jacksonville, Fla. 360 meters. Daily, 10 a. m., weather; 3-4:56 p. m., concert; 7-8 p. m., entertainment; 8:30 p. m., reports.
WDAM—Western Electric company, New York city, N. Y. 360 meters.
WDAO—Automotive Electric company, Dallas, Texas. 360 meters. Daily except Sunday, 1-1:45 p. m., 7:15-8 p. m.
WDAP—Chicago Board of Trade, Drake hotel, Chicago, Ill. 360 meters. 9:35 a. m., 10:01 a. m., 10:31 a. m., 11:01 a. m., 12:01 p. m., 12:31 p. m., 1:01 p. m., 1:25 p. m., market reports; 3:15 p. m., closing quotations; 6 p. m., market summary. Saturday, 12:05 p. m., closing quotations. Daily except Sunday, 1:35 p. m., concert. Tuesday, Thursday, Saturday, 10 p. m., concert. Sunday, 9:15 p. m., concert. Tuesday, Thursday, 7-8 p. m. Wednesday, Friday, Saturday, 7-8:30 p. m. Wednesday, Friday, 10-12 p. m., concerts.
WDAR—Lit Brothers, Philadelphia, Pa. 395 meters. Daily except Sunday, 11-55 a. m., 1-2 p. m., 3:30-5 p. m., 6:30-7 p. m., concert. Monday, 6:30-9:55 p. m., concert. Wednesday, 7-10 p. m., concert. Friday, 7-9:15 p. m., concert.
WDAS—Samuel A. Waite, Worcester, Mass. 360 meters.
WDAU—Slecum & Kilbourn, New Bedford, Mass. 360 meters. Monday, Wednesday, Friday, 11:15 a. m. Wednesday, 6-7 p. m., concert. Sunday, 9-11 a. m., 4-5 p. m., church services.
WDAX—First National bank, Centerville, Iowa. 268 meters. Daily except Sunday, 11:30 a. m., news. Monday, Thursday, 7:30-9 a. m., concert.
WDAY—Radio Equipment corporation, Fargo, N. D. 244 meters. Daily except Sunday, 10:30 a. m., weather; 7 p. m., sporting. Tues, Thursday, Saturday, 8:30-9:30 p. m., concert. Sunday, 11:30 a. m., church services.
WDBC—Kirk Johnson & Co., Inc., Lancaster, Pa. 258 meters.
WDBF—Bobert G. Phillips, Youngstown, Ohio. 261 meters.,
WDM—Church of the Covenant, Washington, D. C. 360 meters. Sunday, 10 a. m., church service 7 p. m., church service.
WDT—Shipowners Radio Service and Premier Grand Piano, New York city, N. Y. 405 meters. Daily except Sunday, 11 a. m.-12 m., concert. Wednesday, 6-7 p. m., concert. Friday, 10-11 p. m., concert.
WDZ—James L. Bush, Tuscola, Ill. 278 meters. Daily except Sunday, 8:30 a. m., 9 a. m., 9:30 a. m., 10 a. m., 10:30 a. m., 11 a. m., 11:30 a. m., 12 m., 12:15 p. m., livestock markets.
WEAA—Frank D. Fallain, Flint, Mich. 280 meters. Daily except Sunday, 7-7:30 p. m., police reports.
WEAB—Standard Radio Equipment company, Fort Dodge, Iowa. 360 meters. Daily except Sunday, 8:40 a. m.-12:20 p. m., stock and grain reports; 2 p. m., bids; 5:15 p. m., summary of markets.
WEAD—Henry tRadio and Electric Supply company, Atwood, Kan. 268 meters.
WEAE—Polytechnic Institute, Blacksburg, Va. 360 meters.
WEAF—American Telephone and Telegraph company, New York, N. Y. 492 meters. Daily except Sunday, 10 a. m., 11 a. m., 3 p. m., 4:30 p. m., 6:30 p. m., 9 p. m., concerts. Sunday, 2:30, 3:30, 6:30, 9 p. m.
WEAG—Nicholas Hineline Bassett Laboratory, Edgewood, R. I. 231 meters.
WEAH—Witchita Board of Trade, Wichita, Kan. 244 meters. Daily except Sunday, 7:40 a. m., 8 a. m., 9 a. m., 10 a. m., 11 a. m., 12 m., market reports.
WEAI—Cornell university, Ithaca, N. Y. 286 meters.
WEAJ—Universtiy of South Dakota, Vermillion, S. D. 360 meters.
WEAL—J. B. Abercrombie, St. Joseph, Mo. 360 meters.
WEAM—Borough of North Plainfield, North Plainfield, N. J. 252 meters.
WEAN—Shepard Stores, Providence, R. I. 273 meters. Monday, 5-6 p. m., Tuesday, 11 a. m.-12 m., 5-6, 7:15-9 p. m. Wednesday, 11 a. m.-12 m., 3-4 p. m., 5-7-9-30-11 p. m. Thursday, 11 a. m.-12 m., 3-4 p. m., 5-6 p. m., 7:15-9 p. m. Friday, 11 a. m.-12 m., 3-4 p. m., 5-6 p. m. Saturday, 11 a. m., 3-4 p. m., 5-7 p. m. Sunday, 10 a. m., 6:30 p. m.
WEAO—Ohio State university, Columbus, Ohio. 360 meters.
WEAP—Mobile Radio company, Mobile, Ala. 360 meters. Daily except Sunday, 12 m., reports; 4-5 p. m., concert. Daily except Sunday, Monday, 7:45-8:45, concert. Sunday, 3-3:30 p. m., church service.
WEAR—News and American Publishing company, Baltimore, Md. 360 meters. Daily except Sunday, 5:30-6 p. m., weather and news. Tuesday, Thursday, 6:30-8:30 p. m.
WEAS—D. Hecht company, Washington, D. C. 360 meters. Daily except Sunday, 2-3 p. m. Wednesday, Friday, 6-7 p. m.
WEAU—Davidson Bros. company, Sioux City, Iowa. 360 meters. Daily except Sunday, 9, 10, 11 a. m., 1, 5 p. m., markets and news. Monday, Wednesday, Friday, 8-9 p. m., concert. Sunday, 7-8 p. m., church service.
WEAY—Iris theater, Houston, Texas. 360 meters. Daily except Sunday, 11 a. m., 1, 2:30, 6 p. m. Friday, Saturday, 8-10 p. m. Sunday, 11-8 p. m.
WEB—The Benwood company, Inc., St. Louis, Mo. 360 meters. Tuesday, Saturday, 7-9 p. m. Wednesday, 8-9 p. m.
WEV—Hurlburt-Still Electric company, Houston, Texas. 360 meters. Daily except Sunday, 10 a. m., 5 p. m., weather, Tuesday, Thursday, 8 p. m., concert.
WEW—St. Louis university, St. Louis, Mo. 261 meters. Daily except Sunday, 9 a. m., stock reports; 10 a. m., weather; 2 p. m., closing quotations.
WFAA—Dallas News and Dallas Journal, Dallas, Texas. 476 meters. Daily except Sunday, 10:30-10:55 a. m., weather; 12:30-1 p. m., lectures; 2:30-3 p. m., stock; 3:30-4 p. m., news; 4:30-5 p. m., sporting; 5:30-6 p. m., household hints; 6:15-6:30 p. m., bedtime story; 6:45-7 p. m., sporting; 8:30-9:30 p. m., concert. Sunday, 2:30-3:30 p. m., bible class; 9:30-11 p. m., concert.
WFAB—C. F. Woese, Syracuse, N. Y. 234 meters. Sunday, 8:30-9 p. m., church service.
WFAF—H. C. Sprattley, Poughkeepsie, N. Y. 273 meters.
WFAH—Electrical Supply company, Port Arthur, Texas. 360 meters. Tuesday, Thursday, 11 p. m., concert.
WFAJ—Hi-Grade Wireless Instrument company, Asheville, N. C. 250 meters.
WFAM—Granite City Electrical company, St. Cloud, Minn. 360 meters. Daily except Sunday, 3:30-4 p. m., markets. Monday, Wednesday, 7:30-9 p. m., concert.
WFAN—Hutchinson Electrical Service company, Hutchinson, Minn. 360 meters. Daily except Sunday, 11:57-12:30, time and weather. Tuesday, Wednesday, 8:30 p. m., concert. Sunday, 2:30 p. m., church services.
WFAQ—Missouri Wesleyan college, Cameron, Mo. 360 meters.
WFAT—The Daily Argus Leader, Sioux Falls, S. D. 360 meters. Daily except Sunday, 9:15, 11:15 a. m., 12:30, 1:30 p. m., markets and weather; 7:30, sporting.
WFAV—University of Nebraska, Lincoln, Neb. 360 meters. Daily except Sunday, 10 a. m., 12:40 p. m., weather. Saturday, 10 a. m., 12:30 p. m., news. Wednesday, 8:30 p. m., concert.
WFI—Strawbridge & Clothier, Philadelphia, Pa. 395 meters. Daily except Sunday, 9:45 a. m., market; 12 m., 2, 5:30 p. m., concert. Tuesday, Thursday, Saturday, 7 p. m., concert.
WGAF—Goller Radio service, Tulsa, Okla. 360 meters.
WGAL—Lancaster Electrical Supply and Construction company, Lancaster, Pa. 248 meters. Monday, Wednesday, Friday, 6:30-8 p. m., concert. Sunday, 2-2:30 p. m., church service.
WGAN—Cecil E. Lloyd, Pensacola, Fla. 360 meters.
WGAQ—Glenwood Radio corporation, Shreveport, La. 360 meters. Daily except Sunday, 12:30-1:30, 6:30-7:30 p. m., concert. Sunday, 11 a. m., 7:30 p. m., church services.
WGAR—South West American, Fort Smith, Ark. 360 meters.
WGAU—Radio Manufacturing and Service company, Wooster, Ohio. 226 meters.
WGAW—E. C. Albright, Altoona, Pa. 261 meters. Tuesday, Wednesday, 8-10 p. m., concert. Sunday, 8-9:30 p. m., concert.
WGAY—North Western Radio company, Madison, Wis. 360 meters. Daily except Sunday, 9 a. m., weather; 4:30 p. m., news. Monday, Thursday, 8:30 p. m., concert. Sunday, 3 p. m., concert.
WGAZ—South Bend Tribune, South Bend, Ind. 360 meters. Daily, 9:30 a. m., household hints; 5-5:30 p. m., concert. Monday, Wednesday, Friday, 7-8 p. m., concert.
WGF—The Register and Tribune, Des Moines, Iowa. 360 meters. Tuesday, Friday, 7:30 p. m., concert. Saturday, 10 p. m., concert. Sunday, 5 p. m., church service.
WGI—American Radio and Research corporation, Medford Hill., Mass. 360 meters. Sunday, 3-4 p. m., concert; 7:30-9 p. m., concert. Monday, 4-5:30 p. m., reports. Tuesday, 11 a. m.-12 m., concert; 2-3 p. m., woman's club; 4-7:30 p. m., concert. Wednesday, Thursday, 11 a. m.-12 m., concert; 4-5:30 p. m., reports; 6:30-8 p. m., concert. Friday, 11 a. m.-12 m., concert; 2-3 p. m., woman's club; 4-5:30 p. m., reports; 6:30-8 p. m. concert. Saturday, 5-5:30 p. m., reports; 6:30-8, concert.
WGL—Thomas F. J. Howlett, Philadelphia, Pa. 360 meters.
WGM—The Atlanta Constitution, Atlanta, Ga. 429 meters. Daily except Sunday, Wednesday, 6-7 p. m., concert; 9:30-10:30 p. m., concert. Sunday, 3:30-4:30 p. m., organ recital; 9:30-10:30 p. m., concert. Wednesday, 12-1 a. m., concert.
WGR—Federal Telephone and Telegraph company., Buffalo, N. Y. 360 meters. Daily except Sunday, 10:45 a. m., weather; 1 a. m., organ recital; 1:35 a. m., market; 1:30 p. m.-2:30 p. m.-3:30 p. m.-4:30 p. m., stocks; 5:30 p. m., organ recital; 6 p. m., news; 7:45 p. m. on Friday, road reports. Monday, Wednesday, Friday, 10:45 p. m., concert. Sunday, 2 p. m., church service.
WGV—Interstate Electric company, New Orleans La. 350 meters. Monday, Wednesday, Saturday, 7-8 p. m., concert. Saturday, 6:30-7:30 p. m., concert.
WGY—General Electric company, Schenectady, N. Y. 380 meters. 10:55 a. m. noon, time signals; 1:01, 1:10 p. m., stocks; 1:20 p. m., weather; 12 m., concert; 4 p. m., stocks; 4:15 p. m., market reports; 4:20 p. m., news; 4:30 p. m., sporting; 4:30 p. m. Friday only, children's story; 6:40 p. m. Friday only, health talks. Daily except Sunday, 6:45 p. m., concert; 8:55 p. m., 9 p. m., time signal; 9:30 p. m. Friday only, concert. Sunday, 9:30 a. m., 5:30 p. m., church services.
WHA—University of Wisconsin, Madison, Wis. 360 meters. Daily except Sunday, 11:59 a. m., time signal, weather. Monday, Wednesday, Friday, 7:30 p. m., news.
WHAA—State University of Iowa, Iowa City, Iowa. 283 meters.
WHAB—Clark W. Thompson company., Galveston, Texas. 360 meters. Daily except Sunday, 9:45 a. m., weather; 10:55 a. m., time signal; 12 m., stocks; 3:30 p. m., stocks; 5 p. m., concert. Tuesday, Friday, 8 p. m., concert. Sunday, 11 a. m., 7:30 p. m., church services.
WHAC—Cole Brothers Electric company, Waterloo, Iowa. 360 meters. Daily except Sunday, 6 p. m., news. Monday, Wednesday, Friday, 9:30 p. m., concert. Sunday, 11 a. m., church services.
WHAD—Marquette university, Milwaukee, Wis. 280 meters. Wednesday, 7:30-8:30 p. m., concert.
WHAG—University of Cincinnati, Cincinnati, Ohio. 222 meters.
WHAH—Hafer Supply company, Joplin, Mo. 360 meters. Tuesday, Thursday, 8-10 p. m. Daily except Sunday, 10 a. m., 2 p. m. Saturday, 10:30 p. m., 11:30 p. m., concert.
WHAK—Roberts Hardware company, Clarksburg, W. Va. 360 meters.
WHAL—The Capital News, Lansing, Mich. 248 meters. Daily except Sunday, 12:30 p. m., 2:55 p. m., 4:30 p. m. Monday, Wednesday, Friday, 7:45 p. m. Saturday, 12 midnight, concert. Sunday, 2:30 p. m., church service.
WHAM—University of Rochester, Rochester, N. Y. 360 meters. Daily except Sunday 1:50 p. m., 3:15 p. m., weather and market; 6-3:30 p. m., concert. Sunday, 2:15 p. m., church services.
WHAO—F. A. Hill, Savannah, Ga. 360 meters.
WHAP—Otto & Colms, Decatur, Ill. 360 meters.
WHAQ—Semmes Motor company, Washington, D. C. 242 meters. Monday, 6-7 p. m., lecture.
WHAR—Paramount Radio and Electric company, Atlantic City, N. J. 231 meters. Daily, 1-2 p. m., 6-8 p. m.
WHAS—The Courier Journal and Louisville Times company, Louisville, Ky. 400 meters. Wednesday, 4-5 p. m., concert market, weather; 7:30-9 p. m., concert. Sunday, 10 a. m., church service; 4-5, sacred music.
WHAV—Wilmington Electric Specialty company, Inc., Wilmington, Del. 360 meters.
WHAY—Huntington Publishing company, Huntington, Ind. 360 meters. Daily except Sunday, 12 m.-12:30 p. m., weather; 3 p. m., concert; 6 p. m., news. Monday, Wednesday, Friday, 8 p. m., concert. Sunday, 3 p. m., church services; 4 p. m., concert.
WHAZ—Rensselaer Polytechnic Institute, Troy, N. Y. 380 meters. Monday only, 8-9:30 p. m., 11 a. m.-12:30 p. m., second Monday of each month.
WHB—Sweeney Auto and Electric School, Kansas City, Mo. 411 meters. 8:23 a. m., 8:35 a. m., 9:25 a. m., 10:25 a. m., 10:30 a. m., 11:25 a. m., 11:30 a. m., 12:23 p. m., 12:27 p. m., 1:25 p. m., 3 p. m., stock, weather, grain; 3:05 p. m., grain review; 12:40 p. m., 2 p. m., 7 p. m., concert. Sunday, 8-10 p. m., concert.
WHD—West Virginia university, Morgantown, W. Va. 360 meters.
WHK—The Radiovix company, Cleveland, Ohio. 360 meters. Daily except Sunday, 1 p. m., 4 p. m., 6 p. m., concert. Wednesday, 8-9:55 p. m., concert. Sunday, 8-9:55 p. m., grand opera.
WHN—Associated Broadcasters, Inc., Brooklyn, N. Y. 360 meters. Daily except Sunday, 8:30-10 a. m., 11 a. m.-12 noon, 1:15-2-15 p. m., 2:45-4:30 p. m. Monday, Wednesday, Saturday, 6:30-11 p. m., concert. Tuesday, Thursday, Friday, 8:30-11 p. m., concert. Sunday, 8:30-9:30 a. m., 2-5 p. m., 8:30-11 p. m.
WIAB—Joslyn Automobile company, Rockford, Ill. 252 meters. Tuesday, Friday, 7:30-8:30 p. m., concert. Monday, Thursday, 8-9 p. m., concert. Sunday, 12 m.-1 p. m., church services.
WIAC—Galveston Tribune, Galveston, Texas. 360 meters. Daily except Sunday, 12:35 p. m., reports. Tuesday, Saturday, 8 p. m., concert.
WIAD—Ocean City Yacht club, Ocean City, N. J. 254 meters. Friday, Saturday, Sunday, 8-12 p. m.
WIAF—G. A. DeCortin, New Orleans, La. 234 meters. Tuesday, 8-9:30 p. m. Sunday, 10-11:30 a. m., church services.
WIAH—Continental Radio and Manufacturing company, Newton, Iowa, 360 meters. Daily except Sunday, 12-1 p. m., concert. Sunday, 10:45 a. m., church services.
WIAI—Heer Stores company, Springfield, Mo. 252 meters. Daily except Sunday, 10:30 a. m., weather and concert. Tuesday, Thursday, Saturday, 7:30 p. m., concert.
WIAJ—Fox River Valley Radio Supply company, Neenah, Wis. 224 meters.
WIAK—Daily Journal Stockman, Omaha, Neb. 278 meters. Daily except Sunday, 7:45 a. m., 9:10 a. m., 10:20 a. m., 12 m., 1:30 p. m., 3:50 p. m., market and weather.
WIAO—School for Engineering of Milwaukee, Milwaukee, Wis. 360 meters. Monday, Tuesday, Thursday, Friday, 10-10:30 a. m., 11:30 a. m.-12 m., concert; 5-6 p. m., concert; 7-7:30 p. m., concert.
WIAQ—Chronicle Publishing company, Marion, Ind. 226 meters.
WIAR—Paducah Evening Sun, Paducah, Ky. 360 meters. Daily except Sunday, 7-8 p. m., concert.
WIAS—Hawkeye Home Electric company, Burlington, Iowa. 360 meters. Tuesday, Thursday, 8-9 p. m., concert.
WIAT—Leon T. Noel, Tarkio, Mo. 360 meters.
WIAU—American Trust and Savings bank, Le Mars, Iowa. 360 meters.
WIAY—Woodward & Lathrop, Washington, D. C. 224 meters.
WIK—K. & L. Electric company, McKeesport, Pa. 360 meters.
WIL—Continental Electric Supply company, Washington, D. C. 360 meters. Daily except Sundar, 4:30-6 p. m., concert.
WIP—Gimble Brothers, Philadelphia, Pa. 509 meters. Monday, 3-2:30 p. m., concert; 5-5:45 p. m., concert, sporting; 6-6:30 p. m., organ recital; 2-2:30 p. m., concert; 5-5:45 p. m., concert, sporting; 6-6:30 p. m., bedtime stories; 7-7:20 p. m., lecture; 7:20-9 p. m., concert; 9:10-11 p. m., concert. Wednesday, 2-2:30 p. m., concert; 5-5:45 p. m., concert, sports; 6-6:30 p. m., bedtime stories. Thursday, 12 m.-1 p. m., organ recital; 2-2:30 p. m., concert; 5-5:45 p. m., concert, sporting; 6-6:30 p. m., bedtime stories; 7-8 p. m., concert; 8-8:30 p. m., organ recital. Friday, 2-2:30 p. m., concert; 5-6:45 p. m., concert, sporting; 6-6:30 p. m., bedtime stories. Saturday, 12 m.-1 a. m., organ recital; 2-2:30 p. m., concert; 5-5:45 p. m., concert, sporting; 6-6:30 p. m., bedtime stories; 7-7:20, lecture; 7:20-9 p. m., concert; 9-9:12 p. m., concert. Sunday morning and evening church services.
WJAB—American Electric company, Lincoln, Neb. 360 meters. Monday, Thursday, 9:30-10:15 p. m., concert. Sunday, 8-9 p. m., church services.
WJAD—Jackson's Radio company, Waco, Texas. 360 meters. Daily except Sunday, 4-4:30 p. m. Monday, Friday 8 p. m., concert. Sunday, 11 a. m., church services.
WJAF—Muncie Press and Smith Electric company, Muncie, Ind. 360 meters. Daily except Sunday, 2-2:30 p. m., 4:30-5 p. m. Monday, Wednesday, Friday, Saturday, 7-8 p. m. Sunday, 11:45 a. m.-12 m., church services.
WJAG—Norfolk Daily News, Norfolk, Neb. 360 meters. Daily except Sunday, 12:15, 5:30 p. m., weather, markets, news.
WJAK—C. J. White, Greentown, Ind. 254 meters.
WJAM—D. M. Perham, Cedar Rapids, Iowa. 268 meters. Daily except Sunday, 9-10:20 a. m., 12:30 p. m., markets. Tuesday, Wednesday, Friday, 7:15-8:15 p. m., concert.
WJAN—Peoria Star, Peoria, Ill. 280 meters. Daily except Sunday, 9:15 a. m., 10:30 a. m., 1:30 p. m., markets, weather; 5:30 p. m., sporting. Tuesday, 9:15-10:45 p. m., concert.
WJAP—Kelly-Duluth company, Duluth, Minn. 360 meters.
WJAQ—Capper Publications, Topeka, Kan. 360 meters.
WJAR—The Outlet company, Providence, R. I. 360 meters. Daily except Sunday, 9-10 a. m., 12 m.-1:30 p. m., 4-5 p. m. Monday, Tuesday, Thursday, 6-7 p. m. Friday, 7-8 p. m., concert.
WJAS—Pittsburgh Radio Supply house, Pittsburg, Pa. 360 meters. Daily except Sunday, 10:30-11 a. m., 1:30-2 p. m. Monday, Wednesday, Friday, 6:30-8 p. m.
WJAT—Kelly-Vawter Jewelry company, Marshall, Mo. 360 meters. Daily except Sunday, 4:15-4:45 p. m.
WJAX—Union Trust company, Cleveland, Ohio. 390 meters. Daily except Saturday, Sunday, 9-9:15 a. m., 10-10:45 a. m., 2-2:45 p. m., 3-3:45 p. m., concert. Tuesday, 7:30-9:30 p. m. Thursday, 8-10:30 p. m., concert.
WJAZ—Zenith-Edgewater Beach Hotel Broad-

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RADIO'S UTILITY TO BE PERMANENT, DECLARES EXPERT

By George A. Hastings.

RADIO is here to stay. There is no longer any doubt about its permanence as a utility, nor is there likely to be any radical change or new discovery in connection with it which will affect it fundamentally. The history of other inventions, as well as experience in the field of radio to date, indicates this to be a fact.

Two years ago when radio first became known to the man on the street there was a general belief among laymen that some new idea would soon come out and upset all the principles previously discovered in this new art of communication. But nothing of the kind has happened, and in this respect radio is repeating the history of other inventions.

Take the telephone for example. The telephone is fundamentally the same today as the first model which Alexander Graham Bell produced. Likewise the principle of the steam engine is the same now as when Robert Fulton made the first steamboat. Hardly ever has a great invention later undergone a fundamental change in the principles underlying it. Obsolescence comes in styles, but not in principles. Refinements are made, costs cut, and parts made simpler and more rugged, but no revolutionary change occurs.

The same is true of radio. Circuits that gave good results two years ago give good results now, altho simpler circuits have been developed, using fewer controls.

It is a fact that the public is now buying higher grade parts than they were a year or two ago, but they are still buying well-known, tried and true brands.

Five years ago a certain small concern produced an amplifying transformer which was the first offered for general sale to the public. Today that transformer is identical with the one first produced, and its efficiency as well as its slogan have become famous. This manufacturer has developed the so-called reflex circuit to a point where anyone can put together a set which will bring in broadcasting stations within a thousand-mile radius and do so on a loud speaker.

Models and styles change, but not fundamental principles. The pessimists who predicted the failure of radio will have to find something new to worry about. Take anybody with a good set and try and get it away from him, or shake his faith in radio. Try and do it. Ask the radio fan—he knows.

Broadcasting Stations and Schedules

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casting station, Chicago, Ill. 448 meters. Daily except Sunday, Monday, 10 p. m.-2 a. m. Wednesday, 12 m., news of McMillan expidition. Sunday, 6-9 p. m.

WJB—Indian Pipe Line corporation, Lawrenceville, Ill. 1,790 meters.

WJC—Indian Pipe Line corporation, Owensboro, Ky. 1790 meters.

WJD—Denison university, Granville, Ohio. 229 meters. Friday, Saturday, 5-6 p. m., lecture.

WJH—William B. Boyer company, Washington, D. C. 273 meters. Daily except Sunday, 2-3 p. m., concert. Sunday, 7 p. m., church service.

WJX—DeForest Radio Telephone and Telegraph company, New York, N. Y. 360 meters.

WJY—Radio Corporation of America, New York city, N. Y. 405 meters. Daily except Sunday, 3-5 p. m., concert. Tuesday, Thursday, Friday, 6:30-10:30 p. m., concert. Sunday, 1:30-4 p. m., 5-5:30 p. m., church services.

WKAA—H. F. Paar, Cedar Rapids, Iowa. 360 meters. Monday, 6:30 p. m. Thursday, 11:30 p. m. Saturday, 6:30 p. m. Sunday, church services as announced.

WKAD—Charles Looff, East Providence, R. I. 240 meters.

WKAF—W. S. Radio Supply company, Wichita Falls, Texas. 360 meters.

WKAN—United Battery Service company, Montgomery, Ala. 360 meters. Monday, Wednesday, Friday, 6:30-7 p. m., concert.

WKAP—W. Flint Cranston, R. I. 360 meters.

WKAQ—Radio Corporation of Porto Rico, San Juan, P. R. 360 meters. Tuesday, Saturday, 9 p. m., concert.

WKAR—Michigan Agricultural college, East Lansing, Mich. 280 meters.

WKAS—L. E. Lines Music company, Springfield, Mo. 360 meters. Monday, Wednesday, Saturday, 8-9:15 p. m., concert.

WKAV—Laconia Radio club, Laconia, N. H. 360 meters.

WKAW—Turner Cycle company, Beloit, Wis. 226 meters. Daily, 12-12:15 p. m., 7-7:30 p. m.

WKAX—William A. MacFarlane, Bridgeport, Conn. 231 meters.

WKAY—Brenau college, Gainesville, Ga. 360 meters.

WKC—Joseph M. Zamoiski company, Baltimore, Md. 360 meters. Daily, 6:30 p. m.

WKY—WKY Radio shop, Oklahoma City, Okla. 360 meters. Daily except Sunday, 3:30 p. m., concert; 7:30 p. m., sporting; 8:55 p. m., weather; 9 p. m., concert.

WLAC—North Carolina State college, Raleigh, N. C. 360 meters.

WLAG—Cutting and Washington Radio corporation, Minneapolis, Minn. 417 meters. Daily, 8:30 a. m.-10 p. m., markets, concert, children's hour, lecture. Wednesday, 10 p. m., concert. Sunday, 10:30 a. m., 7:45 p. m., church services; 3:30 p. m., matinee musical.

WLAH—Samuel Woodworth, Syracuse, N. Y. 234 meters.

WLAJ—Waco Electric Supply company, Waco, Texas. 360 meters.

WLAK—Vermont Farm Machine company, Bellows Falls, Vt. 360 meters.

WLAL—Tulsa Radio company, Tulsa, Okla. 360 meters.

WLAN—Putnam Hardware company, Houlton, Me. 360 meters.

WLAP—W. V. Jordon, Louisville, Ky. 360 meters.

WLAQ—A. E. Schilling Electrical Contractor-Dealer, Kalamazoo, Mich. 360 meters.

WLAT—Radio and Specialty company, Burlington, Ia. 360 meters. Monday, Wednesday afternoons; Monday, Wednesday evenings.

WLAV—Electric Shop, Inc., Pensacola, Fla. 360 meters. Monday, Wednesday, Friday, 7-8 p. m.

WLAW—New York police department, New York, N. Y. 360 meters.

WLAX—Greencastle Community Broadcasting station, Greencastle, Ind. 231 meters. Wednesday, Friday, 7:30-8:30 p. m., concert. Sunday, 7:30 p. m., church services.

WLAY—Northern Commercial, Fairbanks, Alaska. 360 meters.

WLAZ—Hutton & Jones Electric company, Laurel, Ohio. 248 meters. Wednesday, 8-9:15 p. m. Saturday, 10:30-11:30 p. m., concert. Sunday, 7:30-9 p. m., church services.

WLB—University of Minnesota, Minneapolis, Minn. 360 meters.

WLP—Northern States Power company, 15 South Fifth street, Minneapolis, Minn.

WLW—Crosley Manufacturing company, Cincinnati, Ohio. 309 meters. Daily except Sunday, 10:30 a. m., 1:30 p. m., 3 p. m., 4 p. m., market reports. Monday, Wednesday, 8-10 p. m., concert. Tuesday, Thursday, 10-12 p. m., concert. Saturday, 2 p. m., concert. Sunday, 9:30 a. m., 11 a. m., church services.

WMAB—Radio Supply company, Oklahoma City, Okla. 360 meters.

WMAC—J. E. Page, Cazenovia, N. Y. 261 meters.

WMAF—Round Hills Radio corporation, Dartmouth, Mass. 360 meters.

WMAH—General Supply company, Lincoln, Neb. 341 meters.

WMAJ—Kansas City Daily Drovers' Telegram, Kansas City, Mo. 275 meters. Daily except Sunday, 8:15 a. m., 9:15 a. m., 10:15 a. m., 11:15 a. m., 12:15 p. m., 1:15 p. m., 2:15 p. m., markets and weather.

WMAK—Norton Laboratories, Lockport, N. Y. 360 meters.

WMAL—Trenton Hardware company, Trenton, N. J. 256 meters. Wednesday, Thursday, 6:30-8 p. m., concert.

WMAM—Beaumont Radio Equipment company, Beaumont, Texas. 360 meters.

WMAN—First Baptist church, Columbus, Ohio. 286 meters. Sunday, 10:30 a. m.-12 m., 7:30-9 p. m., church services.

WMAP—Utility Battery Service company, Easton, Pa. 246 meters. Daily except Sunday, 3-4 p. m., 5-5:45 p. m. Wednesday, 7-8:55 p. m., concert.

WMAQ—Chicago Daily News, Chicago, Ill. 448 meters. Daily except Saturday, Sunday, 4:30-5 p. m. Tuesday, Wednesday, Thursday, Friday, 7-8 p. m., 9-10 p. m. Saturday, 8-10 p. m.

WMAV—Alabama Polytechnic institute, Auburn, Ala. 250 meters. Daily except Sunday, 10 a. m., 12 a. m., weather, markets. Tuesday, Thursday, Saturday, 7:30-8:30 p. m., concert.

WMAX—K. & K. Radio Supply company, Greenville, Ohio. 240 meters.

WMAY—Kingshighway Presbyterian church, St. Louis, Mo. 280 meters. Sunday, 11 a. m., 8 p. m., church services. Tuesday, 7-8 p. m., church services.

WMAZ—Mercer university, Macon, Ga. 268 meters. Daily except Sunday, 5:30-6 p. m., 7-7:30 p. m., 8:30-9:30 p. m. Tuesday, Wednesday, Thursday, 10:30-11 a. m., church services.

WMC—Commercial Appeal, Memphis, Tenn. 500 meters. 9:30 a. m., market; 12 m., weather; 3 p. m., weather, market. Tuesday, Friday, 11 p. m., concert. Saturday, Sunday, 8 p. m., concert. Wednesday, silent night.

WMH—Precision Equipment company, Cincinnati, Ohio. 248 meters. Daily except Sunday, 12:15 p. m., 12:45 p. m. Tuesday, Friday, 4-4:30 p. m.

WMU—Doubleday-Hill Electric company, Washington, D. C. 262 meters.

WMW—Pere Marquette Railroad company and Ann Arbor Railroad company, Manitowoc, Wis. 1,666 meters.

WNAB—R. D. Nichols, Bowling Green, Ky. 360 meters. Daily except Tuesday, 4-5 p. m., 7:30-9 p. m.

WNAC—Shepard Stores, Boston, Mass. 278 meters. Daily except Sunday, 3-4 p. m., concert. Monday, Wednesday, Friday, 5:30-6 p. m., concert. Tuesday, Thursday, Friday, 7-9 p. m., concert. Sunday, 10-11 a. m., 1:30-3 p. m., 5:30-7:30 p. m., church services.

WNAD—University of Oklahoma, Norman, Okla. 360 meters. Daily except Sunday, 7-8 p. m.

WNAL—R. J. Rockwell, Omaha, Neb. 360 meters.

WNAN—Syracuse Radio Telegraph company, Inc., Syracuse, N. Y. 280 meters. Tuesday, Thursday, Friday, 7-9 p. m., concert Daily, 11 a. m., market and agriograms.

WNAP—Wittenberg college, Springfield, Ohio. 360 meters. Friday, 8-8:30 p. m. Special sporting features as announced.

WNAQ—Charleston Radio Electric company, Charleston, S. C. 360 meters.

WNAR—C. C. Rhodes, Butler, Mo. 360 meters.

WNAS—Texas Radio corporation, Austin, Texas. 360 meters.

WNAT—Lenning Brothers company, Philadelphia, Pa. 360 meters. Wednesday, Saturday, 6:30-8:30 p. m., concert. Sunday, 1:30 p. m., 3:30 p. m., church services.

WNAV—Peoples Telephone and Telegraph company, Knoxville, Tenn. 360 meters. No definite schedule.

WNAW—Henry Kunzman, Fort Monroe, Va. 360 meters. Sunday, 1-3 p. m., concert.

WNAX—Dakota Radio Apparatus company, Inc., Yankton, S. D. 244 meters. Dail except Sunday, 11:30 a. m., markets, weather; 4:30 p. m., concert. Wednesday, 9 p. m., concert.

WNAY—Ship Owners Radio Service, Baltimore, Md. 360 meters.

WNJ—Shotten Radio Manufacturing company, Inc., Albany, N. Y. 360 meters. Daily except Sunday, 9 a. m., market reports. Wednesday, 7:15 p. m., concert.

WNO—Wireless Telephone company, Jersey City, N. J. 360 meters.

WOAA—Dr. W. Hardy, Hardy Sanitarium, Ardmore, Okla. 360 meters.

WOAB—Valley Radio company, Grand Forks, N. D. 360 meters. Daily except Sunday, 10 a. m., 2 p. m., concerts. Sunday, 3-4 p. m., church services.

WOAC—Maus Radio company, Lima, Ohio. 266 meters.

WOAD—Friday Battery and Electric company, Sigourney, Iowa. 360 meters.

WOAE—Midland college, Fremont, Neb. 360 meters.

WOAF—Tyler Commercial college, Tyler, Texas. 360 meters. Daily except Sunday, 12 m., market; 8 p. m., concert. Sunday, 11 a. m., 8 p. m., church services.

WOAG—Apollo theater, Belvidere, Ill. 224 meters.

WOAH—Palmetto Radio corporation, Charleston, S. C. 360 meters. Monday, Thursday, Saturday, Sunday, 9 -12 p. m., concert.

WOAI—Southern Equipment company, San Antonio, Texas. 385 meters. Daily except Sunday, 10:30 a. m., market, weather; 12:15 p. m., live stock, news; 3 p. m., closing market; 7 p. m., sporting. Tuesday, 9:30-10:30 p. m., concert. Thursday, 7:30-8:30 p. m., concert. Thursday, 7:30-8:30 p. m., concert. Saturday, 9:30-10:30 p. m., concert. Sunday, 11 a. m., church services.

WOAJ—S. E. Ervin, Parsons, Kas. 285 meters. Thursday, 7-8 p. m., concert. Sunday, 3-4:30 p. m., church services.

WOAK—Collins Hardware company, Frankfort, Ky. 240 meters.

WOAL—W. E. Woods, Webster Groves, Mo. 360 meters.

WOAN—James D. Vaughan, Lawrenceburg, Tenn. 360 meters.

WOAO—Lyradion Manufacturing company, Mishawaka, Ind. 360 meters.

WOAP — Kalamazoo college, Kalamazoo, Mich. 360 meters. Monday, Wednesday, Friday, 6:30-7:30 p. m., concert.

WOAQ—Portsmouth Kiwanis club, Ports-Mouth, Va. 360 meters.

WOAR—H. P. Lundskow, Kenosha, Wis. 360 meters.

WOAT—Boyd Martell Hamp, Wilmington, Del. 360 meters.

WOAV—Pennsylvania National Guard, Erie, Pa. 242 meters. Tuesday, Wednesday, 8:30-10 p. m., concert. Friday, 8:15-9:45 p. m., concert. Sunday, 6:45 p. m., church services.

WOAW—Woodmen of the World, Omaha, Neb. 526 meters. Monday, Tuesday, Thursday, Friday, Saturday, 9 p. m., concert. Sunday, 9:30 a. m., 9 p. m., church services.

WOAX—F. J. Wolff, Trenton, N. J. 240 meters.

WOAZ—Penick Hughes company, Stanford, Texas. 360 meters.

WOC—Palmer School of Chiropractice, Davenport, Iowa. 484 meters. Daily except Sunday, and Tuesday night, 10:55 a. m., time signal; 11 a. m., weather; 2 p. m., markets; 3:30 p. m., lecture; 6:30 p. m., sporting; 7 p. m., concert; 10 p. m., concert. Sunday, 9 a. m., chimes; 6 p. m., concert; 7 p. m., church services; 8 p. m., concert.

WOI—Iowa State college, Ames, Iowa. 360 meters. Daily except Sunday, 9:30 a. m., 12:45 p. m., 9:30 p. m., concert.

WOK—Pine Bluff company, Pine Bluff, Ark. 360 meters.

WOO—John Wanamaker, Philadelphia, Pa. 509 meters. 10 a. m., organ recital; 10:30 a. m., weather; 10:55 a. m., time signal; 11 a. m.-12 m., concert; 3:45 p. m., organ recital; 6:30-7 p. m., sporting; 8:55 p. m., time signals; 9:02 p. m., weather.

WOQ—Western Radio company, Kansas City, Mo. 360 meters. Monday, Tuesday, Wednesday, Thursday, 8:45 a. m., 9:55 a. m., 10:35 a. m., 11:30 p. m., 1 p. m., 6:30 p. m., reports. Saturday, 7 p. m., concert. Sunday, 6 p. m., concert.

WOR—L. Bamberger & Co., Newark, N. J. 405 meters. Daily except Sunday, 1:30-3 p. m., 5:15-6:30 p. m. Monday, Wednesday, Saturday, 8-10 p. m.

WOS—Missouri State Marketing bureau, Jefferson City, Mo. 441 meters. Daily except Sunday, 8-9 a. m., 10 a. m., 11 a. m., 12 m., 1 p. m., 2 p. m., 5 p. m., market, weather. Monday, Wednesday, Friday, 8-9:30 p. m., concert.

WPAB—Pennsylvania State college, State College, Pa. 360 meters.

WPAC—Donaldson Radio company, Okmulgee, Okla. 360 meters. Monday, Wednesday, Friday, 10 p. m., musical and educational. Sunday, 10 p. m., 9 p. m., church services.

WPAD—W. A. Wieboldt & Co., Chicago, Ill. 360 meters. Daily except Sunday, 12:30-1:30 p. m. Monday, 6:30-7:30 p. m. Tuesday, Thursday, 8-9 p. m. Wednesday, Friday, 9-10 p. m. Sunday, 2:30-3:30 p. m.

WPAF—Peterson's Radio company, Council Bluffs, Iowa. 360 meters.

WPAH—Wisconsin Department of Markets, Waupaca, Wis. 360 meters. Daily except Sunday, 9:30, 10:30, 11:30 a. m., 12:30, 2:30, 4:30 p. m., markets, weather, news.

WPAJ—Doolittle Radio corporation, New Haven, Conn. 268 meters.

WPAK—North Dakota Agricultural college, Fargo, N. D. 360 meters.

WPAL—Superior Radio and Telephone Equipment company, Columbus, Ohio. 286 meters.

WPAM—Awerbach & Guet, Topeka, Kan. 360 meters.

WPAQ—General Sales and Engineering company, Frostburg, Md. 360 meters.

WPAP—Theo. D. Phillips, Winchester, Ky. 360 meters.

WPAR—R. A. Ward, Beloit, Kan. 360 meters. Friday, 8 p. m., concert. Sunday, 11 a. m., 8 p. m., church services.

WPAS—J. & M. Electrical company, Amsterdam, N. Y. 360 meters.

WPAT—St. Patrick's cathedral, El Paso, Texas. 360 meters. Sunday, church services and lectures.

WPAU—Concordia college, Moorhead, Minn. 360 meters.

WPAW—Delaware Radio Installation company, Wilmington, Del. 360 meters.

WPAZ—Dr. John R. Koch, Charleston, W. Va. 273 meters.

WPG—Nushawg Poultry farm, New Lebanon, Ohio. 360 meters. Daily except Sunday, 12-12:15, news; 6-6:30, markets. Monday, Friday, 8-9:45 p. m., concert.

WPI—Electric Supply company, Clearfield, Pa. 360 meters.

WPL—Northern States Power company, St. Croix Falls, Wis. 1764 meters.

WQAA—Horace A. Beale Jr., Parkersburg, Pa. 360 meters.

WQAB—Southwest Missouri State Teachers' college, Springfield, Mo. 236 meters.

WQAC—Gish Radio service, Amarillo, Texas. 360 meters. Daily except Sunday, 5-6:30 a. m. Wednesday, Friday, 9:30-9 p. m., concert.

WQAD—Whitehall Electrical company, Waterbury, Conn. 242 meters. 4:30-5:45 p. m. Monday, Wednesday, Friday, concert.

WQAE—Moore Radio News station, Springfield, Vt. 275 meters. Daily except Sunday, 6-6:30 p. m. Sunday, 1-3 p. m., church services.

WQAF—Sandusky Register, Sandusky, Ohio. 240 meters.

WQAH—Brock Anderson Electrical Engineering company, Lexington, Ky. 254 meters.

WQAL—Cole County Telephone and Telegraph company, Mattoon, Ill. 258 meters. Tuesday, Thursday, 8 p. m., concert.

WQAM—Electrical Equipment company, Miami, Fla. 360 meters.

WQAN—Scranton Times, Scranton, Pa. 280 meters. Daily except Sunday, 11:30 a. m., 3:30, 6:30 p. m., market, weather, sporting. Tuesday, Friday, 7 p. m., concert.

WQAO—Calvary Baptist church, New York, N. Y. 360 meters. Sunday, 9:30 a. m., 6:45-9 p. m., church services.

WQAQ—Abilene Daily Reporter, Abilene, Texas. 360 meters. Tuesday, Thursday, Friday, 7-8 p. m. Sunday, morning and evening church services.

WQAS—Prince-Walter company, Lowell, Mass. 266 meters.

WQAT—Radio Equipment corporation, Richmond, Va. 360 meters. Daily except Sunday, 1-4:15 p. m., concert. Sunday, 2-4 p. m., church services.

WQAV—Huntington & Guerry, Greenville, S. C. 280 meters.

WQAW—Catholic University of America, Washington, D. C. 236 meters.

WQAX—Radio Equipment company, Peoria, Ill. 360 meters.

WQAZ—Greensboro Daily News, Greensboro, N. C. 360 meters.

WRAA—Rice institute, Houston, Texas. 360 meters. Monday, 8-9 p. m., concert. Sunday, 4:30 p. m., lecture.

WRAB—Savannah Board of Public education, Savannah, Ga. 360 meters.

WRAD—Taylor Radio shop, Marion, Kan. 248 meters. Daily except Sunday, 12-12:25 p. m., 5:15-5:45 p. m., markets, weather. Monday, Thursday, 8-9 p. m., concert.

WRAF—Radio club, Inc., Laporte, Ind. 224 meters. Monday, Wednesday, Friday, 9:45-10:45 p. m., radio school. Sunday, 2-3 p. m., church services.

WRAH—Stanley N. Read, Providence, R. I. 360 meters.

WRAL—Northern States Power company, St. Croix Falls, Wis. 248 meters. Daily, 6:45 p. m., concert. Wednesday, 10 p. m., concert.

WRAQ—St. Louis Radio Service company, St. Louis, Mo. 360 meters. Daily except Sunday, 4:15-5 p. m., concert. Sunday, 3-5 p. m., concert.

WRAP—The Electrical Construction company, Winter Park, Fla. 360 meters.

WRAR—Radio and Electric shop, David City, Neb. 226 meters. Daily, 6:30-7:30 p. m., concert.

WRAS—Radio Supply company, McLeansboro, Ill. 360 meters.

WRAU—Amarillo Daily News, Amarillo, Texas. 360 meters.

WRAV—Antioch college, Yellow Spring, Ohio. 360 meters.

WRAW—Horace D. Good, Reading, Pa. 238 meters.

WRAX—Flexon's garage, Gloucester City, N. J. 268 meters.

WRAY—Radio Sales corporation, Scranton, Pa. 280 meters. Monday, Wednesday, Saturday, 7:15-8:25 p. m., concert.

WRAZ—Radio Shop of Newark, Newark, N. J. 233 meters.

WRK—Doron Brothers' Electric company, Hamilton, Ohio. 360 meters. Friday, 8:15 p. m. Saturday, 2:15 p. m., concert.

WRL—Union College Radio club, Schenectady, N. Y. 360 meters.

WRM—University of Illinois, Urbana, Ill. 360 meters. Monday, Thursday, 8:30-8:50 p. m., 9:30 p. m., lectures and news.

WRP—Federal Institute of Radio Telegraphy, Camden, N. J. 360 meters.

WRR—City of Dallas, Dallas, Texas. 360 meters. Daily except Sunday, 12-12:30 p. m., weather; 3-3:30 p. m., sports, news; 7-7:15 p. m., police news; 8-8:30 p. m., concert. Sunday, 11 a. m., church services.

WRW—Tarrytown Radio Research laboratory, Tarrytown, N. Y. 273 meters. Monday, Wednesday, Friday 6:30-9:30 p. m., concert. Sunday, 6:30-8:30 p. m., church services.

WSAA—B. S. Sprague Electric company, Marietta, Ohio. 360 meters. Wednesday, 7:30 p. m.

WSAB—Southeast Missouri State Teachers' college, Cape Girardeau, Mo. 360 meters. Monday, Wednesday, Friday, 3 p. m., 9 p. m.

WSAC—Clemson Agriculture college, Clemson college, S. C. 360 meters. 11 a. m., 4 p. m., weather, market reports. Saturday, 7-9 p. m., concert.

WSAD—J. A. Foster company, Providence, R. I. 261 meters. Daily, 1:30-3:30 p. m., concert. Monday, 6-7 p. m. Wednesday, 7:15-9:30 p. m. Friday, 6-7 p. m.

WSAG—Loran V. Davis, St. Petersburg, Fla. 244 meters.

WSAH—A. G. Leonard, Jr., Chicago, Ill. 248 meters.

WSAI—U. S. Playing Card company, Cincinnati, Ohio. 360 meters.

WSAJ—Grove City college, Grove City, Pa. 360 meters. Sporting news as announced.

WSAI—U. S. Playing Card company, Cincinnati, Ohio. 309 meters. Tuesday, Thursday, 8-10 p. m. Saturday, 10-12 p. m.

WSAK—Daily News, Middleport, Ohio. 258 meters.

WSAL—Franklin Electric company, Brookville, Ind. 246 meters.

WSAN—Allentown Radio club, Allentown, Pa. 229 meters.

WSAP—Seventh Day Adventist church, New York, N. Y. 263 meters. Sunday, 6:30-8:30 p. m., church services.

WSAQ—Round Hills Radio corporation, Dartmouth, Mass. 280 meters.

WSAR—Doughty & Welch Electric company, Fall River, Mass. 254 meters.

WSAT—Plainview Electric company, Plainview, Texas. 268 meters.

WSAW—Curtis & McElwee, Canandaigua, N. Y.

WSAX—Chicago Radio Laboratory, Chicago, Ill. 268 meters.

WSB—Atlanta Journal, Atlanta, Ga. 429 meters. Daily except Sunday, 12-1 p. m., 2:30-2:45 p. m., 3-6 p. m., 8-9 p. m., 10:45-12 p. m. Sunday, 10:54 a. m., 12:15 p. m., 5-6 p. m., 7:30-9 p. m., church services.

WSL—J. & M. Electric company, Utica, N. Y. 273 meters. Daily except Saturday, Sunday, 10-10:30 a. m., 1-1:30 p. m., 2-2:30 p. m., 3-3:30 p. m., 4-4:30 p. m., concert. Monday, Wednesday, 7-8 p. m. Saturday, 10-10:30 a. m., 4-5 p. m., 7-8 p. m. Sunday, 6:30-11 a. m., 6:30 p. m.

WSY—Alabama Power company, Birmingham, Ala. 360 meters. Daily except Sunday, 3 p. m., markets. Monday, Wednesday, Friday, 8 p. m., concert. Sunday, 11 a. m., 8 p. m., church services.

WTAB—Fall River Daily Herald Publishing company, Fall River, Mass. 248 meters.

WTAC—Penn Traffic company, Johnstown, Pa. 360 meters. Daily except Sunday, 10:15 a. m., 2:15 p. m. Tuesday, Thursday, 7:30 p. m.

WTAD—Robert E. Compton and First Presbyterian church, Carthage, Ill. 229 meters.

WTAF—Louis J. Gallo, New Orleans, La. 242 meters.

WTAG—Kern Music company, Providence, R. I. 258 meters.

WTAH—Carmen Ferro, Belvidere, Ill. 236 meters.

WTAJ—The Radio Shop, Portland, Me. 236 meters.

WTAK—Swan-Bower company, Steubenville, Ohio. 266 meters.

WTAL—Toledo Radio and Electric Shop, Toledo, Ohio. 252 meters.

WTAS—Charles E. Erbstein, Elgin, Ill. 275 meters.

WTAU—Ruegy Battery and Electric company, Tecumseh, Neb. 360 meters.

WTAW—Agricultural and Mechanical College of Texas, College Station, Texas 254 meters. Wednesday, Friday, 7:45 p. m., music talks. Sunday, 11 a. m., 12 m., 4 p. m., church services.

WTG—Kansas State Agricultural college, Manhattan, Kan. 360 meters.

WWAC—Sanger Brothers, Waco, Texas. 360 meters. Daily except Sunday, 11 a. m., weather; 1:30 p. m., concert. Wednesday, Saturday, 8 p. m., concert.

WWAD—Wright & Wright, Inc., Philadelphia, Pa. 360 meters.

WWAX—Wormser Brothers, Laredo, Texas. 360 meters. Daily except Sunday, 4:30-5:30 p. m., concert. Wednesday, Saturday, 8-9 p. m., concert.

WWB—Daily News Printing company, Canton, Ohio. 268 meters. Tuesday, Thursday, 8-9 p. m., concert. Sunday, 10:30 a. m., church services.

WWI—Ford Motor company, Dearborn, Mich. 273 meters. Wednesday, 8-10 p. m., concert.

WWJ—The Detroit News, Detroit, Mich. 517 meters. Daily except Sunday, 9:30, a. m., hints to housewives; 9:45 a. m., health talk; 10:25 a. m., weather report; 11:55 a. m., time signal; 12:05 p. m., concert; 3-4 p. m., except Monday, band concert; 4-4:15 p. m., weather report; 5-6 p. m., sports. Daily except Saturday, 7-8:30 p. m., concert, alternate weeks; 8:30-10 p. m., concert, alternate weeks. Tuesday, 9:45 a. m., ironing day special, alternate Thursday; 11 p. m., special program. Sunday, 11 a. m., church service; 4 p. m., band concert; 5 p. m., Detroit News orchestra.

WWL—Loyola university, New Orleans, La. 268 meters.

WWT—McCarthy Brothers & Ford, Buffalo, N. Y. 360 meters.

WWZ—John Wanamaker, New York City, N. Y. 360 meters.

VACUUM TUBES GET JAZZ BLUES FROM PROGRAMS

THE national craze for jazz may affect vacuum tubes. This is the latest development in radio broadcasting news.

When a radio transmitter tube shows unmistakeable signs of becoming converted to jazz music and develops a blue light which dances in perfect cadence and absolute abandon to the "blue" notes of a moaning saxophone, "what chance has the advocate of grand opera broadcasting," radio engineers and operators ask?

Tube Seems to Know.

Such is the situation at a Washington, D. C., broadcasting station every time it broadcasts the music of Le Paradis orchestra or the Metropolitan theater. On all other occasions the tube maintains a solemn dignity befitting the occasion, and performs in a highly efficient manner, it is said.

The engineers, who carefully avoid discussing the ethics of the equipment, rise to the defense of the tube to say that the blue light is probably caused by a small amount of gas which is present in some quantity in all vacuum tubes. When the tube is working, the gas becomes ionized, and if present in sufficient quantity, gives off a bluish light.

Modulation Varies Light.

The vividness of this light, it is explained, is increased with the modulation and with the changes in volume of the music. When a heavy chord is struck, the light visibly brightens, with the result that during a jazz piece the blue light keeps absolute time with the music, bringing out the beats, thus emphasizing the syncopation.

"That's as it should be," say the lovers of jazz, "even a radio tube gets a thrill out of popular music." The students of Wagner, Beethoven and Liszt, however, scoff at the idea, claiming "that jazz gives the tube the blues."

Plan Across-Sea Tests

The transatlantic tests of the American Radio Relay league will be undertaken in December and January. Believing that the efficiency of American amateur radio transmitters was proved adequately last winter, American amateurs will not transmit but will listen for signals from stations in continental Europe. British and French amateurs will transmit on alternate nights, the French tests beginning Dec. 22. Amateur stations in the United States will not transmit during the tests, so broadcast listeners hearing interference between 8 p. m. and 1 a. m. on the days of the tests will know that the trouble is caused by commercial stations or by foreign amateurs who get across.

Converts "Liliom" to Radio

"Liliom," by Franz Molnar, has been made into a radario by Fred Smith, the originator of this form of entertainment for the radio. Mr. Smith is studio director of WLW (Cincinnati), from which station it will be presented Dec. 6. The production under the direction of Helen Schuster Martin, will be surrounded by appropriate music by Kreisler. A new number written especially for string quartet will be played by the Cincinnati Conservatory String quartet.

Theatrical, Movie Reviews

In order to give the radio audience as wide a range in informative service as possible, the WLW (Cincinnati) devotes a portion of its Monday schedule for theatrical and movie reviews. The movie reviews are given every Monday at 4 o'clock and the theatrical reviews at 9:30 p. m. Members of the studio staff see the movies and the dramatic and musical attractions and then give a review to the unseen radio audience.

Wall Paper Aerial

A new "wireless" antenna has been invented. It is in the form of wall paper with a metallic design. The set is connected to this metal by means of an inconspicuous soldering lug.

BUILD YOUR OWN SETS—*IT'S EASY!*

Panels Drilled FREE

Specially drilled panels are included with each of the sets illustrated and described below. We give this free service only on panels included with complete sets.

What "Salvage" Really Means—

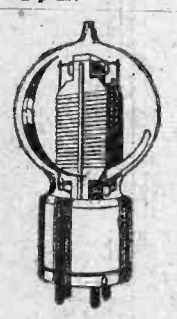
Sometimes a manufacturer over-produces and must sacrifice his surplus stock for cash. Sometimes a dealer misjudges market conditions and must unload—again for cash. Our business is to buy—to "Salvage"—these special offers by paying spot cash for the entire surplus. That's how we bought 40,000 Automatic Electric Headsets—10,000 Western Electric VT-2 Tubes, etc. But in order to keep on taking advantage of such offers, we must make a quick turnover. That is why we offer you a $10 Automatic Electric Headset at the unequalled price of $3.65. That, too, is the main reason why all our offers are priced so attractively. "Salvage" to us does NOT mean something that has been used. We handle no second-handed merchandise. Every item we sell is guaranteed brand new—in fact 95% of our merchandise is in the manufacturer's own carton and carries his guarantee along with ours. "Salvage" to YOU means buying quality radio merchandise for less!

Complete Instructions

for assembling and blueprints for wiring are included with each outfit. Instructions written so everyone can understand them. No special skill or technical knowledge required—a few hours and you're ready to tune-in New York, Los Angeles—any of 'em!

Western Electric VT-2 TUBES

One of the big features of these brand new genuine Western Electric VT-2 Tubes that we bought from the U. S. Signal Corps is that they have a higher amplification factor than any other 5-watt tube made! And almost half of our purchase consisting of 10,000 tubes have been sold. Radio men know that a genuine VT-2 Tube for $7.45 is an unusual opportunity—a real "find"! These tubes may be used for both RF and AF Amplification and for CW and phone transmitting. These are not Navy defects; they have been sold only as a surplus.



$7.45

Automatic Electric LONG RANGE HEADSETS

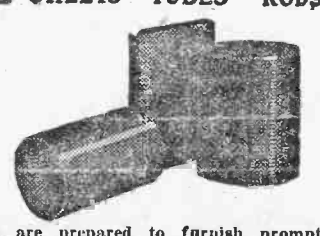
Formerly sold by the Automatic Electric Co., makers of telephone exchanges, at $10 each. We bought their entire stock—40,000 phones—for spot cash and because of this unequalled buying power, we are able to offer you a $10 headset for $3.65.

30 years of experience have produced the Automatic headset. Coil is wound with about 6500 turns of No. 40 enamel coated copper wire. DC resistance 1600 ohms. Impedance, at average music and voice frequency (800 cycles) 21,000 ohms. (Effective impedance rather than DC resistance is the big factor in a good headset.)

$10.00 VALUE $3.65

FORMICA

Made from Anhydrous Redmanol Resins
SHEETS TUBES RODS

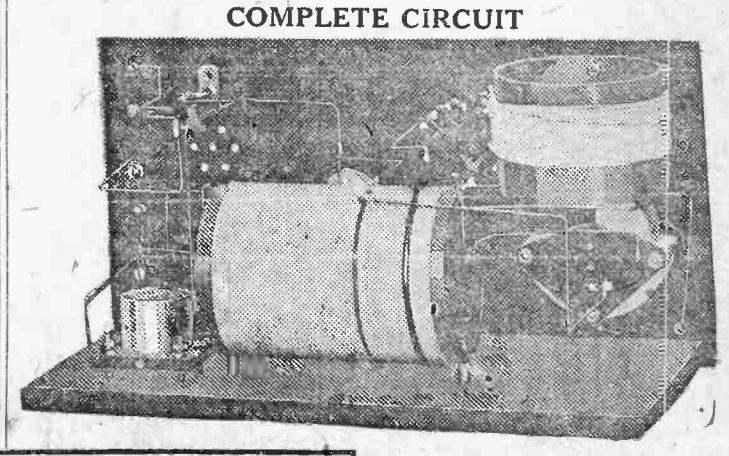


We are prepared to furnish promptly and saw Formica panels of any dimensions. Cutting charge is included in the following prices:

3-16-inch Formica, sq. in.	2c
⅛-inch Formica, sq. in.	1½c
Tubing (2 to 4-inch diameter), per running inch	10c

COCKADAY

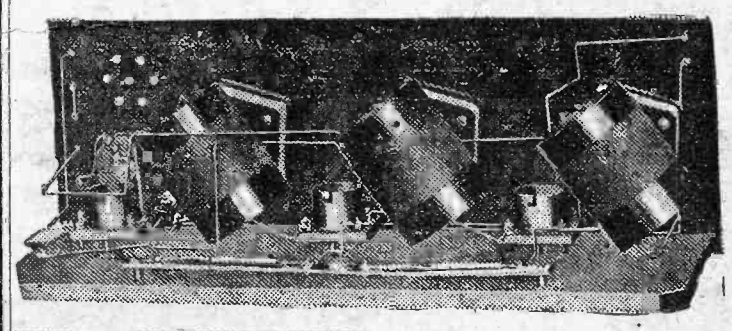
COMPLETE CIRCUIT



Regular Price EACH		Consisting of:	Our Price EACH
$3.00	1	Cockaday Coil	$1.95
1.00	2	Bakelite Dials	.25
1.00	1	John Firth Socket	.45
1.00		Freshman Grid Leak and Condenser	.65
1.50	1	Howard Vernier Rheostat	1.35
1.00	1	Pacent Double Circuit Jack	.50
.80	8	Binding Posts	.05
.02	7	Switch Points	.01
.50	1	Switch Lever	.25
	1	7 x 14 x ⅛ Formica Panel	1.44
		Blueprint and Wire	1.00
	1	Baseboard	.25
3.30	2/23	Plate Condensers	1.45

Our Price $11.95

HAZELTINE NEUTRODYNE

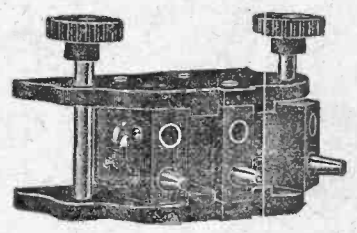


All Parts Licensed Under Hazeltine Patents

1 7x21x3-16 drilled Formica panel.
1 Howard rheostat.
3 4-inch Radion Dials.
3 John Firth bakelite sockets.
8 Binding posts.
3 23 plate variable condensers.
1 Wave control neutroformer.
2 Radio frequency amplifying neutroformers.
2 Grid neutralizing condensers.
1 .00025 micon grid condenser.
1 Marco variable grid leak.
1 Baseboard for mounting.
25 feet tinned copper bus bar wire and complete instructions for assembling and wiring.

3 Tube
Our Price $28.60
4 Tube ——— $44.65
5 Tube ——— $46.25
(Freed Eiseman or Fada Neutroformers)

2 and 3 Coil Mountings



Completely moulded of bakelite in which all metal parts are moulded. Mounts on four screws threaded in back, nickel plated. Highly finished in black. Moulded bakelite spaces the coil plugs. Silk flexible leads with provision for rear or base outlet. Spring contacts insure positive connection. Eliminates body capacity. Any standard plugs will fit. Size 3 inches deep, 2¾ inches high, 4 inches long.

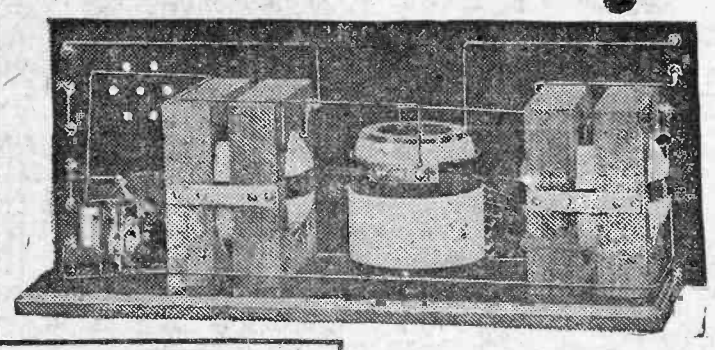
3 Coil ——— $3.45
2 Coil ——— $2.45

Electric Soldering Iron

Specially adapted to Radio work. Simply attach to your light socket. Complete, with 6-foot cord and attaching plug. Lasts a lifetime for ordinary home or light shop work.

$2.45

KNOCKED DOWN SHORT WAVE

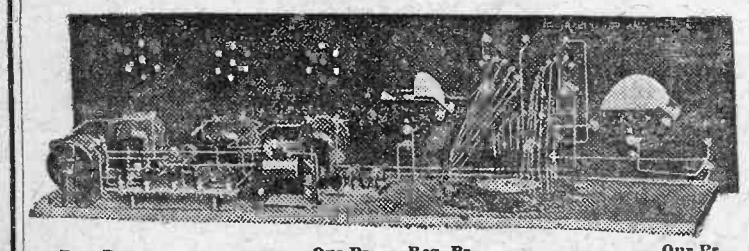


Reg. Price		Consisting of	Our Price
$10.00	2	Mahogany Variometers	$3.90
5.00	1	Mahogany Variocoupler	1.75
3.00	3	Bakelite Dials	.75
1.00		John Firth Socket	.45
1.10		Howard Rheostat	1.00
4.50		Mahogany Cabinet	2.95
2.25		Genuine Formica Panel	1.75
.80	8	Binding Posts	.40
.50		Switch Lever	.25
.40	12	Switch Points	.20
1.00		Freshman Grid Leak and Condenser Combined	.65
1.00		Complete Drawing for Assembly and Wiring	.50

$25.85 Value
Our Price $13.45

REINARTZ

DETECTOR AND 2-STEP



Reg. Pr. EACH			Our Pr. EACH
$6.00	1	Drilled Panel, 7x28x 3-16 inches	$3.92
2.50	1	Spider Web Coil	1.95
6.00	1	23 P. Ver. Condenser	3.45
5.00	1	11 P. Ver. Condenser	2.95
1.50	1	Howard Ver. Rheostat	1.35
1.10	2	Howard P. Rheostat	1.00
.75	3	Firth Sockets	.45
2.00	1	Variable Grid Leak and Condenser (cartridge type)	1.40

Reg. Pr. EACH			Our Pr. EACH
$4.75	2	Transformers (A 1 1 American 10-1 and 3-1 or new type high and low ratio Thordarson)	$4.25
.10	7	Binding Posts	.05
.40	2	Dozen switch points	.20
.02	6	Switch stops	.01
.50	3	Switch Levers	.25
1.00	2	Bakelite Dials	.25
1.00	2	Jacks, Double Circuit	.50
.65	1	Jack, Single Circuit	.35
1.00		Baseboard	.50
.75		Blueprint for assembly	.50
.50	25	feet tinned wire	.25

Reg. Price $46.97
OUR SPECIAL PRICE $29.95

Bradleystat or Bradleyleak

UNIVERSAL
New Type $1.25 ea.

GENUINE
Nathaniel Baldwin

LOUD SPEAKER
$25 Very Special

Moulded Variometers and Variocouplers

$3.65

Important!

Any individual part in any of the four outfits above may be purchased separately at the special reduced prices listed under column headed "Our Price"

509 South State Street
Phone: Wabash 4183

CHICAGO SALVAGE STOCK STORE

509 South State Street
Phone: Wabash 4183

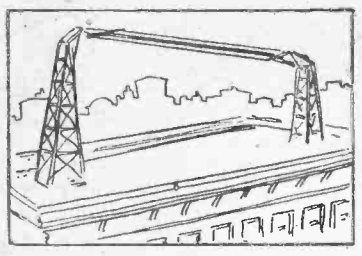
Our Guarantee

All our merchandise is guaranteed by us to be of First Quality.

All Mail Orders, large or small, shipped to you promptly. Address Dept. P-6.

THE CHICAGO EVENING POST

RADIO MAGAZINE



Published Every Thursday

THURSDAY, NOVEMBER 22, 1923.

Issued as a Supplement to
The Chicago Evening Post

BROADCASTING

HOME RADIO

RADIO SETS

HOOK-UPS

AMATEUR RECEPTION

HOME-WORKSHOP

RADIO SCIENCE-

RADIO PROGRAMS

LOCAL NEWS

U.S.RADIO NEWS

HOME LABRATORY

AMATEUR TRANSMISSION

RADIO STATIONS

INVENTIONS

D.X.RECORDS

RADIO PRACTICE-

COMMERCIAL

IRENE PAVLOSKA, who appears as Stephano, page of Romeo, in "Romeo and Juliet" this evening at the Chicago Opera company's presentation of Shakespeare's romance. This opera will be broadcast tonight from station KYW by direct wire from the Auditorium

FOREIGN RADIO NEWS

MANUFACTURERS NEWS

NEW EQUIPMENT-

DEALERS NEWS

JOBBER NEWS

IN THIS ISSUE

With a Good Radio Set

—and a Correct List of Broadcasting Stations and Programs

You Are Assured of an Enjoyable Evening

With a good radio set, you can sit restfully in your easy chair in your Chicago home—and hear a concert in Los Angeles, just as clearly as if you were in the very hall, nearly 3,000 miles away, in which the concert is given. You can hear a momentous speech by a world-famed statesman, delivered in some Atlantic seaboard city, just as plainly as if you were on the platform, right beside him. You may select that which is of most interesting or entertaining value to you, from hundreds of programs, in as many cities—near, far, anywhere. The possibilities of radio are practically unlimited. Radio brings the world to you—annihilating time and distance. Radio is an essential—today. You cannot be without a set in your home—if you wish to keep in step with modern achievements.

Good radio sets are easily obtained. Many are described in this magazine every week.

But—for complete lists of broadcasting stations and meters—and absolutely authentic programs

Consult This Magazine Every Thursday

And keep it for reference. You will want to refer to it many times in the course of the week. No other Chicago newspaper even approaches it for information necessary to enable you to obtain utmost satisfaction with your radio set. On all other days of the week you will find the Radio department of The Post in line with the big Thursday magazine—complete and correct in programs; also with all radio news of real importance.

Read

THE CHICAGO EVENING POST

Every Evening

IVERSON C. WELLS
Editor
Assisted by a Staff of Regular and Special Contributing Writers.

The RADIO MAGAZINE Section is edited with the view of giving authentic news of the radio broadcasting field and authoritative information on the subjects of home construction of receiving and transmission sets, of the operation and maintenance of apparatus, and as an exchange of opinion for its readers.

THE CHICAGO EVENING POST

RADIO MAGAZINE

Published Every Thursday

THE RADIO MAGAZINE Section
Is Issued as a Weekly Supplement to The Chicago Evening Post.

The supplement is not sold as a separate publication, but is a part of the regular Thursday editions of The Chicago Evening Post. There is no increase in price for The Post on that date, and readers should see that each Thursday issue they purchase has THE RADIO MAGAZINE section.

THURSDAY, NOVEMBER 22, 1923.

Weekly Subscription $1.35 Per Year.

Phans Do Miracles on Radio

By THE NIGHT PROWLER.

About all the time we night prowlers have for taking journeys out into the ether these days is along about the time when most of the broadcasting stations are signing off for the night. Those of us who can pick up California, of course, have a little fun, but how many of us are there so fortunate?

The radio show at the Coliseum is knocking evening programs into a cocked hat. Everyone and his uncle seems to be down at the Coliseum. And, why not, isn't it the biggest show on earth? Isn't it something that only will be with us a few days longer, while broadcasting stations will be going all the winter? Certainly.

DX-ers Perform Miracles.

I'm printing some of those DX records I promised you the last week. You'll find them on page ten. Get over there on that page of the world's greatest radio magazine, and size up what those long-distance hounds have been doing. Then take a hitch in your galluses and get busy. Your reputation is at stake.

There is a very odd thing about some of these reports I am printing today. A number of these DXers got a bunch of stations that were not even on the air Monday night! I can't, for the life of me, see how they did it. Can you?

For instance: Several DX-ers report having heard PWX, the Havana, Cuba, station, Monday evening. If my records are clear, that station does not come in on Mondays. WTAM (Cleveland) and WCX (Detroit) are two other stations reported by many as having been heard last Monday. These stations are not scheduled for that evening.

Looks like some one is performing miracles with radio when they can get "something from nothing."

Headsets Cause Trouble.

Radio makes liars out of many of us. Perhaps the strain of holding headsets to the ears for hours in the small moments of the stilly night, or a steady pressure on a certain brain cell of a too tight headband, renders us irresponsible.

If you have time tonight from the radio show, there's a mighty interesting menu set forth for you by both local and outside stations. KYW is giving us the program of popular local interest in the broadcasting of grand opera again this evening. "Romeo and Juliet" is on the bill.

WDAP has Dr. DeForest and Mrs. DeForest at 9 o'clock. Bowden Washington, who designed the United States navy radio apparatus during the great war, will speak at the radio show in the Coliseum at 10 o'clock this evening. His speech will be carried by sealed wire to radiophone broadcasting stations WDAP and WJAZ and will be sent out over the air.

Tomorrow evening Channing Pollock and Miss Flora May Hackett, noted beauty, will speak from the Coliseum at 10 o'clock, and their talks also will be broadcast from WJAZ and WDAP by means of sealed wires. These two programs were arranged by the Cutting & Washington company, which operates the broadcasting station WLAG at Minneapolis.

These are some of the feature artists on the air the coming week at local broadcasting stations: 1, Pennsylvania Railroad Terminal band at KYW Wednesday evening, Nov. 28. 2, George R. Hill Jr., barytone, at WDAP, Friday evening, Nov. 23. 3, Mrs. Mary Oberdorfer, at WMAQ, Friday night, Nov. 23. 4, Ralph "Bugs" Wheeler, at WTAS (Elgin), Monday evening, Nov. 26. 5, Mary Tris, popular pianist, at WJAZ, Sunday evening, Nov. 25.

Today's Programs

Below are given the complete schedules of all the Chicago and suburban broadcasting stations and those of the out-of-town stations which are most commonly tuned by local radiophans.

These schedules are a regular daily feature in The Chicago Evening Post.

On Thursday of each week a complete list and schedule of every broadcasting station in the United States is published in the Chicago Evening Post's sixteen-page Radio Magazine section.

CHICAGO STATIONS

(Central Time Is Shown.

KYW—Located in Commonwealth Edison building; 536 meters; Wilson J. Wetherbee, director.

Day—9:30 a. m., news and markets; 10 a. m., market reports; 10:30 a. m., financial news and comment; 10:58 a. m., naval observatory time signals; 11 a. m., market reports; 11:05 a. m., weather report; 11:30 a. m., news and comment of the financial and commercial market; 11:35 a. m., table talk by Mrs. Anna J. Peterson; 12 m., market reports; 12:30 p. m., late financial news and comment; 1 p. m., market reports; 1:20 p. m., closing market quotations; 2:15 p. m., late financial comment and news bulletin; 2:30 p. m., closing stock quotations, Chicago Stock exchange; 3 p. m., late news and sport bulletin; 4 p. m., news and sport bulletins; 4:30 p. m., late news and sport bulletins; 5 p. m., latest news of the day.

Evening—6:50 p. m., children's bed-time story; 8 to 11 p. m., opera, "Romeo and Juliet," broadcast from the Auditorium theater.

WAAF—Located at Union Stock yards; 286 meters.

Day—Live stock reports at 8:40, 10:30 10:45 a. m., 12:30, 12:45, 3, 4:30 p. m.

WMAQ—Located on Hotel LaSalle; 447.5 meters. Miss Judith C. Waller, program director.

Day—4:30 p. m., to be announced by radiophone.

Evening—7 p. m., weekly talk to Boy Scouts by Rockwell R. Stevens; talk by Albert Lasker; 9 p. m., ensemble music from Hotel La Salle trio; 9:15 p. m., to be announced.

WDAP—Located on Drake hotel; 360 meters. Jack Nelson, program director.

Day—1:40 p. m., Drake concert ensemble, market reports direct from Chicago board of trade on every half hour, beginning at 9:30 a. m. and continuing until 1:30 p. m.

Evening—10 p. m., program by Helen Louise Schafer.

WJAZ—Located on Edgewater Beach hotel; 447.7 meters; E. Warren Howe, program director.

Day—This station has no regular day schedule.

Evening—10 p. m., Oriole orchestra—"Dreamy Eyes"; "Aria from La Jolie Fille de Perth" (Bizet); selected (Sodero-Pothleder), "Rose Immortal" (Saar); "Silent Night" (Bohm); "If I Give You a Rose" (English); "Drifting Back to Dreamland" "Electric Girl"; "Hindoo Song" (Bamberg); "My Love Is a Muleteer" (DicRogero); "Saphische Ode" (Brahms); "Gavotte" (Popper); "A Dream" (Bartlett); "Sobbin Blues"; "Sunshine of Mine"; "Conscreation" (Manney); "Uncle Remus" (Homer); "Mazurka" (Popper); "Sunflower Hard"; "Marcheta."

WPAD—Located on W. A. Wiebold & Co., School street and Ashland avenue.

Notice—This station has closed and is being moved to Armour institute where it will be operated by the radio department of that institution.

WSAH—Located at 4801 Woodlawn avenue; 248 meters.

WSAX—Located on Chicago Radio laboratory; 268 meters.

SUBURBAN STATIONS

(Central Time Is Shown.)

WCBD—Zion, Ill., 345 meters. J. H. Depew, station manager.

Note—This station broadcasts only on Monday and Friday evenings, Wednesday afternoons and on Sundays.

Monday—Special concerts from studio at 8 p. m. by Zion band or orchestra and solo artists.

Wednesday—2:30 to 3:45 p. m., sacred solos, duets and an address by Wilbur Glenn Voliva, general overseer of the Christian Catholic Apostolic church of Zion.

Sunday—9 to 9:30 a. m., Sunday school; 2:30 to 5:30 p. m., Sunday service with special music by Zion band or organ, and by Zion White Robe choir; also an address by Wilbur Glenn Voliva.

WIAB—Rockford, Ill.; 252 meters; 8 to 9 p. m., concert.

WRM—Urbana, Ill., University of Illinois; 360 meters; 8:50 to 9:30 p. m., lectures and news.

WTAS—Elgin, Ill.; 275 meters; 7:30 p. m., musical program.

OUT-OF-TOWN STATIONS

Eastern Programs.
(Central Time Is Shown.)

KDKA—East Pittsburg; 326 meters:

Day—11 a. m., music; Union live stock market report from the National Stockman and Farmer; 12:55 a. m., Arlington time signals; 1:30 p. m., music; weather forecast; 1:50 p. m., United States bureau of market reports furnished thru the National Stockman and Farmer.

Evening—7:15 p. m., dinner concert by the Grand Symphony orchestra from the Million Dollar Grand theater, Pittsburg, Pa.; 8:30 p. m., weekly chat with the farmers by Frank E. Mullen, radio editor of the National Stockman and Farmer; 8:45 p. m., the children's period; 9 p. m., National Stockman and Farmer market reports; 9:15 p. m., address of interest to the farmers; 9:30 p. m., concert by the Lyric quartet, composed of Sarah Peck, soprano; Jane Packham Alexander, contralto; Gilbert Morris, tenor; Almet B. Jenkinson, barytone; Agnes Pendergrast Schaffer, accompanist, and Marian Dual McDade, piano, and Charles Riley, violin. Program to be announced by radio; 10:55 p. m., Arlington time signals; weather forecast; 12:30 p. m., special concert.

WBZ—Springfield, Mass.; 337 meters:

Day—12:55 p. m., Arlington time signals.

Evening—8 p. m., "Clubs, Spades and Wood," an outing story from Field and Stream; 8:30 p. m., twilight tales for the kiddies; "Setting the Story," last lecture of a course in short-story writing, by Dr. J. Berg Esenwein; letter from the New England Homestead; 9 p. m., concert by the Y. M. C. A. Glee club; 10 p. m., bedtime story for grown-ups, by Orison S. Marden; 10:55 p. m., Arlington time signals.

WEAF—New York city; 493 meters: 5:30 to 8 p. m., concerts.

WGI—Medford Hillside, Mass.; 360 meters:

Evening—7:10 p. m., late news flashes, sport news, Boston American; 7:30 p. m., Boston police reports, Boston police headquarters; 7:40 p. m., code practice, lesson number 139; 8 p. m., evening program: 1 "Bits of Wisdom," by Mr. George Brinton Beal, prominent newspaper man; 2. a mandolin club musicale, under the direction of Mrs. Savage; 3. bedtime stories for parents, prepared by the Children's Aid association and read by Alfred F. Whitman, executive secretary.

WHAZ—Troy, N. Y.; 380 meters: This station broadcasts only on Monday evenings.

WGY—Schenectady, N. Y.; 280 meters; silent night.

WGR—Buffalo; 319 meters.

Day—4 p. m., tea time music from Hotel Statler; 9 p. m., concert program.

WJY—New York city; 405 meters.

This station broadcasts only on Sundays at 2:30 p. m. to 6 p. m.

WJZ—New York city; 455 meters; no silent night.

Day—4 p. m., afternoon Auditorium concert by direct wire from the Wanamaker Auditorium; 5 p. m., "Things the Business Girl Should Know," by Mary Buchanan; 5:15 p. m., Ethel Jackson, elocutionist; 5:30 p. m., Theodore Van Yorx concert; Francis Shaw, soprano; Duane Nelson, basso; 7 p. m., "Jack Rabbit Stories," by David Cory. 8:30 p. m., the World's Work; 8:45 p. m., recital by Helen Wetmore Newman, soprano; 9:05 p. m., "Income Taxes," by Frank Shevit; 9:15 p. m., evening radio organ recital, program played by Walter Hardley, professor of organ at Pomona college, California; by direct wire from the Wanamaker Auditorium; 9:15 p. m., "The World at the Cross-Roads," by Francis H. Sisson of the New York Board of Trade and Transportation, and vice president of the Guaranty Trust company; 10:45 p. m., concert by Helen Ruossm, harpist, and Isadore Leezenbaum, violinist; 11:30 p. m., dance program by the Hotel Commodore orchestra under the personal direction of Bernard Levitow, by direct wire from the Hotel Commodore.

WOO—Philadelphia; 509 meters:

Day—10 a. m., grand organ; 10:30 a. m., United States weather forecast; 10:55 a. m., United States naval observatory time sig-

(Continued on Page 10.)

Tuning Requires Patience

Tuning is a matter of patience mixed with understanding. Whirling dials promiscuously is not tuning. Most any sort of radio set can be made to perform long distance work if properly handled.

DeForest Arrives for Show

Dr. Lee DeForest, "The Father of Radio," was scheduled to deliver an address at 3 o'clock this afternoon at the Second Annual Radio show now being held in the Coliseum.

Dr. DeForest arrived in the forenoon over the Twentieth Century from New York city. Mrs. DeForest was with him. After the Coliseum program Dr. and Mrs. DeForest will be the guests at 6 o'clock dinner at the Union League club.

Later in the evening Dr. DeForest will appear at the studio of WDAP, the Board of Trade broadcasting station on the Drake hotel, and will send broadcast a speech to the thousands of listeners-in. Mrs. DeForest also promises to sing two or three numbers from this same station during the evening. Dr. DeForest's speech at this station is scheduled for 9 o'clock.

Dr. DeForest will leave at midnight for Detroit, where he will be the guest of Edward H. Jewett, president of the DeForest Radio and Telegraph company.

Surpasses All Expositions.

No exposition ever held in the historic Coliseum has drawn such throngs thru its portals as has the second annual radio show.

Last evening and today the great convention hall was packed with visitors, there being such a crush especially in the evening, that it took one hour to push down the crowded avenues lined with the attractive booths of exhibitors.

No industry has had such popular and universal interest as radio. Unlike all others, everyone can and does enjoy and profit by the employment of radio. This is shown not only by the great crowds that jam the Coliseum show, but also by the cosmopolitan nature of the throngs.

E. T. Flewelling, inventor of the circuit that bears his name, was the speaker at last evening's program held in the annex of the Coliseum. Mr. Flewelling gave a very interesting and enlightening talk on his circuit and made clear many points about the operation of his "super," which tends to make this efficient circuit even more popular than it is.

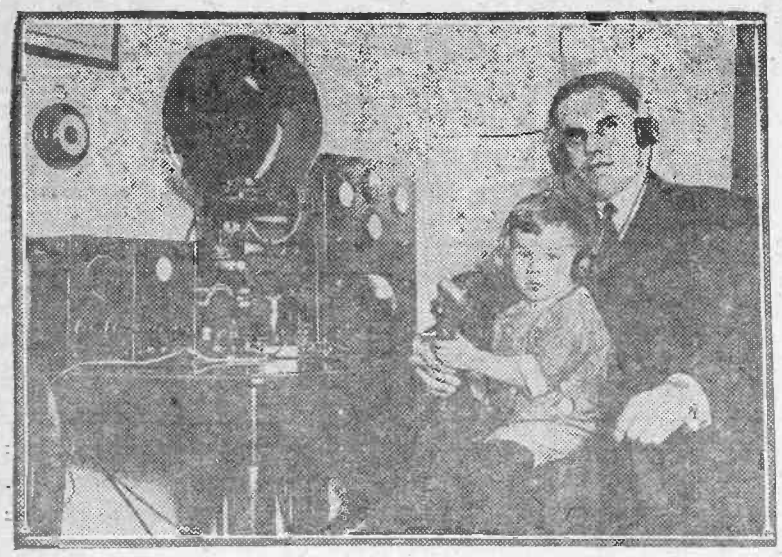
Home Builders Show Sets.

One of the most interesting features of the show is the exhibit of home built sets which have been entered in a prize contest. These are displayed in a special exhibit in the annex. There is everything from the simple crystal set to the big fourteen tube super-heterodyne. There are freaks galore, novelty sets and sets de luxe.

The eleven-tube super-heterodyne receiving set was built by a Chicago amateur, and is one of the features of the amateur exhibit. More than sixty home-built sets are entered in the two amateur contests. About half of the entries are from Chicago, and the other half are from different points in the United States, ranging from Massachusetts to California.

Several radical departures in radio

Continued on Next Page.



Thousands of kiddies listen to bed-time stories nightly, but few are privileged to hear their own grandfathers in recitations for their own particular benefit. Bobby Johnston of Cleveland, Ohio, however, does just that, when his grandfather, Dr. William T. Johnston, 100 miles away, at Collins, Ohio, tells him the ones he knows Bobby will like, thru the medium of his 100-watt transmitting outfit. Photo shows Bobby and his pa, Don H. Johnston, listening in on grandfather's nightly story.

How Crystal Operates in Radio Sets

The crystal detector is the simplest of all radio detectors used at the present time. Unlike the vacuum tube, it does not in most cases require a local battery for its operation, and the initial cost is practically the last cost, says Beverly B. Dudley, local member of the American Radio Relay league.

The crystals are inexpensive, easily obtained, and can be replaced with little trouble, should the old ones become inoperative or dirty. Their disadvantages are threefold. They are critical to adjust; they are not as sensitive as vacuum tubes; and thirdly, they cannot be made to oscillate for the reception of amateur continuous wave signals.

The Contact Point.

Essentially the crystal detector, sometimes known as a mineral detector, consists of a crystal upon which a contact of copper or steel wire is made. It is this contact that permits the reception of signals, inasmuch as this contact is a rectifier of the radio-frequency currents.

Crystal detectors consist in the commercial form of a base, a metal cup in which the crystal is mounted, a wire contact, known as the cat whisker, a holder for the wire, and binding posts for convenient connections.

The crystals used most commonly at present are: Galena, radiocite, silicon, carborundum and bornite in the order named. The first two require a light copper or phosphor bronze contact, while the rest work better with a heavier steel, needle-point contact.

The radio-frequency energy in the receiving set, before it reaches the detector, is a weak alternating current, similar to the house lighting current, but where the house lighting current alternates its polarity 120 times per second, this radio-frequency current alternates its polarity 1,000,000 times (or more) per second, i. e., where the house lighting current has a frequency of sixty cycles, the radio-frequency currents have a frequency of 500,000 cycles per second.

Current Reverses Rectified.

A current of this frequency cannot be heard for several reasons. When one of the groups of alternations acts on the telephone receiver it causes no motion of the diaphragm, because each variation of the current in one direction is followed by the current flowing in the opposite direction, so that the telephone diaphragm has not enough time to start moving and resulting effect is no motion at all. Something that allows the current to flow thru it in one direction and stops the current from flowing in the opposite direction is needed in the circuit, to actuate the diaphragm. The detector does this.

At the contact between the crystal and the cat whisker, current can flow thru in one direction, but not in the other. Such oscillations pass thru the detector, which suppresses half of these oscillations. This current is still vibrating much too fast for the telephone diaphragm to follow, but the successive impulses of current flow thru the telephone receiver, and the impulses in any one group are all in the same direction so that their effects add and produce a motion of the diaphragm. The motion of this diaphragm causes sound waves which vary in pitch and intensity according to the rectified current passing thru the winding of the receiver.

Here you see two of the most popular members of KYW (Chicago) official family. The young lady at the left is none other than Sally Mencke, the studio pianist and official accompanist. She is shown listening to "Sen" Kaney, the chief announcer of the station. "Sen" is peeling off a six-reel feature to Sally. It is supposed to be going over the microphone in front of him, and is, of course, but really it looks as if "Sen" had forgotten his invisible audience and was more interested in entertaining Sally.

Radio Aids in Shorthand Night School

Scarcely a week goes by without new uses for radio being found. Acquiring speed in taking shorthand dictation is the latest. Already it has proved practical, and its possibilities are interesting stenographers and public schools and commercial colleges thruout the country.

A popular shorthand publication has directed the attention of radiophan stenographers to the daily and nightly opportunity to transcribe in shorthand the great variety of material which comes over the radio and thereby improve the accuracy of their work and increase their speed. Hundreds of student stenographers quickly tried it out with good results, and even larger numbers of shorthand writers who have finished school and taken positions have found it a means to keep up with their shorthand practice.

See National Night School.

"Nobody need get rusty who has a radio," one stenographer wrote, "nor fail to get promoted to a better job for lack of practice."

The fact that so much of the radio broadcasting is in the evening may make radio a sort of nationwide night school.

One of the advantages of practice in writing the material which comes by radio is the variety of subject matter—sermons, news reports, educational talks, business reports, travelogues, lectures, book reviews — and many different styles of delivery of radio speakers. And the opportunities are open to shorthand writers in the most secluded hamlet or on the remotest farms provided they have satisfactory receiving sets.

As to the use of radio by public schools and business colleges, the New York city board of education recently gave an interesting demonstration. In co-operation with station WJZ (New York city) and the Gregg Publishing company, the board held the world's first radio shorthand contest.

Gives Pupils Prizes.

Provided with receiving sets, pupils in the shorthand classes in several important high schools took dictation from the radio at eighty words a minute and 100 words a minute. Prizes were awarded to the students who transcribed the dictation most accurately. The Bushwick high school in Brooklyn won first honors in the contest.

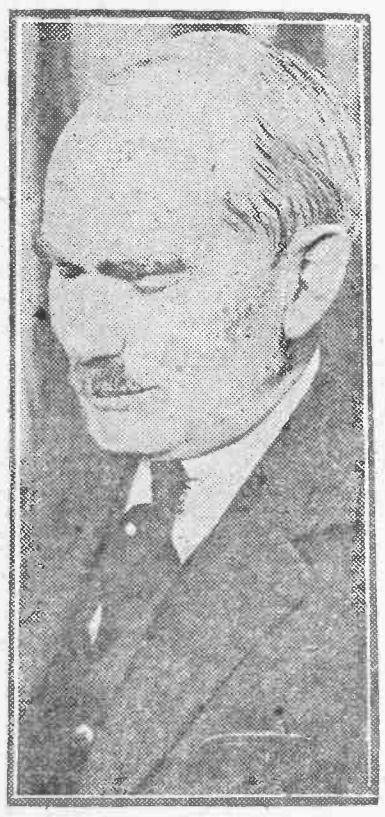
The contest had an important additional result in demonstrating the necessity of good receiving apparatus both for school work of this kind and for good results by outside stenographers utilizing radio for shorthand practice.

For all such tests and for general use in this new field, reliable apparatus is essential. Not one of the winged words must be missed, and every sound must be clear and undistorted. The blurring of "s" and "th" would spoil accurate transcription.

WNP Message Reaches Boston Within 48 Hours

HARTFORD, Conn., Nov. 22.—After completing a wide curve across Canada and back over the United States, a radio message from Capt. Donald B. MacMillan in winter quarters at north Greenland was delivered forty-eight hours later to his secretary in Boston, thru the traffic system of the American Radio Relay league.

The message was received here in the early morning by Boyd Phelps of the technical staff of the C. D. Tuska company.



DR. LEE DE FOREST.

DeForest Here for Radio Show

(Continued from Preceding Page.)

are exhibited by the leading manufacturers in the main exposition.

Exhibits Solid Silver Set.

A hand-wrought solid silver receiving set—shipped from Buffalo, N. Y., under heavy guard by the Federal Telephone & Telegraph company, is exhibited for the first time here. It is said to be the finest example of art in radio construction ever achieved.

Another unusual exhibit is that of the Electrical Research laboratories of Chicago, which shows the process of reflexing radio currents in the Erla reflex curcits. The different parts are connected by Giessler tubes, instead of wiring, and electric flashes pass thru these tubes. The spectators have their first chance to see the currents pass thru the circuit.

The Zenith Radio corporation has a new set which is shown to the public for the first time.

Special feature programs have been arranged by the leading broadcasting stations, located in Chicago, in connection with the show. These programs are put on at the Coliseum, large stages having been erected at each end of the main auditorium.

The programs are carried to the different stations by means of sealed wires.

Announcers Appear in Person.

A feature in connection with these programs will be the personal appearance at the Coliseum of the various regular announcers of the different stations. This gives the public its first chance to see these announcers, whose voices are heard over the ether each evening.

Practically every big manufacturer in the United States, and every radio jobber and retailer in the middle west is at the show. To give them a chance to transact business, the Coliseum is opened every day at noon for members of the trade. The public is admitted from 2 o'clock in the afternoon until 11 o'clock at night.

Helpful Hints on Radio Construction and Design

By BEVERLY DUDLEY.
(Member A. R. R. L.)

It has been stated that a coil and condenser in parallel are much superior to a variometer for tuning. Laboratory tests have shown that the resistance of the best variometer is thirteen ohms. The resistance of a good coil and condenser is about seven ohms.

It is a good plan to use No. 18 to No. 24 wire for the coils. In laying out the parts of a set, arrange the apparatus as much like the wiring diagram as convenient. This facilitates easy wiring. For appearance's sake the apparatus should be symmetrically arranged.

The coils used in receivers are very important. The turns should be spaced to lower the distributed capacity between adjacent wires. This is accomplished in honeycomb, spiderweb and bank wound coils. The honeycombs seem hard to handle at short waves, but the spiderweb coils are almost an ideal inductance. They are small, compact, efficient, self-supporting, durable and can be easily made and mounted.

Don't paint your coils with shellac or varnish. If it is necessary to hold the adjacent wires in place, use collodion. This keeps the wires in place, dries quickly, and does does not appreciably affect the efficiency of the coil. Be careful in handling collodion as it is very inflammable. Single layer coils are most common and easily made, tho they are not the most efficient.

Little Supporting Material.

In making the coils, use as little supporting material as necessary. You don't need, for example, a rotor for a variocoupler an inch thick; in any case a light waterproof tube of cardboard is preferable to a heavy composition tube.

In wiring the set be patient. A receiver cannot be connected up in five minutes and make a good job of it; it is the perfection of details that makes a good receiver. Don't attempt to build more than two stages of audio-amplification unless you are perfectly familiar with the theory and amplifications of such circuits, as howls and squeals result from poorly designed amplifiers. Use a good transformer.

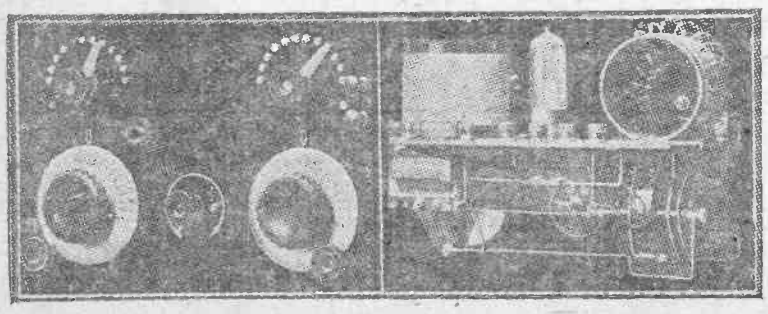
Simple Method of Control.

A simple method of controlling regeneration applicable to either single or two-circuit tuners is to connect a 200 or 400-ohm potentiometer between the antenna and receiver. Varying the resistance tends to control regeneration. This scheme was tried out at station 9BR with some success and is worthy of a trial. It seems to give greater range to a receiver, especially if a hard tube is used for detection, since it brings the tube up to the oscillating point without "spilling."

The range of a well designed single tube receiver cannot be stated, altho during the winter nearly all the powerful United States stations should be heard, if a good antenna is used. Using a single wire three feet off the ground and fifty feet long, WSB, Atlanta, Ga., was recently heard, on a detector tube, while amateurs as far away as Denver, Minneapolis, central Ohio and Kentucky came in with enough volume to be heard several inches away from the phones on the detector tube alone. The set was, however, well designed, and those results could not have been accomplished with a haphazardly designed receiver.

(Published thru the courtesy of the American Radio Relay League.)

A popular type of dance frock that will stand much wear, is the silver bodice joined to the full skirt of lace.



This receiver won second prize in a recent contest conducted by an eastern magazine. It is not only a neat bit of workmanship, but is capable of good service.

Donnelley to Construct New Station

Announcement was made today that Chicago is to have another class C broadcasting station. It is to be located on one of the popular north side hotels. Thorne Donnelley is back of the enterprise.

The equipment already is being built but will not be ready for installation for several weeks.

Mr. Donnelley, who, with J. Elliott Jenkins, gave Chicago its first powerful and popular broadcasting station in WDAP, located on the Drake hotel, says he expects to make the new station one of the best in the United States.

Messrs. Donnelley and Jenkins sold the Drake equippment to the Chicago Board of Trade last winter. Mr. Jenkins has remained with WDAP as its chief engineer, but for some time Mr. Donnelley has not had any active interest in the station.

Here Is the Smallest Regenerative Radio Set in the World That Actually Works

ON this page is pictured and described perhaps the smallest one-tube receiving set in the world that actually receives and performs its work like a full-size radio set. It was constructed by a Chicagoan and not only is a marvel in size and results it obtains, but also in workmanship, as to build it one must be as skillful as a watchmaker. The set was tested in The Post experimental laboratory and it does all that is claimed for it.—The Editor.

By LEWIS B. HAGERMAN.
(Radio Construction Engineer.)

INSPIRED by a desire to see how compactly a practical working radio receiver set might be wired and constructed, I have built a one-tube variation of the ultra-audion circuit in a cabinet that occupies a space of only 4¼x2¼x2¼ inches, and easily can be held in the palm of one hand and still leave sufficient room for something else.

The receiver might be termed the acme of portability, as it weighs only fourteen and one-half ounces, and easily can be carried in a coat pocket. I call it the "Midget."

The set, as I have constructed it, uses a WD-11 tube, and one dry cell of one and one-half volts to light the filament. The "B" battery is a 22½ volt dry cell. Either of the batteries is considerably larger than the receiver.

List of Parts.

Many of the parts used were especially built for the set. This is particularly true of the inductance and the condensers. These parts are:

Four panels 4¼x2¼x2¼ inches.
Two ends 2¼x2¼ inches.
Two 2-inch dials.
Five binding posts.
One adapter for socket.
One .00025 grid condenser with leak mountings (Dubilier).
One 1½-meg grid leak (Electrad).
Two inductance coils (special).
One variable condenser .0005 (special).
One variable condenser, three-plate, as vernier (special).
Two hinges for cabinet lid (special).
One 6-ohm rheostat (Marco).

The extras, such as head phones, batteries and tube, are the same as with any other receiving set.

The variable condensers and the inductances excite the most interest among those who have seen this tiny receiver. I know of but one place in Chicago where they may be obtained. The editor of The Chicago Evening Post Radio Magazine has the address of this dealer, and will give it to anyone who cares to construct one of these sets from my working plans.

The condensers are less than two inches in diameter and about one and one-fourth inches in depth. They have the usual number of plates—the .0005 having twenty-three and the vernier three. The plates are of special material. These are very efficient condensers, and give surprising results.

Inductance Coils Unusual.

The inductances are of the conductive inductance type. They were especially wound by the Estru people according to my own design, and are of the spider web construction. They are built in an oblong shape and when placed together are 2½ inches in length and ¼-inch in thickness. Each has thirty-five turns of wire and both coils are connected at one end as is shown in the schematic diagram which accompanies this article.

The Marco rheostat was selected because of its compactness. It is the only piece of apparatus that is mounted on the outside of the cabinet.

The hinges for the cabinet I took from a small jewel box which a member of my household had discarded. Any small hinge will suffice. The binding posts I found at the 5 and 10-cent store, and are of the small type that are often used on crystal sets. You may have to do some hunting to locate these.

The tube socket is an adapter for the WD-11 tube which I found also at the 5 and 10 cent store. This is mounted direct on the floor of the cabinet without using a socket.

Requires Care and Patience.

Considerable care and a world of patience must be exercised in building this set as it almost is a watchmaker's job. First make the cabinet, using one-sixteenth-inch bakelite. Cut to the dimensions specified and be sure that the cutting is accurately done.

Four pieces 4¼x2¼x2¼ inches are cut, one for the panel, one for the lid, and 2 pieces 2¼ inches for the sides.

After the holes are bored the cabinet parts may be given a dead finish in the usual way by rubbing down with fine emery paper, making sure to rub all one way to prevent streaks. Finish with emery paper and oil and wipe off the surplus oil.

The mounting of the parts must be carefully studied out or you will find yourself in trouble before you have gone very far. Take the base board first. Mount on this the tube adapter, which is to act as a socket, placing it at one corner of the board. This should be the corner in the back of the cabinet at the right side, when viewing the set from the front.

Next mount the fixed condenser and grid leak, placing these in position just in front of the adapter socket. The construction of the adapter will permit part of the condenser and mount going underneath it to some extent and save space.

Wire As You Proceed.

The proper length wire for the tube and the grid leak and fixed condenser should be attached while the base board is still detached from the rest of the cabinet. In fact, it is wise to do all the wiring possible at this stage and as the work progresses follow this idea thruout, wiring as you go along. Of course, all joints must be soldered.

Now put on the ends of the cabinet. There are 2¼ by 2¼ inches. The screws used are rather tiny ones and you will find them at the watchmaker's shop. They are not three-eighths of an inch long.

Bore three holes on the bottom of both end pieces for mounting to the base board. Bore four holes on either side of the end pieces for attaching to the front panel and back piece. These holes should be very carefully drilled as the bakelite will chip if this is not done. Also start, or countersink, holes for these screws on the ends and bottom sides of the front panel and back panel so that the screws will start easily, then gently force the screws the rest of the way.

After the two end pieces are attached to the base board insert the inductances. These go in the left-hand corner at the back, viewing the set from the front. A small strip of bakelite should be placed before the two coils as a support. (See photo diagram.)

Mounting the Condensers.

Much of the interior wiring should be done by this time. Now we are ready for the condensers. First remove the front plate bakelite shields or plates, as the panel of the cabinet is to act in this capacity. The wiring, of course, should be done to the condensers before they are attached to the front panel.

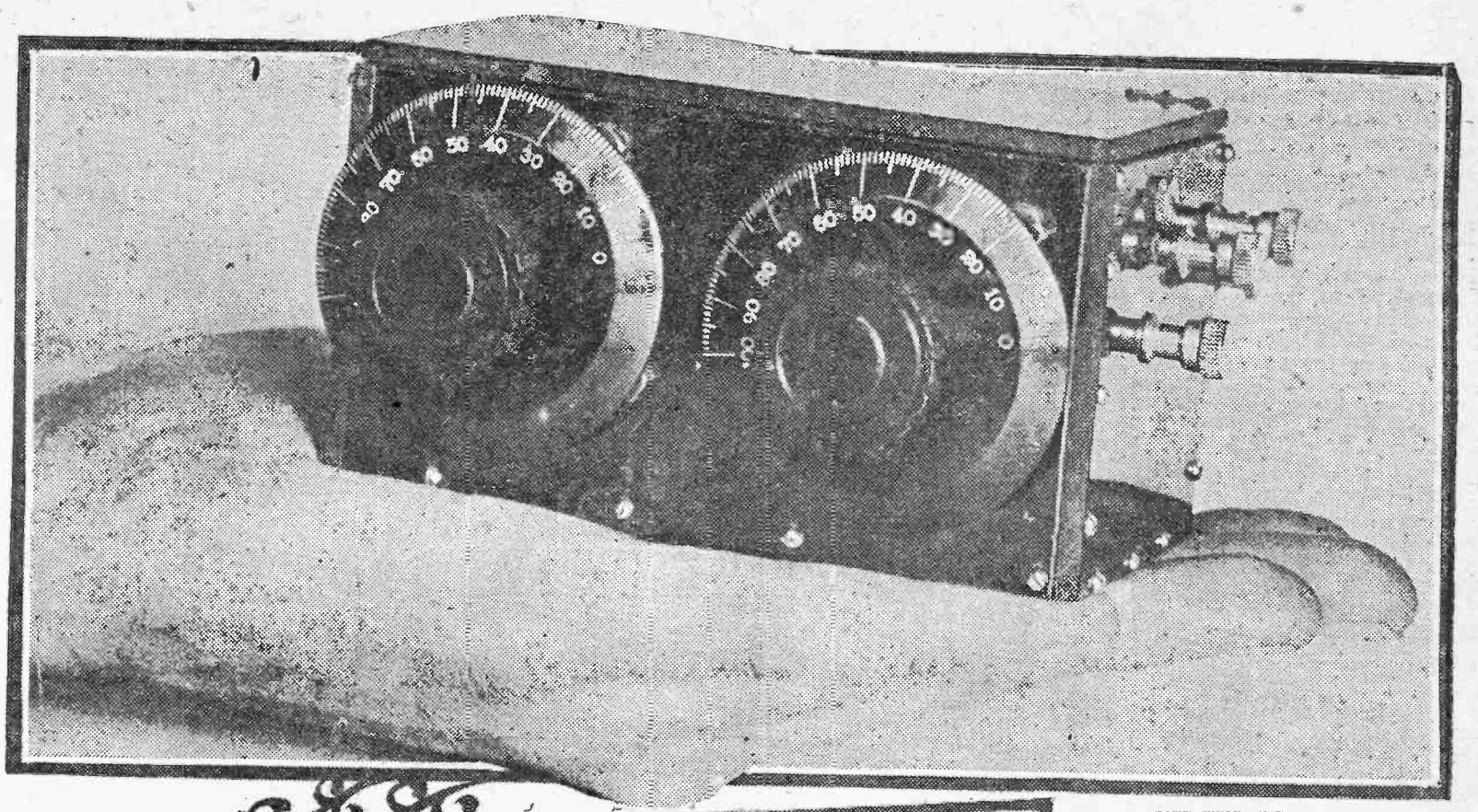
By reference to the photo diagram, which indicates the location of the various parts, you should have little trouble in getting the set together, altho it is a tedious job.

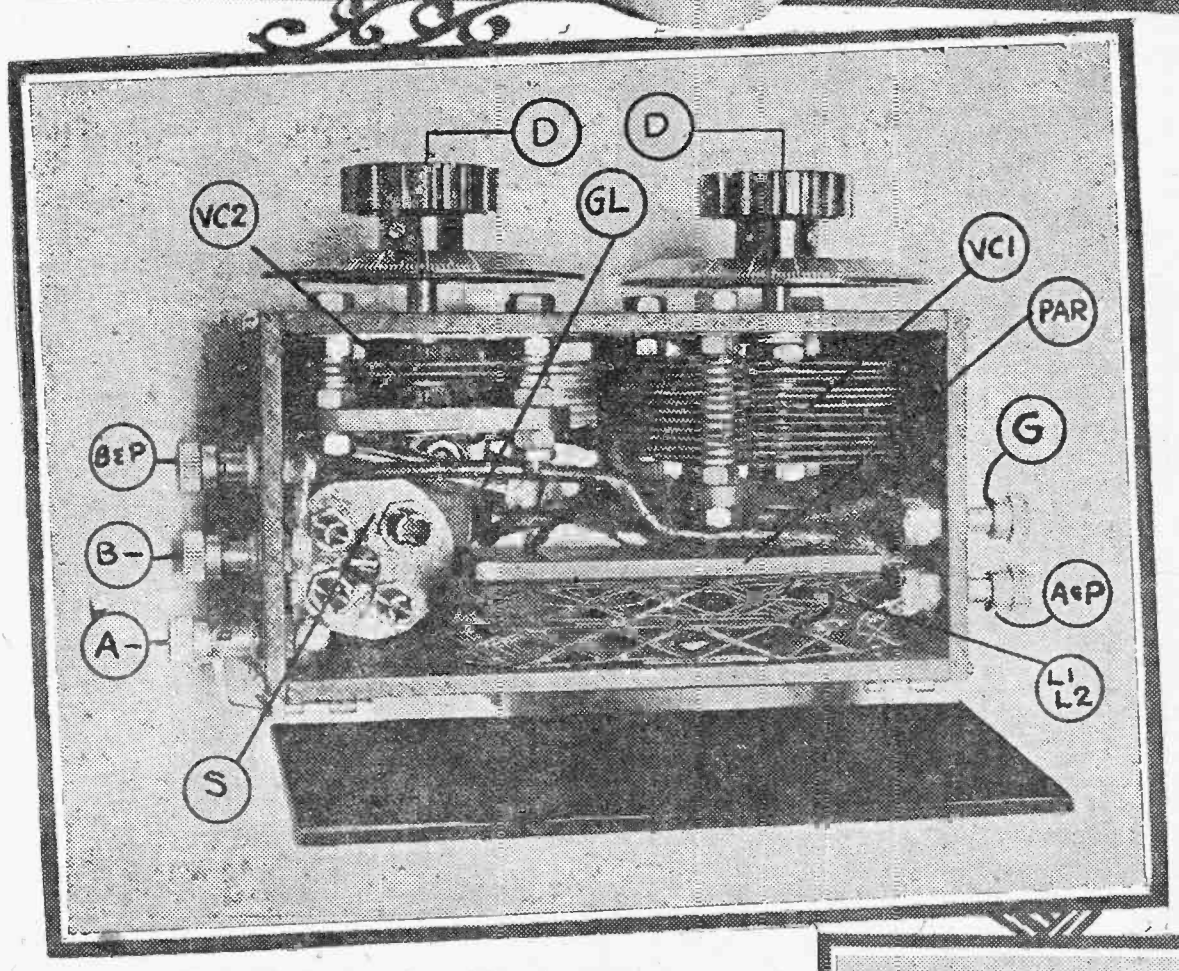
The battery connections will puzzle even the old-timers. The "A" connections are in the rear of the set. The "A" plus goes to the rheostat rotor or arm post, the other end of rheostat goes to the third post from front of set on right hand side. This post also connects to second post, which is "B" negative. The "A" minus goes to the third post at rear of set on right end, viewing the set from the front. (See photo diagram.)

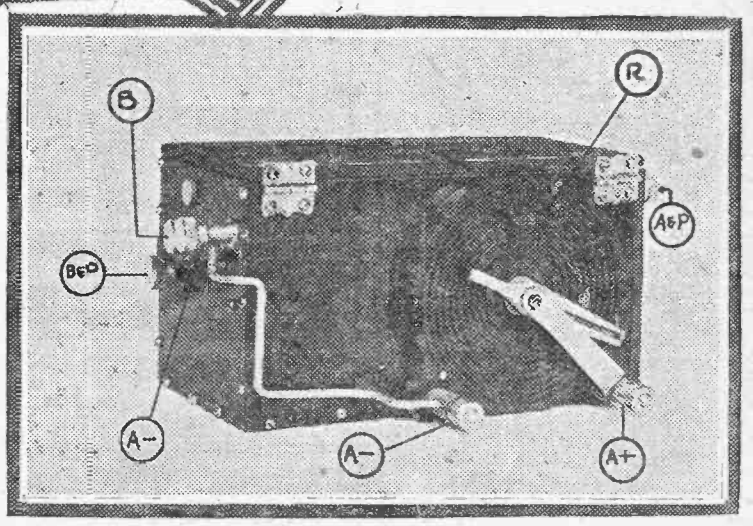
The phone connections also are unusual. One phone tip goes to the antenna connection post as indicated on the photo diagram. The other is connected to the "B" plus battery.

The tuning of the set is done in the usual way, the condenser being the only control except the rheostat, which is fairly critical.

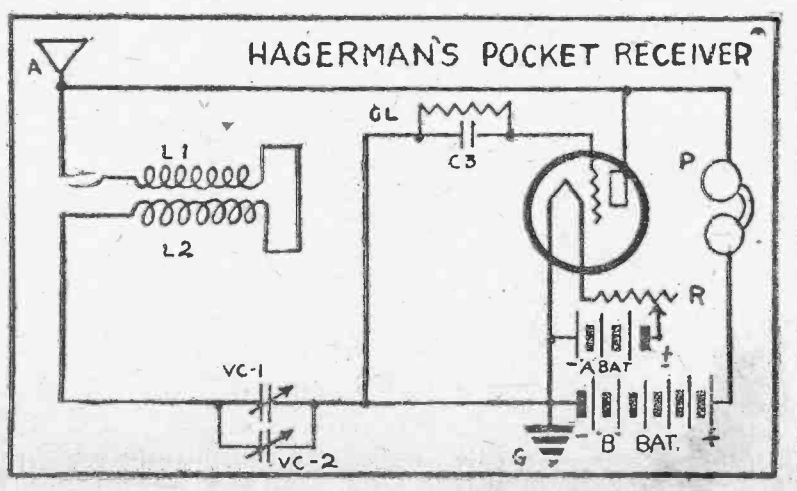
I have received just as good reception on this single tube set as I have from a full-grown man size ultra-audion one-tube set. Amplification, of course, does to the baby grand just what it does to any receiver.







In upper picture is full-size view of the Midget one-tube regenerative receiving set. Just below is photo-diagram (full size), showing interior layout. D-D are variable condenser dials on front of panel. VC-1 is 23-plate variable condenser. VC-2 is 3-plate variable vernier condenser. GL is grid leak, underneath which is grid-leak condenser (.00025); L1-L2 is inductance. S is adapter socket for WD-11 tube. B and P is post for "B" battery plus post to which also is connected one of the phone plugs. B— is post for "B" battery negative lead. A— is filament negative lead post. A and P is aerial and phone post. G is ground-lead post. In the lower corner is reduced size photo of back view of receiver, showing special rheostat at R. The other designating letters correspond to those in the center photo.



Coolidge to Use Radio in His Messages

President Coolidge has accepted the invitation of President E. F. McDonald of the National Association of Broadcasters and will read his messages over radio. This means that an audience of several millions will hear the voice of the nation's chief executive instead of a few as heretofore.

President Coolidge's acceptance was sent to Mr. McDonald thru Secretary Slemp, who wrote as follows:

"In the president's behalf, I want to express the sincerest of thanks for your letter of Nov. 5.

"In the short time that I have been connected with the executive establishment, I have come to realize as never before the tremendous burden that a president has to bear, and the fact that it is the sort of burden that is well nigh impossible to share even with the most willing and capable of coadjutors.

"You have presented a most interesting suggestion as to one possibility of helping to relieve him of some of his obligations. Your suggestion will receive the fullest and most sympathetic attention, and you may be assured will be kept in mind whenever an opportunity presents whereby we may avail ourselves of it."

Mr. McDonald, in making his proposal, declared that all the large broadcasting stations which are associated in a national co-operative body would pledge to transmit his messages and public utterances to every nook and corner of the country.

Avoid Use of Shellac

The four-circuit tuner (Haynes) has very low decrement in the circuits and employs loose coupling. In making them it is necessary they be wound on composition tubing of good quality and that no shellac or any other kind of insulating varnish be used on the windings.

Westinghouse Opens First Radio Relay Station in World

BROADCASTING voice and music from coast to coast by radio as a regular diet now is being done. This was made possible by the installation of a relay station in a Nebraska town. This article tells the story of its installation.—The Editor.

HASTINGS, Neb., is the place selected by the Westinghouse Electric and Manufacturing company for the location of its first radio relaying station to serve as the connecting link of the pioneer station at East Pittsburg, Pa.—KDKA—with the people living on the Pacific coast and also citizens of the western states.

The installation of the Hastings station KFKX, as its license reads, means that broadcasts from station KDKA will be picked up as easily and with the same apparatus in the farthest western states as KDKA's broadcasts are now received by people living a few hundred miles from East Pittsburg.

The relaying station marks a great forward step in radio, almost as great a stride in radio progress as was made when the Westinghouse company first started radio broadcasting with the establishment of its world's pioneer broadcaster, station KDKA, in November, 1920.

Always a pioneer in radio, the Westinghouse company, because of its engineering genius, now has removed the limitations of distance in the broadcasting of programs. The transmitting station at KDKA is as fine and as modern as radio engineers can make it. It is possible to receive KDKA all over the country, but, naturally, the greater the distance away from the station, the more sensitive must be the apparatus.

To pick up KDKA in California, for instance, requires very sensitive, high-priced apparatus. Knowing this condition, the Westinghouse company, by experimenting with short-wave relaying and relaying stations, has made it possible to rebroadcast or relay its eastern concerts from Hastings, which will serve as a booster station to points on the Pacific coast. Thus the same simple apparatus which can be used on the Pacific coast to pick up local broadcasters also can pick up the relayed KDKA.

The station at Hastings is one of the marvels of the radio engineering world, for not only can it relay from KDKA in the east on one wave, but it also can transmit concerts direct from KDKA, or transmit concerts from its own locality. The ability to equip a station for this type of work calls for engineering genius.

KFKX, for example, can receive broadcasts from KDKA on, say 3,200 kilocycle-frequency (94 meters) and relay the same broadcasts to another transmitting station located on the Pacific coast on 2,800 kilocycle-frequency (107 meters). Both these frequencies are much higher than are used in radio broadcasting and will not interfere either with radio broadcast traffic or amateur traffic.

The next step in this plan would be to tie up with a western station to pick up the 2,800 kilocycle-frequency (107 meters) broadcasts and rebroadcast on the regulation broadcast wavelengths or frequencies.

KFKX can receive, also, broadcasts sent from KDKA on 3,200 kilocycle-frequency (94 meters) and transmit direct to its territory on 1,050 kilocycle-frequency (286 meters) which is its assigned broadcasting wave length. It can transmit also its own broadcasts from a local source on 1,059 kilocycles, for the benefit of the people living in its territory or westward to the Pacific ocean.

For this relaying—short wave relaying as it is termed in the radio engineering world—two special transmitters are required, with special receivers to receive the high frequencies.

Hastings, Neb., and East Pittsburg, Pa., have duplicate transmitters and receivers. The Hastings station is one of the finest in the world, as is also the station at East Pittsburg. These stations are the result of radio engineering development and are actually considered to be the "ne plus ultra" of the present broadcasting era.

A feature of the high-frequency broadcasters is the short antenna used. The antennae at Hastings and at East Pittsburg are not over thirty-five feet long. This is much smaller than the antennae required for ordinary broadcasting. There is only thirty-five feet between flat top and counterpoise. The antenna and counterpoise consist of two small cages.

One of the difficulties attendant upon high-frequency broadcasting is that every precaution must be taken to prevent any outside influences, such as vibration, that would change the frequency. The vibration of the ground or the swinging of the antenna would serve to throw the set off its frequency.

To guard against the possibility of swinging, both the East Pittsburg and Hastings high-frequency stations' antenna, including the flat top and counterpoise, are stretched between cross arms rigidly attached to the tower instead of the more common swinging spreaders.

The down lead from the antenna to the counterpoise consists of copper tubing rigidly mounted on long, high-voltage porcelain insulators on the poles. The various inductances on the set are wound on rigid forms. Copper tubing is used to make all the connections.

The high-frequency set at East Pittsburg is located on the top of a nine-story building and naturally ordinarily would be subjected to jars. This set, therefore, is suspended on a system of springs so vibrations of the building cannot affect the operation of the set.

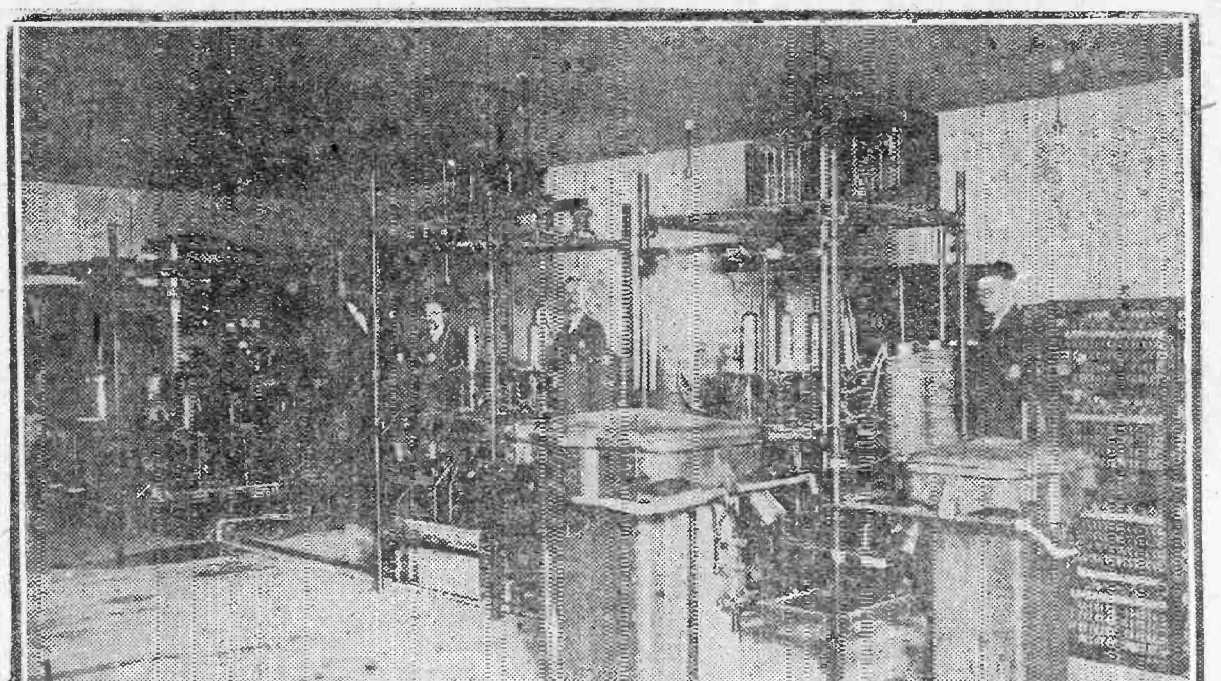
At Hastings, the set is located in an isolated building, and is not subjected to any vibrations, so the precaution of suspending this set on springs has not been necessary.

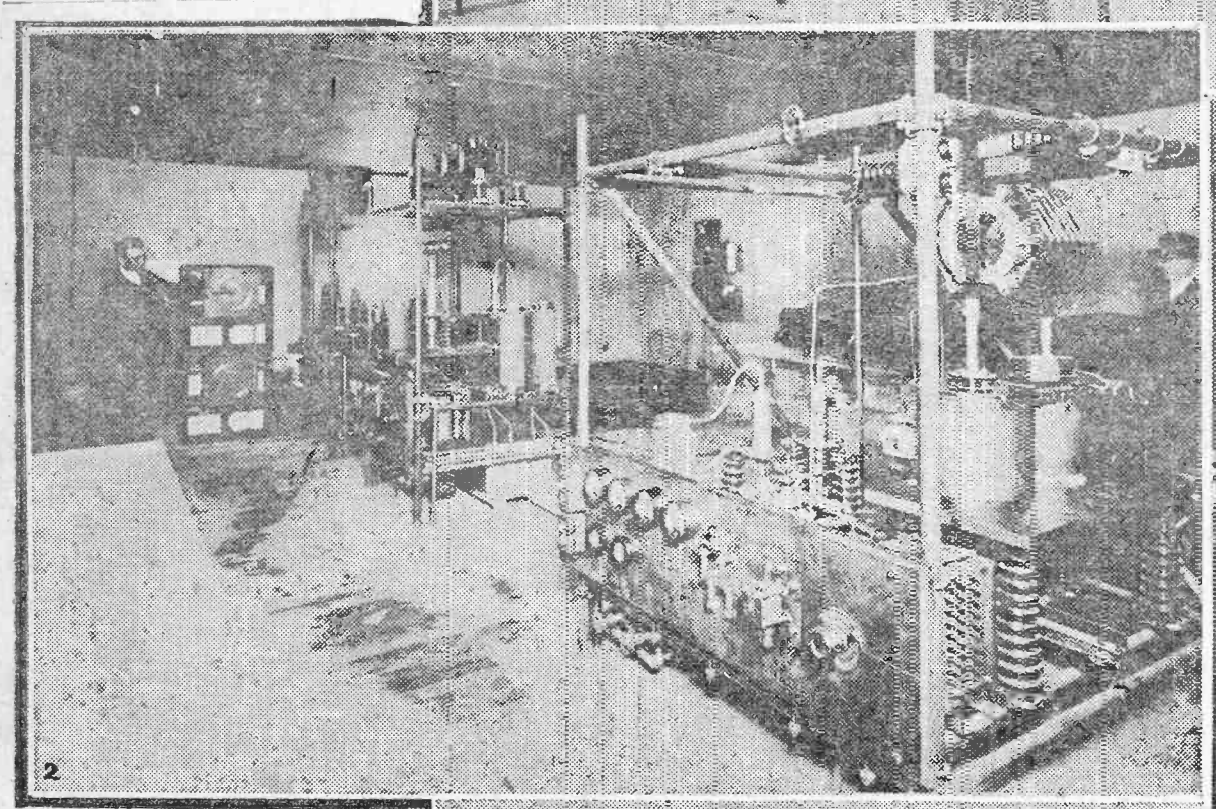
The transmitting set at Hastings consists of three panels, as follows: the rectifier panel, the modulator panel and the oscillator panel. The rectifier converts the high voltage A. C. current received on the antenna to high voltage D. C. for the plate circuit. The modulator, with its accessories, impresses the voice-frequency on this high voltage D. C. current before it goes to the oscillator. Finally the oscillator converts the high voltage D. C. current into radio-frequency in which form it is delivered to the antenna.

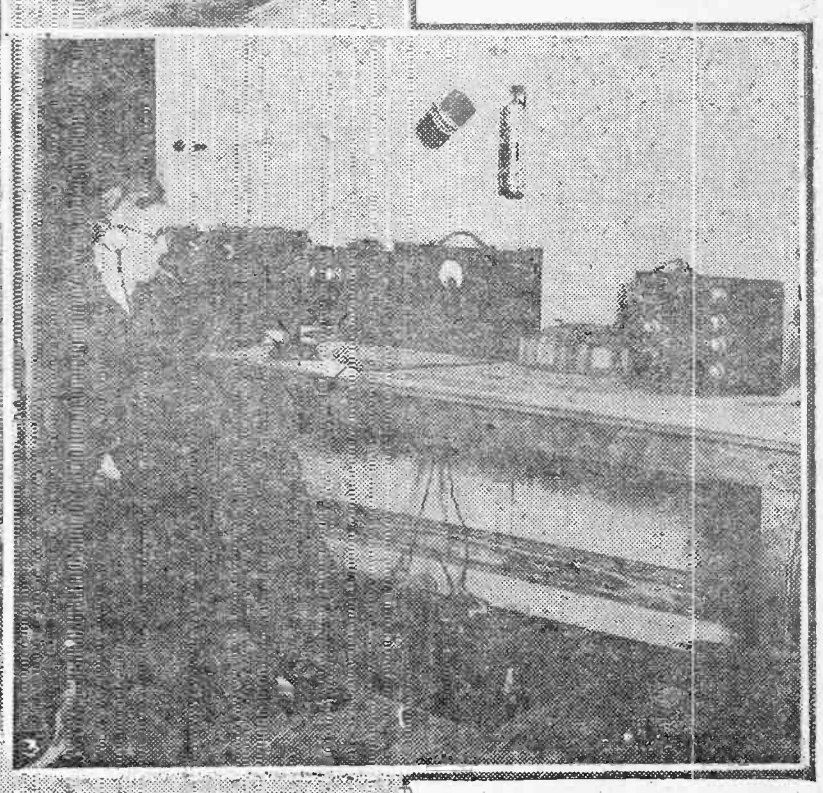
For local broadcasting a studio has been suggested in the main business section of Hastings, which will be connected with the station by means of telephone lines.

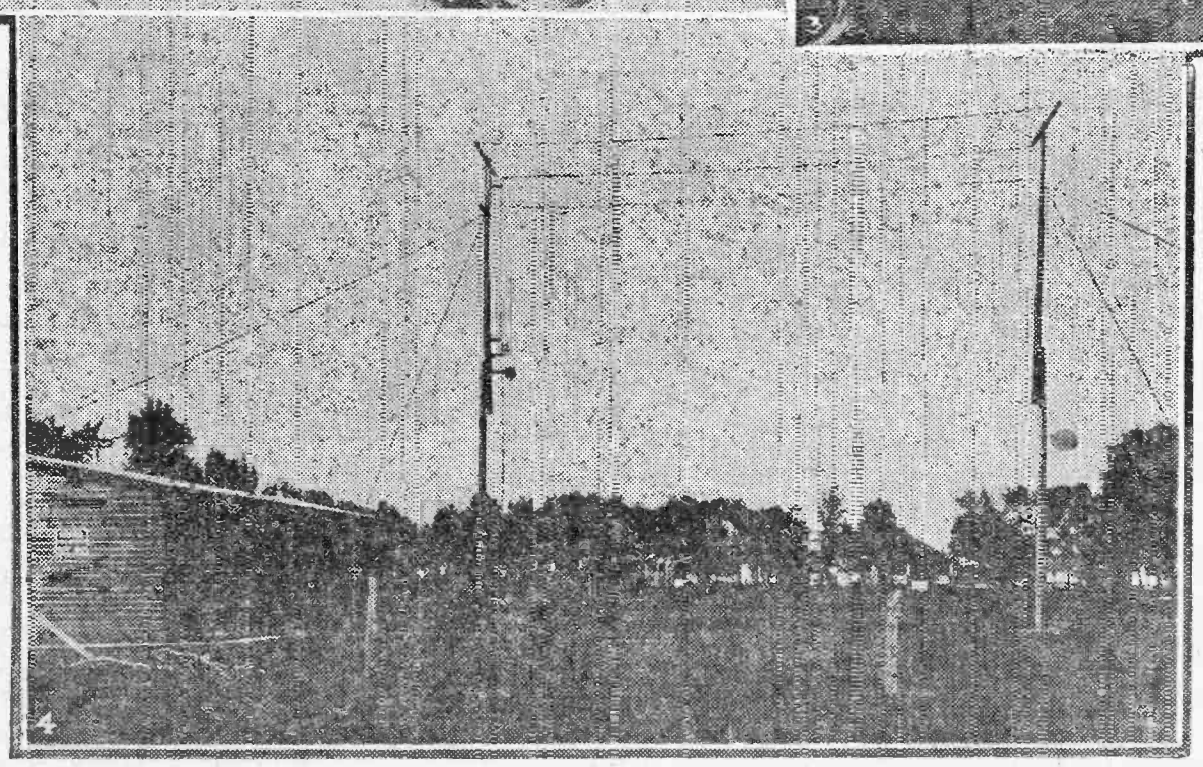
The studio, if built, will compare favorably with any eastern studio, and a special type of condenser transmitter will be installed to insure good tonal quality.

Because of the establishment of this station, Hastings, the little town in the middle west, now has a radio station that compares favorably with any transmitter in operation. In power, pick-up tone and other radio qualities it ranks in efficiency with KDKA, acknowledged today to be the finest broadcaster in the world. Station KFKX, whatever may be its fate, will always live in radio history as the first relaying and re-broadcasting station in the world to be established for practical daily broadcasts.









Here are the first published pictures of the Westinghouse new radio relay station at Hastings, Neb. The upper picture (No. 1), shows the room where the monster tubes are located. No. 2 is a view in another part of the operating room. No. 3 shows a station official listening in on the reception as a check. The antenna system is shown in Fig. 4.

U. S. Completes Tests on Freqency Amplifiers

The United States bureau of standards has issued a pamphlet dealing with measurements of voltage amplification in audio-frequency amplifiers. This circular gives actual results of voltage-amplification measurements made on 16 L. F. amplifiers on the market during 1921-22, all the amplifiers employing transformer coupling.

The measurements were taken over a frequency-range of 400 to 2,100 cycles per second.

The different pieces of apparatus are, of course, referred to by a reference number, not by the name of the manufacturer.

It is believed that the examples given in this report will be of assistance to manufacturers in testing and describing their own products, and it seems that a similar system in this country would probably be beneficial, and would lead to improvements.

Hawaii Gets U. S. Music by Relay

Radiophans in the Hawaiian islands have for some time had the pleasure of listening to programs from "the good old U. S. A.," rebroadcast from the station of the Honolulu Advertiser. Usually these programs come from KHJ and KFI, both in Los Angeles and both equipped with 500-watt transmitters.

Recently a new record was made with the rebroadcasting of a late program from WHB, at Kansas City. This station is also equipped with a 500-watt transmitter and its well-known slogan, "The Heart of America," has been heard from coast to coast. On this particular occasion the engineer in charge of the Hawaiian station said that WHB's signal strength was exceptionally good and its modulation perfect.

The rebroadcasting arrangement is as follows: At the Koko Head station twelve miles from Honolulu, is a receiver consisting of three stages of radio-frequency and a standard short wave set, fed from a combination of a beverage and horizontal antenna. The signal is then amplified with one stage of audio-frequency and one stage power-amplification, and passed thru twelve miles of telephone line to the city of Honolulu, where it is put into the modulating circuit of the Honolulu Advertiser's transmitter (KGU). The distant signal thus actuates the local station and provides coast programs to the enthusiasts in the islands of the Hawaiian group.

Stranded Wire Aerial

There are several designs of stranded wire aerials on the market. One of the most efficient consists of sixteen strands intertwined in a flat forma about one-quarter of an inch wide. It enables one to use a shorter aerial where conditions prevent the long single wire.

Don't Overwork Tubes

Detector tubes should be given frequent rests and not kept constantly at work. It is best to have two or more tubes and work them alternately.

Haste in Construction

Hurriedly constructed sets seldom give good service. Better proceed slowly and carefully. It pays in the long run.

How to Tune Hazeltine's Neutrodyne Receiver to Get Clear Reception

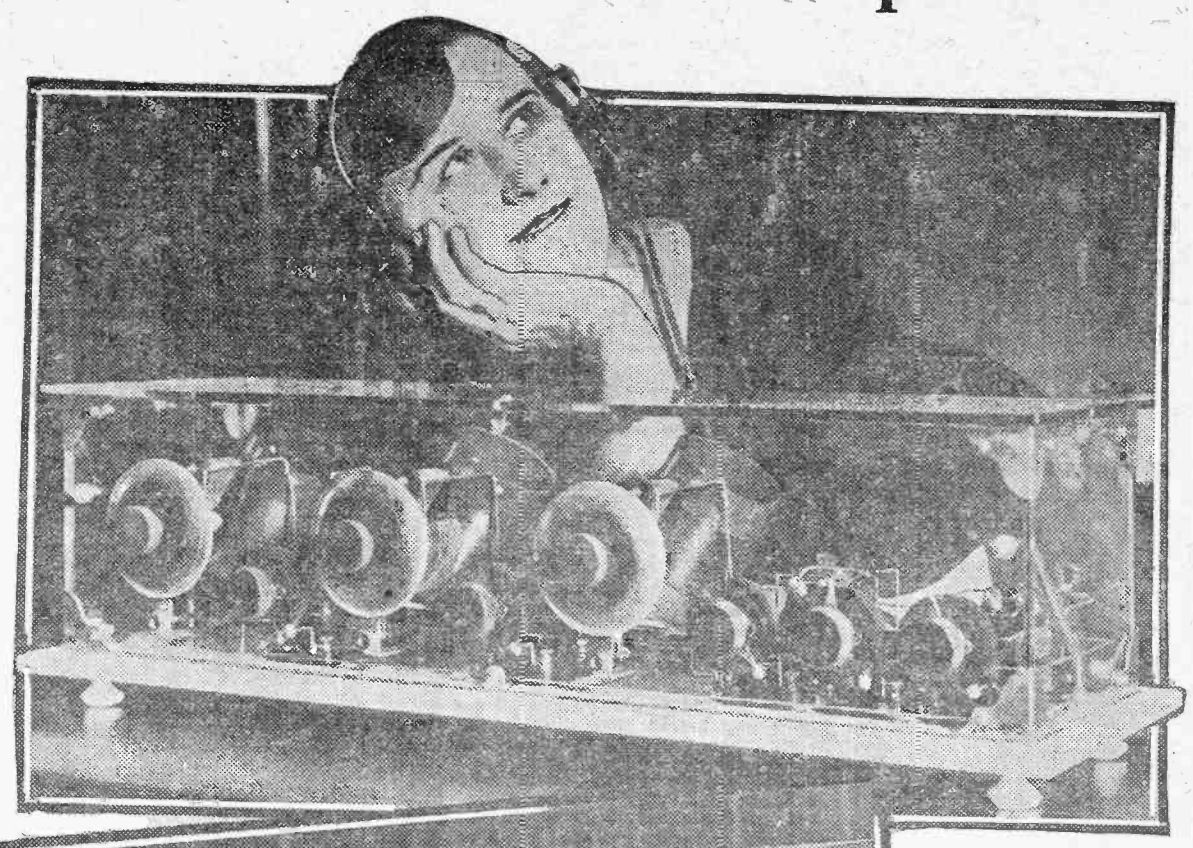
THE world seems to be crazy over the Hazeltine Neutrodyne circuit. Everyone is building it. Wherever one finds twenty homebuilders, however, at work on one of the sets one also finds about eighteen homebuilders having trouble. This article is designed to point the way to the successful operation of the circuit. Also some points are given on the construction.—The Editor.

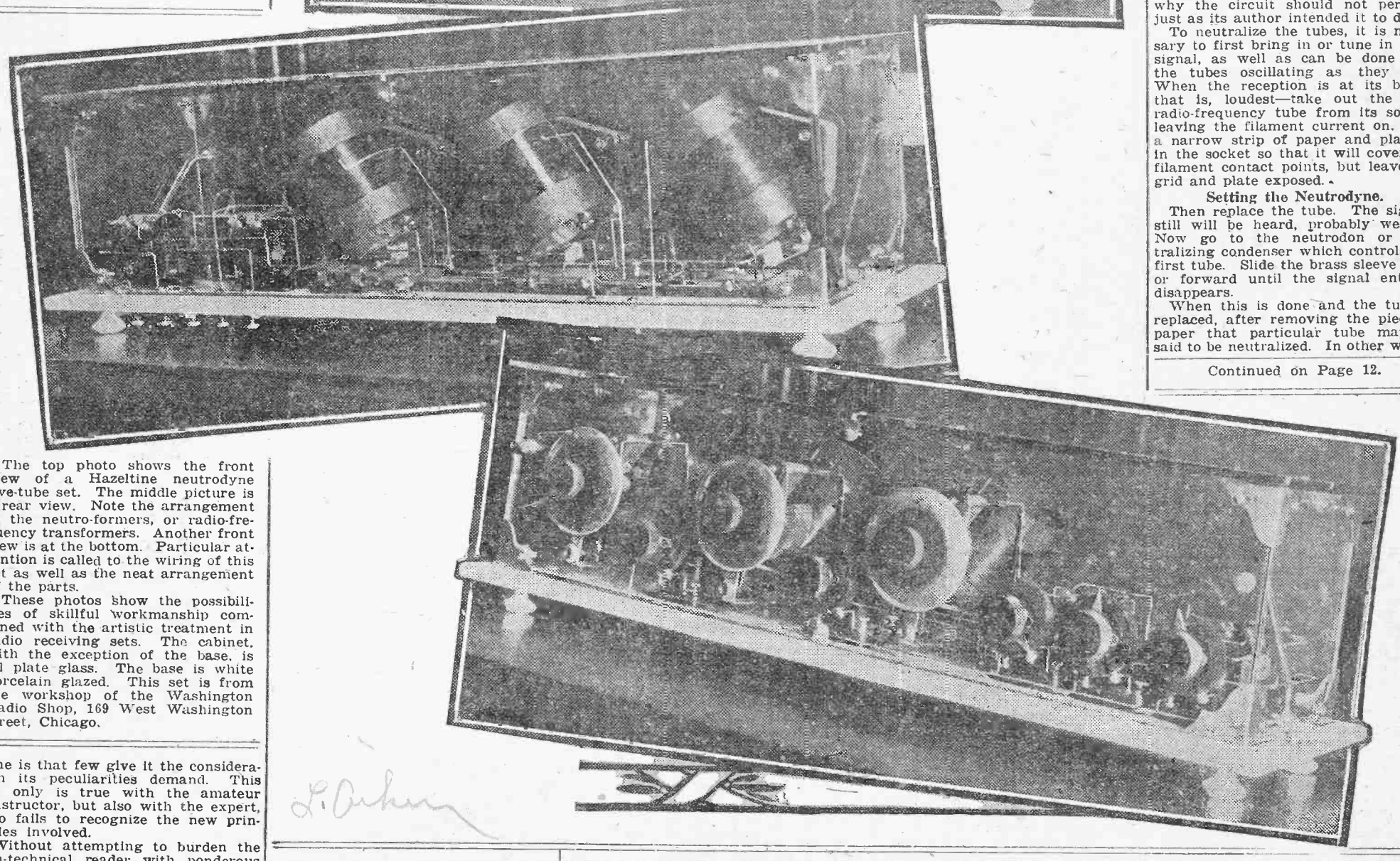
HAZELTINE'S neutrodyne circuit, perhaps, is the most praised and the most abused of all hook-ups demanding the public's attention just now.

It is praised because those who have had success with it have had a wonderful success. It is abused because those who have failed to achieve anything have failed completely.

The neutrodyne circuit is a wonderful circuit—if it is constructed properly, from properly selected values and operated efficiently. It IS a negative proposition if any one of these factors is omitted.

The chief trouble with the neutrodyne is that few give it the consideration its peculiarities demand. This not only is true with the amateur constructor, but also with the expert, who fails to recognize the new principles involved.





The top photo shows the front view of a Hazeltine neutrodyne five-tube set. The middle picture is a rear view. Note the arrangement of the neutro-formers, or radio-frequency transformers. Another front view is at the bottom. Particular attention is called to the wiring of this set as well as the neat arrangement of the parts.

These photos show the possibilities of skillful workmanship combined with the artistic treatment in radio receiving sets. The cabinet, with the exception of the base, is all plate glass. The base is white porcelain glazed. This set is from the workshop of the Washington Radio Shop, 169 West Washington street, Chicago.

Without attempting to burden the non-technical reader with ponderous outbursts of the Hazeltine theory, let us get an understanding of just what the Hazeltine circuit is intended to accomplish in a few simple words and then apply the means given us by the inventor to accomplish those results.

What Neutralizing Means.

One of the serious factors in any regenerative circuit is the tube capacity. The more regeneration employed the louder the howling and screeches of the tubes. The Hazeltine idea seeks to balance out this inherent capacity of the tubes as well as all the stray capacities of the entire set, thereby eliminating the distorting oscillations and regeneration.

There are some other factors involved, but those given will suffice for our purpose here. If the novice will just recognize the goal that Mr. Hazeltine has sought, his troubles with the circuit will begin to fade away.

Prof. Hazeltine argued that if these capacities, particularly in the vacuum tube, could be made negligible, there would be a quieting effect in the circuit.

Fixed and variable condensers will perform this balancing very efficiently in certain parts of the circuit, but when it comes to the tube the capacity is so small here there was no known condenser that would act as a neutralizer. Therefore Prof. Hazeltine devised a neutralizing condenser that would fulfill his requirements.

Smallest of Condensers.

This condenser is of the smallest value known to radio practice. It consists of two short pieces of copper wire, insulated, so attached to a support that their two free ends almost touch. Over these two insulated wires a small brass tube or jacket is slipped. It slides back and forward over the two loose ends of the insulated wires. That is all there is to the backbone of the circuit.

This all sounds simple and it is simple. However, these tiny condensers work wonders when brought into play in the radio-frequency portion of the circuit and their efficient operation, which requires patience and carefulness to the extreme, is the secret of the success of the Hazeltine circuit.

The regulation Hazeltine circuit consists of two stages of radio-frequency, a detector and two stages of audio. There are many variations. More stages of radio are employed in some cases and in others only one stage is used. Additional audio also is attached. However, neither of these additions really is necessary, since the two stages each of radio and audio give sufficient volume and range to suit the most supercritical radiophan.

Then there are hook-ups employing the neutrodyne principle that use the reflex idea and even the Grimes inverse reflex principle, with more or less success.

Tubes Must Be Neutralized.

When the Hazeltine principle is utilized in a circuit the first step to take in getting good reception is to neutralize the tubes used. In the ready-made or manufactured sets, where the tubes come as a part of the equipment this neutralizing usually is done at the factory. In sets that are home-made, or in sets where the tubes do not accompany the apparatus the neutralizing must be done before the Hazeltine circuit is working as it was intended.

If this step is not taken the tubes are going to howl with just as much volume as any other set and there will be distortion in the audio output, if the operator is lucky enough to get that much volume out of his received signals. Usually the signals are too weak to be heard in a loud speaker, even on local stations. Outside stations seldom push thru at all.

It is just this sort of reception the average radiophan has with the neutrodyne. And yet there is no reason why the circuit should not perform just as its author intended it to do.

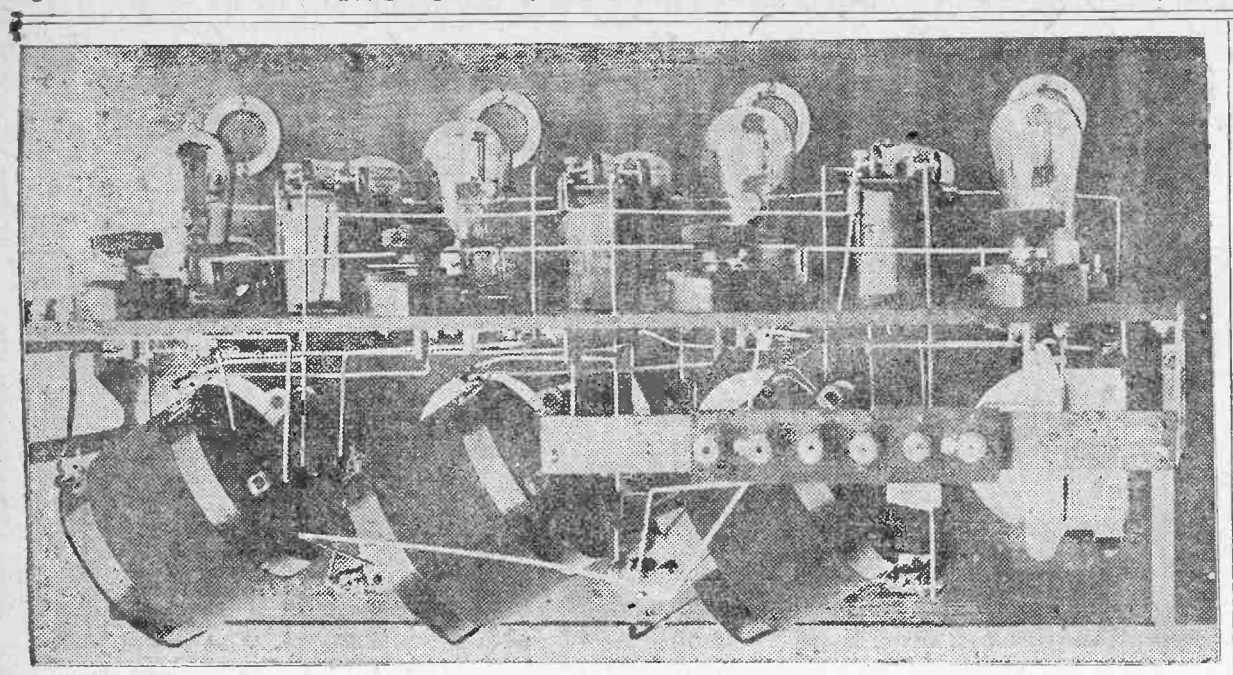
To neutralize the tubes, it is necessary to first bring in or tune in some signal, as well as can be done with the tubes oscillating as they will. When the reception is at its best—that is, loudest—take out the first radio-frequency tube from its socket, leaving the filament current on. Cut a narrow strip of paper and place it in the socket so that it will cover the filament contact points, but leave the grid and plate exposed.

Setting the Neutrodyne.

Then replace the tube. The signals still will be heard, probably weaker. Now go to the neutrodon or neutralizing condenser which controls the first tube. Slide the brass sleeve back or forward until the signal entirely disappears.

When this is done and the tube is replaced, after removing the piece of paper that particular tube may be said to be neutralized. In other words,

Continued on Page 12.



A NEAT PIECE OF WORKMANSHIP ON A NEUTRODYNE.

Describes Reflex Theory in Three Different Circuit Hook-ups

By WILLIAM J. SCHNELL.
(Radio Engineering Staff Electrical Research Laboratories.)

TO THE average radio enthusiast a certain amount of interest is derived from his radio adventures in the form of building and operating of his own receivers. Satisfying as this may be, a particular desire is evidenced by many in not only building their sets and successfully operating them, but after accomplishing these points their radio appetites are usually whetted to the extent of being anxious to understand some of the whys and wherefores of the functioning of their receivers.

To the prospective builder also appeals the knowledge of the characteristics of various receivers in order to equip him better in his selection of the circuit for his receiver. It is to these particular classes of the radio public to which this article is particularly directed. However, it is hoped that some benefit may be gathered from it by all.

The Principle of Reflex Method.

The principle of the reflex circuit depends on the ability of a three-electrode vacuum tube to permit currents of different frequencies to pass thru it at the same time. The frequency of the currents induced in a radio antennae system are of a very high order or very rapid in their cyclic changes, varying in value from about 500 to 1,000 kilocycles per second (depending on wave lengths). This incident current in the antenna system is what is generally termed the radio-frequency currents.

It is not possible to cause such high frequency currents in this rapid changing form to actuate directly on a device to convert electrical current variations into sound waves—(receivers).

In a reflex system these incident currents (radio-frequency) usually are amplified by a three-electrode vacuum tube amblifier of radio-frequency currents to increase their intensity before impressing them on to what is termed the rectifier or detector, which acts to convert these high frequency currents into currents of audible frequency.

After rectification, being made audible, these currents are then amplified as were the radio currents by a three-electrode vacuum tube.

WILLIAM J. SCHNELL.

When the Circuits Differ.

It is herein where lies the difference and particular advantage which the reflex system offers over other systems. In other systems after rectification the rectified radio or audio currents are amplified by additional tubes for this purpose. In a reflex system before these input radio-frequency currents are rectified they are reflected or reimpressed back on the tubes which amplified them at radio-frequency, and, when rectified, are re-amplified at audio-frequency before being passed on to the receivers or loud speaker to be converted to sound waves.

Principally, this means a considerable tube and also other apparatus economy which would otherwise be required for these additional tubes as used in other than reflex systems.

As will be pointed out in a latter part of this article, if properly designed and built, more than vacuum tube economy can be secured from the method of reflexing as employed in radio receivers.

Various Reflex Methods.

There are a number of methods of utilizing the reflex principle, among which are the progressive plural tube reflex wherein the reflex action proceeds from the input to the output tube in direct progression and where the reflex action is performed in more than one tube.

Then there is the so-called inverse duplex system wherein the reflex action is not tube progressive, but is inverted back toward the input tubes.

In the Erla circuits the reflex action is progressive from the input, but only is utilized in one tube. That is in the other above-mentioned systems the reflex feature is made to actuate in more than one stage of tube.

Due to the complexity and intricateness of controlling currents of the order of radio-frequencies it is not possible to successfully stabilize a system wherein the reflex action is included in more than one stage. It is not a matter of balancing the loads in the various tubes, as it can be readily shown that the loads caused by any audio signals on the tubes in these circuits are never such that the few micro-watts of radio signals additionally impressed upon them would overload them, as has been many times stated.

Impracticable Reflex Circuits.

In the systems wherein the reflex action has been extended to more than one stage it would be necessary to add considerable adjustments to control the currents in their relations to one another in the various circuits before anything like successful operation would be secured. Due to these complications such systems are not considered practical.

As has been stated, in all reflex systems radio-frequency amplification is employed. In general there are practically two forms of using vacuum tubes as radio-frequency amplifiers, i. e., the coupling transformers may be either tunable or the tuning of thse transformers is so-called fixed.

In the tunable type the transformers are so designed that they may be tuned usually by a variable condenser. In the other type (tuned) the transformers are so designed that they represent a certain tuning over a certain range without tuning. As is evident, the latter are "broad," or if employed in a receiver would mean for unselective reception.

Selectivity Is Necessary.

In these times of a great number of broadcasters operating on and extending over a considerable broad wave band, selectivity in a receiver is of prime importance, as every radio enthusiast appreciates. The feasibility of endeavoring to secure anything like selectivity from such radio-frequency coupling transformers as the so-called tuned type is likewise only too well known by those who have attempted it.

Therefore, it is imperative that if selectivity in a receiver is to be had where radio-frequency amplification is employed, the coupling transformers in such an amplifier must permit tuning adjustment by a variable tuning device such as a variable condenser.

Because the transformer is actually tuned to the signal with this type of radio-frequency amplification, not only great selectivity is obtained but greater amplification likewise is secured.

No transformer which is designed to have fixed tuning (so-called tuned) does not require tuning, can operate successfully either in this form or even if a variable tuning device is added to it, because this design will not permit of it. Therefore, the radio-frequency stages in the receiver should consist of transformers which are tuned variably and with transformers which permit tuning.

How to Control Circuit.

Either a vacuum tube, two or three-electrode, or any of the many forms of crystal and like rectifiers of high frequency currents, can be used a rectifier, we are told, in a radio receiver. However, in a reflex circuit due to the particular location in the circuit and inherent characteristics of the detector, a crystal rectifier will be more satisfactory.

By the use of the proper crystal rectifier an excellent controlling effect on the stability of the entire circuit may be had. This feature is not generally known, but is demonstrated in the stability of the circuits using this form of a detector. This point has been brought out time and again in laboratory analysis.

Not every crystal rectifier which might possess high rectifying properties will be found the best for this purpose, due, as has been mentioned, to the fact that the crystal can be made to provide a stabilizing effect on the reflex action of the circuit. The fixed type of crystal naturally requiring no adjustment (if correctly designed) affords the best form of rectifier for the reflex circuit.

Transformers of Special Design.

Another point of interest which was first announced by the Electrical Research laboratories in their development of reflex circuits and, likewise not generally known, is the fact that not any and every audio-transformer can be used in a reflex circuit. This can be realized by the fact that due to the fact that in a reflex circuit the audio-transformer is associated with the radio-frequency currents of the circuits it requires a design and construction differing from the regular audio-transformer to permit of efficient operation of the reflex action.

No attempt will be made here to outline the phenomena responsible for this, as this would lead into technical phases not generally understood by the lay person, but suffice it to state that experimentation with this feature soon will qualify this statement.

In the foregoing we were told of the action of the reflex principle and were pointed out the various methods of performance and the advantages and disadvantages of each. We will now summarize our findings into the requirements of a reflex receiver for practical, successful and efficient operation:

1. The reflex action should not be extended to more than one tube for stable operation.
2. Straight radio or straight audio added is desirable, but not more reflecting stages.
3. The radio-frequency amplifier should be of such construction as to permit of variable tuning if selectivity and maximum amplifier efficiency is to be obtained.
4. A crystal rectifier of the correct design will afford the most efficient rectifier for the circuit.
5. The audio-transformer is of prime importance in the maximum or reflex action.

Designs Three Circuits.

We will now discuss in general the circuits developed by the Electrical Research laboratories and how they offer various choices to the radio enthusiasts and at the same time permit of the maximum in our requirements as enumerated above.

There have been three reflex circuits so far released by the Electrical Research laboratories and in order to secure success for these circuits the design of the exacting apparatus for these circuits also was developed.

These circuits comprise one, two and three-tube combinations. The one tube circuit consists of one stage of radio-frequency amplification, one stage of reflexed radio-frequency amplication and one stage of audio-amplification wherein a crystal is utilized for rectification and stability. It was shown in diagram form and described in last week's Radio Magazine Section.

This combination affords the maximum of satisfaction obtainable from one tube—affording loud speaker operation on all local signals and likewise ample volume on distant signals.

The two-tube circuit consists of one stage of straight radio-frequency amplification, one stage radio-frequency tuned and one stage of reflex radio-frequency with one stage of reflexed audio-frequency amplification wherein likewise a crystal is employed for rectification.

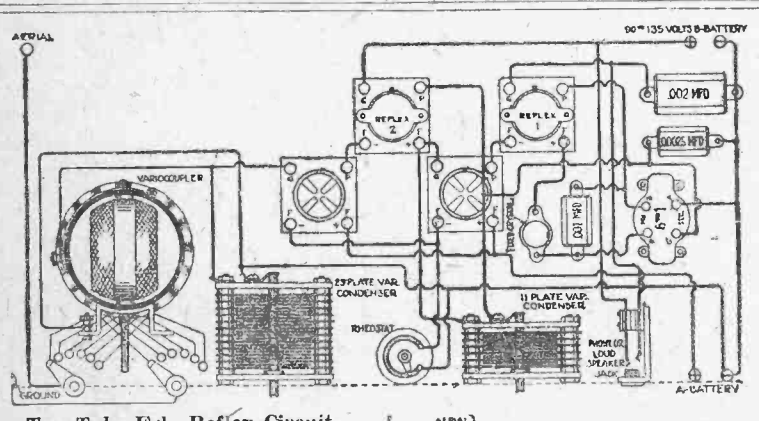
Brings High Selectivity.

High selectivity sensitiveness and volume is obtainable from this combination. The three-tube circuit is the same as the two-tube circuit with the addition of one stage of straight audio-amplification. This affords all the advantages of two-tube circuit and as regards selectivity and sensitiveness with the addition of surplus volume.

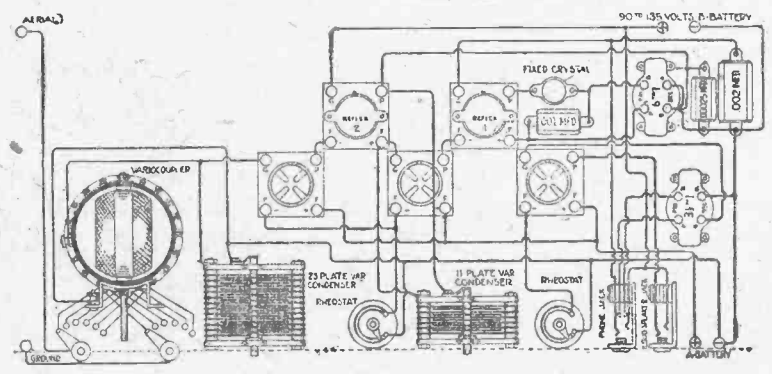
Tube for tube, greater efficiency is possible with these circuits than in any other combination.

An analysis of our first part of this discussion on the effects of the various forms of reflex circuits and later the combinations for correct operation and these together with our requirements, compares with the characteristics of the Erla circuits will evidence the efficacy of these circuits.

There is no question that the reflex principle as applied to radio receivers is in line with the progress toward the ultimate receiver. It is not a question of what performance a receiver gives alone, but what performance per tube, other equipment, operation and reproduction will have the main bearing.



Two-Tube Erla Reflex Circuit.



Three-Tube Erla Reflex Circuit.

Makes Super Flewelling Selective

Efforts to design a circuit for a radio telephone receiving set that with the least amount of equipment would produce the greatest amount of volume, greatly advanced thru the development of the Flewelling circuit by E. T. Flewelling, radio engineer, are given further impetus by the announcement that this circuit had been improved by the addition of what a Chicago radiophan terms an "equilibrator" coil.

The improvement, it was stated, more than repaid for the addition of another control device to the set, thru the increased selectivity and slightly additional volume.

Altho the theory of the "equilibrator" coil, sometimes termed "reaction stabilizer," is not new, having been developed in a "four-circuit tuner" receiving set invented by Laurence M. Cockaday, radio engineer, the fact that it has been combined with the Flewelling "flivver" circuit, was considered at least a small advancement.

Connecting "Equilibrator."

The "equilibrator," which acts as a balancing device, is not directly connected to the remainder of the circuit, being made up of a movable induction and coil shunted with a variable condenser and placed in the magnetic field of the primary circuit.

Speaking of his improvement, the designer said:

"Owners of receiving sets using the Flewelling theory of operation may greatly improve their reception by the addition of the 'equilibrator' coil. The coil, with the variable condenser connected in series to tune it to the various wave lengths, may be of the honeycomb type as recommended for the primary and tickler circuits of the regular receiver. It may be of any size from 35 to 50 turns of wire, while the condenser should have a capacity of .0005 microfarads, or twenty-three plates, and preferably be one with the vernier attachment.

How Coils Are Mounted.

"The coil should be so mounted as to be in an adjustable relation to the primary coil, that is, so that the coupling may be caried to any degree, similar to a tickler coil. Unlike the Cockaday circuit, in which the stabilizer coil is fixed, the 'equilibrator' coil is adjustable, adding to its selectivity.

"Adjustment of this coupling frequently results in tuning out of one broadcasting station and the bringing in of another without adjustment of the remainder of the circuit.

"While only a slight increase in volume is noticeable, probably not more than 10 per cent, the fact that the 'equilibrator' tends to produce probably a 50 per cent increase in selectivity of the Flewelling circuit, is its favorable point. Its addition probably produces a slight change in the action of the main circuit, making it possible to use tighter coupling on the tickler coil, thereby giving louder signals and increasing selectivity.

"No changes are necessary in the Flewelling hook-up, outside of the replacement of the two-coil honeycomb with one that will hold three coils to accommodate the 'equilibrator.'"

Condenser Eliminates Body Capacity

The Crosley variable condenser has been so designed as to provide direct positive metallic contact with the charging plates of the condenser, thus eliminating the serious contact resistance which is introduced by spring and friction contacts in the usual form of variable condenser.

The internal resistance, caused by imperfect contact between the plates and spacing washers of the rotary and stationary members of an interlocking condenser, is eliminated in this condenser, so its makers claim.

Not only has the Crosley type condenser many factors designed to improve the overall electrical efficiency, but the arrangement of the plates is such that a minimum electric field is produced around the condenser. This condition is of importance where condensers are employed in circuits which require very delicate and precise adjustment.

The Crosley condenser depends upon a thin sheet of high di-electric material as insulation between the plates. As there is no friction from the opening and closing of the plates, the insulation will last as long as the condenser.

Tests have shown the maximum capacity to be less than .0008 Mf. This frequently runs better than .001 Mf. They are conservatively rated at .0005 Mf. (Price, $2.25. Made by Crosley Manufacturing company, Cincinnati, Ohio.)

Pays to Insulate Lead-In.

It is always a good practice in bringing a lead-in into the house not to let it touch anything. If the lead-in touches any metal, some of the signal strength will be absorbed. In some cases where the lead-in touches wood there is not much difference in the signals; however, when it rains, the wood has the same effect as a metal object.

Long-Distance Hounds

Seeking to get in as many stations as possible in a given time is not good operation. Hastily tuned in signals are never clear and satisfactory. Tune slowly, get the best of the signal strength and sit back and listen in comfort.

Autoplex Circuit Insists on Having Certain Values in Parts Used in Hook-up

So many requests from readers for further suggestions on the new Autoplex loud-speaker, one-tube receiver have come in this week Mr. Wells has undertaken to gather together all the perplexing questions and answer them in the following article.

By IVERSON C. WELLS.
(Radio Editor Chicago Evening Post.)

MUHLEMAN'S new Autoplex one-tube loud speaker receiver, which was illustrated and described in these pages last week, is making a hit with the radiophans. Judging from the mail received, everyone in Chicago seems to be building one of these receivers.

Most of the home-builders had an instant success. However, there were quite a number who wrote in and complained of poor luck with the set. Many could get only the stations on the low wave lengths. Others failed to get anything outside of Chicago. Many declared that reception was possible only with headset. A few even failed to get any reception at all.

In every case, where the trouble was traced back to its source, it was found that just one mistake was made by each and every unsuccessful home-builder. This may be summed up in these few words: They failed to follow implicitly the printed instructions.

The Importance of Values.

That usually is the cause of most all radio trouble. Circuits are worked out from fundamentals. Variations of these fundamentals give the numerous "new" hook-ups. All circuits require certain, determined values. The further away from the beaten path of standard circuits these new hook-ups stray the more critical are the values and constants, it would seem.

The chief source of complaint in the Autoplex comes from the type of variometers used. Two faults are found in most of the apparatus employed. Either the variometers are not of the high-ratio inductance absolutely demanded by the circuit, or they do not have the proper winding for the wave lengths sought.

I sought to make it clear last week that the variometers must be of the type which have the stator wound inside of the mounting. The other type will not do and you are wasting time experimenting with it. Any good variometer will answer, provided it answers the above requirements. If you do not know just what variometer to purchase tell your dealer what you want and he will supply you. Just mention that it is for The Chicago Evening Post Autoplex circuit. He will understand.

Loading Up the Set.

Now, as to the wave lengths. If you are getting only the low wave length stations the addition of two coils in the grid and plate circuits will raise the same to the proper value.

If you have a set of honeycomb coils these will do fine. If you have not then wind some coils yourself. Procure two pieces of fibre or composition tubes about three inches in diameter and two inches in length. The composition is the best. Wind about fifty turns of No. 22-DCC wire on each of these coils. If you use the honeycomb coils start with fifty or seventy-five turn coils.

No set number of turns can be given you on either of these two type coils. The winding of your variometer determines the windings on these coils. So, you will have to experiment to obtain the proper value.

If you wind your own coils try the seventy-five-turn size. If this is too much, and probably it will be, take off enough turns to give you the right wave lengths. If not enough, rewind the coils with more wire.

If you use the honeycomb substitute various combinations until you reac hthe proper value.

These coils are called "loading" coils. They load up the circuits to the proper wave length.

How to Insert Coils.

One of the coils is inserted in the grid circuit, between the grid lead of the variometer and the grid post of the tube. Another is inserted between the plate post of the tube and the plate lead of the variometer. By reference to accompanying schematic diagram, which is an enlargement of the smaller one given last week, you will note an "X" marks the location of these loading coils.

It is not advisable to mount this set permanently until you have experimented with it a little. Do not be too impatient. Lay your parts out on a board and wire them up temporarily. Later, when you have struck the right hook-up and values, it will be ample time to put the parts in a cabinet, and on a panel and wire up permanently.

It is for this reason that I have not gone into construction details to any extent. The Autoplex, as I said last week, is still in the experimental stage. It appears to have a "something" about it that offers many, many possibilities, but this may pass off into vapor when the dispassionate test of practicability is applied.

Construction Details Next Week.

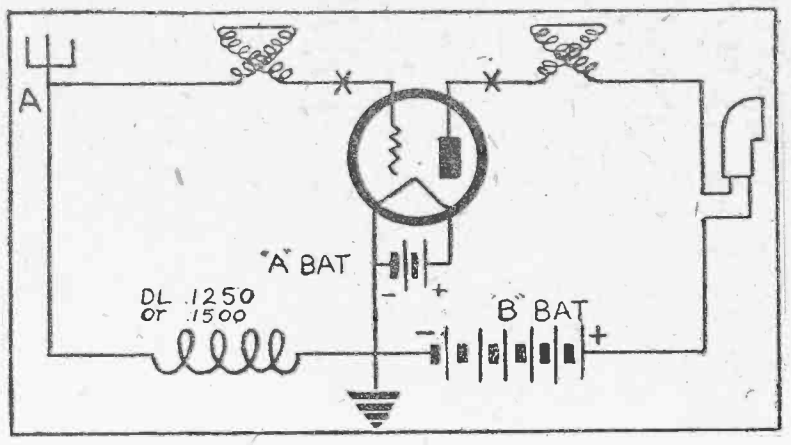
Next week I may give complete construction details for the panel and cabinet, with permanent wiring plan. In the meantime do as I am doing—experiment with the Autoplex and try to find out something about its pecularities.

The next serious mistake experimenters who read last week's Radio Magazine made, is in the vacuum tube used. I was very explicit in the specifications on this point. I told you that Mr. Muhleman had determined that the 216-A tube worked best, with the VT-2, and C-301A or UV-201A as second best.

The other tubes do not seem to work so well. However, you might try what you have on hand. You might have better success. Radio is a freaky thing. Some of us get poor results with the same parts, while others get good results. Location, conditions of circuit, differences in wiring and construction, and many other factors enter into the problem.

Whatever tube you employ be sure that the rated voltage from both the filament and plate circuits is used, and on the "B" or plate battery give the tube all it can stand.

There is one thing sure, however, and that is this: Sufficient volume to operate a loud speaker cannot be obtained from a low-capacity tube. You might just as well save yourself trouble and time by not trying them in this circuit.



This is the schematic diagram of the Autoplex circuit. In case your variometers do not give you the higher wave lengths, insert honeycomb coils at the points marked "X" in the grid and plate leads. These coils may be 50 or 75 turns each.

Some Pointers on Tuning.

Now, a few remarks about tuning: Turn on your filament current. Starting at zero on the variometer dials move them toward 180 degrees both as near the same time as possible. Try to keep the scale readings just about the same on each dial.

A keen, or high-pitched, whistle should come in. I tune with the loud speaker but many may prefer to use the headpiece, altho it will be hard on the ears.

This whistle will continue until you have made the right adjustments. Then suddenly the station signal will be heard as you move the dials forward. Only a slight adjustment of the variometers—a backward or forward movement of the dials, will clear up the reception.

There is a feature about the Autoplex which must be considered in tuning. You will discover early that station signals will come in at several points on the variometer dials. Just one of these is the best, and will give the clearest and loudest reception. You may have to readjust the dials until you can find this spot.

The Autoplex can be used with and without a ground, and also with just a ground connection. If you use the ground connection alone, connect it to the aerial post. I find that by using the ground I eliminate a lot of the noisy noises characteristic of this and all other "supers."

Next week, in addition to giving you the construction details and complete working plans, I propose to give you also a hook-up for amplification. In a subsequent issue we may add radio-frequency.

Let me hear from you who try this circuit. Tell me of your successes.

U. S. Adds Radio to Mail Planes as Air Compass

Steps are under way, at the instigation of the postoffice department at Washington, to supply the government mail planes with voices and ears. The equipping of many of these planes with radio sending and receiving sets is expected to follow the completion of experiments which are now in progress, with every indication of success.

The advantages are obvious when it is realized that in time of heavy fog or severe snow storms, especially at night, a pilot might stray out of his course and find difficulty in locating his next landing station, even tho aided by the powerful electric beacon lights which have been set up along the route. If the pilots and the landing stations can talk to each other, the pilot can be accurately directed from the ground, and thus always find his bearings.

There are also times when a plane has to make an unexpected landing, or when it is desirable to report to the landing field the presence of unusual atmospheric conditions. It has happened several times that air mail pilots have been forced to land at remote and isolated spots in the Rocky mountains.

Directs Searching Parties.

When this occurs, with a radio outfit installed the pilot immediately can call for assistance, instead of waiting hours and perhaps days for a searching party to find him. It is also an advantage to be able to transmit instructions to the pilot between stations, should occasion arise.

For all these purposes, as well as others, radio equipment on the mail planes will be invaluable, in the opinion of the department.

The feasibility of using radio sets, both transmitting and receiving, on the type of plane employed in the air mail service has been established fully by preliminary tests recently completed at Schenectady, N. Y. These tests, with a de Haviland mail plane, took place under the direction of radio engineers of the General Electric company.

The radio equipment used in the tests was especially developed by the General Electric company's radio department, in co-operation with C. F. Egge, general superintendent of the air mail service, and Eugene Sibley, radio traffic supervisor. It is held to be, without question, a big step forward in the commercialization of airplane radio.

Operation Is Simple.

Powerful and highly efficient, the equipment is at the same time so simple that anyone can operate it successfully after brief instruction. In the Schenectady tests, the pilot was unfamiliar with radio apparatus, yet on every trial flight the operation was entirely successful.

Mail airplanes carry only one man, the pilot, in order to conserve space for the "paying load," i. e., the mail. This means that the pilot must operate the radio equipment in addition to his duties in flying. Consequently, the equipment must be practically as easy to operate as an ordinary telephone. That this requirement has been fairly well met was demonstrated by the tests at Schenectady.

The pilot, in order to talk, merely throws the switch handle, conveniently mounted under his seat, to the transmit position and turns a large knob—the antenna variometer—until the ammeter mounted on the board in front of him shows a maximum reading. That is the whole process of tuning the transmitter. After he has done that once, he locks the knob in position, and it is only necessary to throw the handle from "transmit" to "receive," as desired.

Super-Heterodyne Circuit Used.

The receiver is of the "super-heterodyne" type, so selected because of its sensitivity and high selectivity, the latter reducing engine noises and other interference to a minimum. While the seven-tube "super-heterodyne" receiver sounds complicated, in reality this one is very simple. Dut to its special design, there are only two knobs necessary to adjust in tuning.

It is not possible to "duplex" on the plane, as with an ordinary wire telephone, altho this may be done, and, in fact, was done at the landing station. The pilot must throw his switch back and forth to talk or listen, but that requires only a fraction of a second. The new famous XL, or thoriated tungsten filament, tubes are used thruout, and contribute largely to the successful operation and high efficiency of the apparatus.

The transmitter utilizes five fifty-watt XL tubes similar to the UV203-A, and the receiver utilizes seven UV199 tubes, which operate entirely on dry cells.

The high voltage necessary for the plates of the fifty-watt transmitting tubes is supplied by a fifty-two pound, 700-watt dynamotor, operating from a 12-volt battery, and delivering direct current at 1,000 volts. The storage battery charges continually while the engine is running in exactly the same manner as the starting battery of an automobile.

Plane Trails Its Antenna.

The antenna for the mail plane radio equipment consists of a 200-foot trailing wire. This is carried on a special reel in the cockpit, and let out when the plane takes to the air. A counterpoise, consisting of the engine, gas tank and all the struts and wires of the plane, connected together by bonding straps, is used for the ground connection.

During the time the installation work for the preliminary tests was in progress it rained constantly for two days and nights. As the equipment was only covered by canvas, it became thoroly saturated with moisture, so much so that the aluminum brackets and other parts were covered with spots, where the drops of water had evaporated.

Yet the tests went off with great success. The apparatus was tested out on the ground without being dried, and operated perfectly, no tube or other failures occurring. During one of the trial flights both rain and snow were encountered at times, neither of which interfered with the operation of the set.

The tests comprised a number of trial flights from Schenectady. The ground station was the special government call of WWS, assigned by the department of commerce. The longest flight made from Schenectady was when the pilot returned to Hazelhurst field, Long Island, an airline distance of about 175 miles, during which continuous conversation with him was carried on.

The final message received was: "I am in sight of the landing field, and am going to reel in my antenna." This came in at Schenectady strong, indicating that the equipment could cover an even greater distance, and that its normal rating of 100 watts output and 100 miles range is undoubtedly conservative.

Radio Week Nov. 25 Is to Show Value of Home Sets

Radio development takes its place as the marvel of all ages. Practically undreamed of but a few years ago, today millions know its joys.

Radio has become the greatest national home amusement and pastime. No town, village or hamlet is too small or too far away to have its many radio enthusiasts.

Thousands of those tied down to home duties who cannot otherwise know the joys and thrills of masterful musical productions now have the world's artists brought to their own firesides.

In the sports field, radio has again made life more cheerful. The best of sports can only have limited audiences but with the broadcasting of every event of importance the limits have been put away—everybody and anybody can follow the sports with a radio outfit.

In time of national danger, fire, flood or other of nature's disasters, the value of radio is indisputable.

No home is complete without its radio equipment. Every broadcasting station is planning on the finest program ever produced for national radio week, following this general outline: Sunday, Nov. 25, religious programs; Monday, Nov. 26, radio and the stage; Tuesday, Nov. 27, government day; Wednesday, Nov. 28, radio and music; Thursday, Nov. 29, Thanksgiving day, sports; Friday, Nov. 30, education day; Saturday, Dec. 1, radio in the home.

Hear Watch Tick

Bishop William Fraser Mac-Dowell's watch ticked so loudly on a recent Sunday night in addressing the Sunday Evening Club of Chicago that radio transmission of his remarks was affected, according to complaints from New York state and Milwaukee received by the club. The bishop laid his watch on the speaker's desk too near the microphone.

Keep Your Set Clean

Do not let your receiver parts or the amplifier instruments become covered with dust. Wipe off all wires and connections frequently with a soft cloth moistened with wood alcohol.

Long-Distance Records of Phans

ONE TUBE BRINGS IN DX.

Radio Editor: Your radio section is truly the scoop of the country. I don't believe there is one like it anywhere. With my one tube (WD 11) set, using the ultra-audion hook-up, I have heard the following stations:

WOC, Davenport; KSD, St. Louis; WHB, Kansas City; WWJ, Detroit; WCY, Schenectady; WSB, Atlanta; WFAA, Dallas, WBAP, Fort Worth; WMC, Memphis; WEAF, NewNew York; WIZ, New York; WCAO, Baltimore; WCAP, Washington, D. C.; WFT, Philadelphia; WOO, Philadelphia; WCX, Detroit; WOAW, Omaha; WOS, Jefferson City; WMAK, Lockport, N. Y.; WGR, Buffalo; WCBD, Zion, Ill.; WTAS, Elgin, Ill.; WLAG, Minneapolis; WTAY, Oak Park, Ill.; WDAF, Kansas City; WEB, St. Louis; WLW, Cincinnati; WSAI, Cincinnati;- KDKA, Pittsburg; and the following Chicago stations: KYW, WDAP, WPAD, WWAY (deleted), WMAQ, WJAZ, WAAF, ASH, 9 US, 9 XU and 9 DMM. I hope that your good work in radio will continue, and your paper meet with success.—George W. Alm, 3217 West Polk Street, Chicago.

USES GREBE CR-12.

Radio Editor: Got the following stations Monday night, Nov. 19, using Grebe CR-12 set with twenty-foot indoor aerial, all with loud speaker except California: WHAZ, Troy, N. Y.; WGR, Buffalo, N. Y.; WBAP, Fort Worth, Texas; KSD, St. Louis, Mo.; WOS, Jefferson City, Mo.; WOAW, Omaha, Neb.; WBAS, Minneapolis; KWH, Los Angeles, Cal.; WSA, Atlanta, Ga.; WAS, Davenport, Iowa; WXC, Washington, D. C.; WOD, Philadelphia, Pa.; WDAF, Kansas City, Mo.; KOKA, Pittsburg, Pa.; KFI, Los Angeles, Cal.; Milford, Kan., and WFAA, Dallas, Texas.—O. L. Cook, 603 Fullerton Parkway, Chicago.

WAVE TRAP TUNES OUT LOCAL.

Radio Editor: I wish to say that I read your Radio Magazine of last Thursday, and think it by far the best thing of its kind I have ever seen. There are a number of ideas in it I want to try when I get around to it.

I noticed that you intend starting a department in which we "bugs" are to be permitted to brag of our achievements, and I hope thru it to "get a line on" my set. It may be a little better than the ordinary, or it may be that my friends are not quite such good operators.

Anyhow, on Monday night, Nov. 5, from 7 to 11:30, I pulled in twenty-four stations, whose calls I actually heard, besides a few others broadcasting speeches and other longwinded stuff that I didn't wait for.

Among these stations were KFEL, Denver; KFI, Los Angeles; WBAP, Fort Worth; KGW, Portland, Ore.; WBZ, Springfield, Mass., and WSB, Atlanta. Not only did I hear the calls clearly, but in the case of KFI I listened in for over a half hour and got every word distinctly. Most of the others came in very clearly, and with very good volume.

In the middle of September I heard Dallas, Texas, seven nights in nine, and picked up Schenectady and many nearer stations nearly every night all summer long.

Mine is the straight Reinartz hook-up, using, in place of the spiderweb coil, a coupler (home-made) tapped 10-10-10-10-10-1-1-1-1-1-1-1-1-1-1, the rotor being the tickler, with forty-five turns on it, spaced about half an inch above the lower winding. I use one WD-11 and two .0005 Vernier condensers, 22½-plate voltage, and a forty-foot aerial in the attic.

There are always three 2,000-ohm headsets connected, this making it convenient, in case I have some out-of-the-way station "hooked," for the family to help catch the call letters, so that they may testify that I actually had what I claim to have had, later!

Selectivity on this set is very good, tho once in a while we have distance with obligato by Chicago, as, for instance, was the case when WJZ (?) was broadcasting the Dempsey-Firpo fight. WMAQ furnished us the music for the occasion, but nevertheless we got nearly every word. (Also a lot of excitement!)

By the way, I temporarily hooked up the wave-trap you described in last Thursday's magazine, and I've had fine results with it. It cuts out any Chicago station almost entirely, and when I get it finished I expect still better results. Thanks for the idea! Am looking forward to the next issue.—William M. Buettner, 507 7th Avenue, La Grange, Ill.

TUNES IN THIRTY-NINE STATIONS.

Radio Editor: Here is my DX record for silent night Monday, Nov. 19:

KDKA, East Pittsburg, Pa.; WCAE, Pittsburg, Pa.; WDAF, Kansas City, Mo.; WHB, Kansas City, Mo.; WHAJ, Kansas City, Mo.; WEAF, New York city; WJZ, New York city; WCX, Detroit, Mich.; WWJ, Detroit, Mich.; WBZ, Springfield, Mass.; WGY, Schenectady, N. Y.; WHAZ, Troy, N. Y.; KFKB, Milford, Kan.; WOAW, Omaha, Neb.; WMC, Memphis, Tenn.; WBAP, Fort Worth, Texas; WFAA, Dallas, Texas; 5LJ, Jefferson, Texas; WRC, Washington, D. C.; WLAG, Minneapolis, Minn.; WHAS, Louisville, Ky.; WSB, Atlanta, Ga.; WKOO, Philadelphia, Pa.; WOS, Jefferson City, Mo.; WOR, Newark, N. J.; WTAS, Elgin, Ill.; WLW, Cincinnati, Ohio; WGR, Buffalo, N. Y.; WOC, Davenport, Iowa; KSD, St. Louis, Mo.; WCBD, Zion, Ill.; CFCA, Toronto, Canada; CKCK, Regina, Saskatchewan; KLZ, Denver, Colo.; KHJ, Los Angeles, Cal; KFI, Los Angeles, Cal; KPO, San Francisco, Cal.; KGW, Portland, Ore.; PWX, Havana, Cuba.

This is a total of thirty-nine stations. I heard a number of other stations, but did not get the call letters. I quit at 12:37 a. m. and the air was full of stations.—Harry K. Goodall, 445 Kenilworth Avenue, Elmhurst, Ill

ON DETECTOR UNIT ONLY.

Radio Editor: The following stations were received Monday evening, Nov. 19, silent night: WBAH, Minneapolis, Minn.; WOAW, Omaha, Neb.; WMC, Memphis, Tenn.; WHAZ, Troy, N. Y.; KSD, St. Louis, Mo.; WOS, Jefferson City, Mo.; WWJ, Detroit, Mich.; WRC, Washington, D. C.; KDKA, Pittsburg, Pa.; WCAE, Pittsburg, Pa.; WFAA, Dallas, Texas; WGY, Schenectady, N. Y.; WBAP, Fort Worth, Texas; WCBD, Zion, Ill.; WOO, Philadelphia, Pa.; WSB, Atlanta, Ga.; WDAF, Kansas City, Mo.; WOC, Davenport, Iowa; PWX, Havana, Cuba, signed off at 11:01 p. m.; KHJ, Los Angeles, Cal.; KFI, Los Angeles, Cal.

I am using a single circuit special hook-up. Received these stations between 8 p. m. and 12 midnight on detector unit only. I certainly appreciate your new radio section and get your paper every night.—Leslie King, 6012 Ellis Avenue, Chicago.

ROMANCE OF THE AIR.

Radio Editor: I like very much the radio department you are now conducting. I have sometimes thought that the public might be interested in a review of some of the special features broadcasted from the Chicago studios, just as they are interested in reviews of music, opera, etc. Last evening there was a very interesting play broadcasted from the Drake. The romance of radio was very well exemplified last night in a feature from the Fort Worth station. They were broadcasting a late organ recital, and at the conclusion of the recital the announcer said: "I would like to hear from listeners at distances of 2,000 to 5,000 miles."

The wildest fiction writer fifty years ago never visualized a man standing in a room talking in a natural tone of voice, with no visible connection with the outside world, and expecting a man 5,000 miles away to hear his voice.—H. S. Ashenhurst, 4011 Warwick Avenue, Chicago.

SUGGESTION FOR BROADCASTERS.

Radio Editor: The character of your first edition shows the splendid future of The Post in this field, and believing you may be the one to develop a helpful plan some of us have discussed, I submit it to you.

Yesterday I talked with Morgan G. Hogge, assistant superintendent of schools in charge of evening schools, and what I write is as he sees it.

The objection to fitting up rooms in the various evening schools where radio could be heard by pupils and visitors is that the cream of the programs is given after they close at 9 p. m.

I told him that programs depend upon the needs of the audiences, and that if the hour from 8 to 9 p. m. could be made a school hour, I thought KYW, WMAQ and the other big broadcasters would furnish the educational talk, school orchestra, music, etc.

A committee of representatives from each school using the service could help make the programs, and a large number of people would be glad to listen-in on anything prepared by and for our great public schools.

Personally, I would help so far as possible. Having built my own set, with loud speaker, I know the pleasure and profit of it.

My set is a single tube Erla reflex, such as you fully described in your Radio Magazine, and has proven the perfect success you called it.

HERMAN J. BARBER,
6042 Vernon Avenue, Chicago.

AMRAD SET DX RECORD.

Radio Editor: Using the radio-frequency and detector tubes of a No. 3500 double circuit Amrad set, I gathered the following stations the evening of Nov. 12, KYW, WPAD, KDKA, WWJ, WJZ, WOAW, WBAP, WOQ, WGY, WLAG, WGAE, WOS, WSB, WDAF, WCBD, WTAS, WMC, WHAZ, KSD, WFAA, WDAR, WOO, WOR, WBAH, WGR, WNAD, CFCN, WJAZ (tests), WDAJ (tests).

All call letters distinctly heard except WDAR, which I caught just at the signing-off moment. Stations in order of reception.

Tuesday night, Nov. 20, I exceeded my previous record by pulling in thirty-two stations, as follows: KYW, WDAP, WDAF, KDKA, WCX, WOO, WRC, WCAE, WGY, WCBD, WCK, WAAW, WMC, WWJ, WOC, WOS, WHAZ, WTAS, WNO, WBAV, WLW, WOAW, WBAF, CPCA, WBAH, WGR, CJCA, WHN, WSB, KFI, KAD, WBAY.

Your magazine is better, for my purposes at least, than many of the monthly radio publications. If you continue to broadcast every Thursday, I shall allow my subscription to them to die a natural death.—L. V. Phillips, 60 West Lake Street, Chicago.

TOO LATE FOR OUTSIDE TOWNS.

Radio Editor: Glad to note your daily radio program, but this program does not reach us until the following day. Would it be feasible to publish programs for the next night? I suppose the amount of your out-of-town circulation would have to be considered, and I am just telling how this does not do an out-of-town subscriber much good. Hoping that you might fix it up some way.—Noble Bros., by J. T. Oxley, Gibson City, Ill.

COMMON-SENSE ARTICLES, PLEASE.

Radio Editor: I wish to congratulate you on the fine radio section you put out. It fills a long-felt want in newspapers. The articles are plainly written and common sense, and you can count me among your boosters, if you continue anywhere nearly as good as you started in.—Victor Faulkner, 210 South LaVergne avenue.

WELCOME POST CONCERT.

Radio Editor: Please accept congratulations on the excellence of your Radio section. I have bought another local newspaper each evening for radio programs, but yours is so much better that hereafter it is The Post for mine. Just keep up the good work.—Robert F. Pahnu, 2634 Lake View avenue, Chicago.

HE SURELY HAS!

Radio Editor: Am glad to see that at last the editor has a radio set, or at least presume he has because of the special space you are now giving to radio news. We are sure the radio magazine you are to publish will be of much interest. May I also take occasion to commend the editorial policy of this paper? Believe the kind of paper you are putting out is having an influence, which will be felt, for the better things.—H. W. Caldwell, Wilmette, Ill.

WE STAND CORRECTED.

Radio Editor: Congratulations on the new supplement to your Thursday's paper, "Atta boy"!

Get a little dope in occasionally on transmission. Note you show WGF in your list of broadcasters, but that station has not been on the air for several months. Don't know exact status. I'm going to force you to hear from me once in a while. Have quite a library on radio myself, but never tire of reading good dope. Here's hoping.—F. J. Sadler, 1428 23d Street, Des Moines, Iowa.

HE USED CHEAP PARTS.

Radio Editor: Congratulations for the excellent radio magazine of The Post. Among the many articles that interested me was the one on the Autoplex written by Mr. Wells. You ask for reports, and I am glad to have the opportunity to say a few words.

I tried the Autoplex a few weeks ago, but soon discarded it because I found it wasn't any louder than my one-stage radio with crystal detector (not reflexed).

Now I know why it worked ordinarily. I used cheap wooden variometers. It would be a great help to radiophans if the description of a set that really worked was accompanied by the names of the manufacturers who make the parts that were actually in the set. The present way, of course, is the stimulant for business. A few would have to buy several makes of instruments before he got results.

Another letter in Questions and Answers department asks how WDAP can be turned out. I wish I knew, because it is so strong that it is impossible to go thru it for distant stations when a change of program is desired for a few minutes or so. If a Paragon set cannot do it, what set can?

It may interest you to know that on page 21 of Radio World (weekly), dated July 14, an article captioned "An Extremely Selective Single Current One Tube Set," by A. Clapholtz, tells how he kills WEAF, which is located but a half mile from his set, and brings in distant stations. To get this result he combined the volume of the single circuit with the selectivity of the three-circuit tower. It may be worth trying. And again you may have seen this hook-up many times.—Frank H. Mazarette, 4106 Van Buren Street, Chicago.

HEARS SEVENTY-SIX STATIONS.

Radio Editor: In response to your request for calls heard I am sending my list. I have heard seventy-six stations altogether. The list follows: KDKA, WCAE, Pittsburg, Pa.; WOC, Davenport, Iowa; KFAF, KFDL, KLZ, Denver, Colo.; WAAK; WHAD, WIAO, WCAY, Milwaukee, Wis.; KSD, WEB, WCK, St. Louis, Mo.; WSB, WGM, Atlanta, Ga.; WDAF, WHB, Kansas City, Mo.; WOI, Ames, Iowa; WMAK, Lockport, N. Y.; WWJ, Dearborn, Mich.; WCY, Schenectady, N. Y.; WHA, Madison, Wis.; WHK, WJA, WTAM, Cleveland, Ohio; WWJ, WCX, Detroit, Mich.; WHAS, Louisville, Ky.; WLAG, WBAH, Minneapolis, Minn.; WBAP, Fort Worth, Texas; WLW, WSAL, WMH, Cincinnati; WJZ, WBAY, WEAF, WDT, New York, N. Y.; KHQ, Seattle, Wash.; WOS, Jefferson City, Mo.; WDAJ, College Park, Ga.; WEAD, Columbus, Ohio; WFAA, Dallas, Texas; WMAC, Cazenovia, N. Y.; WOR, Newark, N. J.; WDAS, Worcester, Mass.; WAAC, New Orleans, La.; WNAC, Boston, Mass.; WBZ, Springfield, Mass.; WPAC, Okmulgee, Okla.; WHAZ, Troy, N. Y.; WSY, Birmingham, Ala.; WAAP, Wichita, Kan.; WPA, Fort Worth, Texas; WOAW, WAAW, Omaha, Neb.; WTAS, Elgin, Ill.; WMC, Memphis, Tenn.; WCBD, Zion, Ill.; WJH, WCAP, Washington, D. C.; WCR, Buffalo, N. Y.; WBAK, Harrisburg, Pa. WTAH, Belvidere, Ill., KPO, San Francisco, Cal.; WOO, WDAR, Philadelphia, Pa.; KFDY, Brookings, S. D.; KHJ, KFI, Los Angeles, Cal.; WPAH, Waupaca, Wis.; CFCF, Montreal, Quebec, Canada; CJCC, Winnipeg, Manitoba, Canada; CKCK, Regina, Saskatchewan, Canada; WJAR, Providence, R. I.; CFAC, Calgary, Alberta, Canada.

On silent nights I have had various stations on a horn using two steps. WJZ, KPO, CKCK, WBAP, WFAA, WGK and WOS were heard the loudest.

On Sunday, Nov. 4, after 10:30 p. m., I received KPO, KHJ, KFI, all California stations. On Monday, Nov. 5, I heard twenty-four stations using an Ultra-Audion hook-up with one-step audio. Last Monday, Nov. 12, I received twenty stations.

Your radio section is by far the best of any daily newspaper in this city, especially the magazine section on Thursday. Yours truly.—J. Buch, 2030 Lane Court.

HERE IS A REAL RECORD.

Radio Editor: I am glad to see that The Chicago Evening Post is going to devote a part of its space to radio, and I am also more than pleased to hear that they are going to give us DX-ers some space.

I am one of those night prowlers myself, and have been obtaining some very good results with the three-circuit Armstrong regenerative receiver, using two WD-12 dry cell tubes.

On Nov. 1, with local stations coming in like a barage, I tuned in nineteen long-distance stations between 6:30 and 9 o'clock. I do not believe this can be accomplished on any other circuit.

On Monday night, Nov. 5, when the ether waves from Lake Michigan had ceased to penetrate the air, I was able to tune in thirty-eight out-of-town stations, which were hear clearly. I missed a few weak ones, but I am getting accustomed to this now. Attached is a list of those stations with time received and program:

6:10, WDAF, Kansas City, talk; 6:25, WIP, Philadelphia, signing off; 6:35, WJZ, New York, announcing; 6:40, WOC, Davenport, Sandman story; 6:43, KDKA, East Pittsburg, bedtime story; 6:55, WGY, Schenectady, announcing; 7:10, WCX, Detroit, talk; 7:20, WCAE, Pittsburg, library news; 7:30, WHB, Kansas City, talk for children; 7:50 WLAG, Minneapolis, talk for farmers; 7:55, WCK, St. Louis, orchestra—"No, No, Nora"; 8:01, WCBD, Zion, opening announcement; 8:10, WBZ, Springfield, signing off; 8:15, WLW, Cincinnati, talk; 8:25, WPAH, Waupaca, Wis., orchestra—"Dreamland"; 8:30, WHAZ, Troy, soprano solo; 8:35, KSD, St. Louis, organ; 8:37, WWJ, Detroit, Detroit News orchestra; 8:40, WAAW, Omaha, "World Waiting for Sunrise"; 8:50, WOS, Jefferson City, orchestra; 8:55, WMC, Memphis, "On Old Back Porch"; 8:56, WOR, Newark, barytone solo; 9:18, WEAF, New York, signing off; 9:20, WRC, Washington, 'Rain No More," Wendall Hall; 9:30, WFAA, Dallas, College theater organ; 9:40, WOO, Philadelphia, organ; 9:45, WDAR, Philadelphia, orchestra; 9:58, WOAW, Omaha, "Our Little Home"; 10:04, WBAF, Fort Worth, Woman's college chorus; 10:15 WBAH, Minneapolis, announcing; 10:35, WGR, Buffalo, orchestra; 10:55, WDT, New York, signing off; 11, WSB, Atlanta, fox trot; 11:30, KFI, Los Angeles, piano, "Somebody Else"; 11:45, KGW, Portland, Merchant marine talk; 12, WOAG, Belvidere, Ill., piano solo; 12:30, CFCN, Calgary, testing; 1:15, KFKD, Milford, Kan., "Swinging Down the Lane".—Irving C. Johnson, 4551 North Clark Street, Chicago.

GETS COAST ON LOUD SPEAKER.

Radio Editor: Here's what I call real DX stuff: Last Saturday evening, Nov. 17, I tuned in KFCF, Walla Walla, Wash.; KPO, Hale Bros., San Francisco, and KHJ, Los Angeles, all with enough volume to operate a loud speaker with a Baldwin unit. I have a Westinghouse RC, with two steps of audio, and, as you may recollect, it was raining last Saturday night. Again, I stayed up late on Sunday evening till early Monday morning, and was still surprised to find I had tuned in KFI, A. C. Anthony & Co., Los Angeles. They came in very clear and could be heard about forty feet away. Then I got CFAC, Calgary, Canada, and CFCN, all with surprising loudness. To tune in those stations one must stay up till early morning, if he's anxious to get the Pacific coast.—Frank J. Morris, 706 South Sacramento building, Chicago.

HEARS CUBA ON THIS CIRCUIT.

Radio Editor: I am inclosing a list of the stations I got last night, Nov. 20. It was not a very good night, but I managed to get the stations I have on the list. My set is an Armstrong regenerative feedback, using one varicoupler, one forty-three-plate condenser, three WD-11 tubes and am using a 90-degree double wire aerial in the attic of the bungalow.

I have on my list two stations in Los Angeles, one station in Cuba and seventy others since last March. I would like to know the reason for picking up Georgia in two different places without changing the length of my coil. Can hardly wait to see The Post Radio Magazine. Here is my list: WSY, WDAF, WJZ, KFKB, WWJ, WCAE, WOAW, WLAG, KDKA, WCX, KSD, WOO, WOS, WCBD, WOC, WFAA, WMC, WTAS, WHAZ, WOR, WBAP, WSB, KFI.—Archie Patera, 1810 South 48th Court, Cicero, Ill.

USES REGENERATIVE SET.

Radio Editor: How's this for a three-tube Armstrong regenerative set: WCAE, Pittsburg, Pa.; KDKA, Pittsburg, Pa.; WDOF, Kansas City, Mo.; WCX, Detroit, Mich.; WWJ, Detroit, Mich.; WOO, Philadelphia, Pa.; WMAJ, Kansas City, Mo.; WGY, Schenectady, N. Y.; WJZ, New York City; KFKB, Medford, Kan.; WGR, Buffalo, N. Y.; WBAP, Fort Worth, Texas; WFAA, Dallas, Texas; WRC, Washington, D. C.; WLW, Cincinnati, Ohio; WCBD, Zion, Ill.; KSD, St. Louis, Mo.; WOS, Jefferson, Mo.; WLAG, Minneapolis, Minn.; WSB, Atlanta, Ga.; WHAZ, Troy, N. Y.; WOC, Davenport, Iowa; KOP, Detroit, Mich.; WPAH, Waupaca, Wis.; WTAS, Elgin, Ill.; KFKX, Hastings, Neb.; CFCA, Toronto, Canada; WOAW, Omaha, Neb.; WBAH, Minneapolis, Minn. and KFI, Los Angeles, Cal.—Archie R. Patera, 1810 South 48th court, Cicero, Ill.

ON ONE TUBE ONLY.

Radio Editor: In your daily radio section suggested that we give you results obtained for Monday night, Nov. 19. I copied the following: DX, KDKA, WGY, WOAW, WCX, WOO, WEAF, WBAP, WRC, WLAG, WDAF, WHA, WCBD, WOS, WWJ, WSB, WMC, WLW, WBAH.

I have a homemade one-tube set using modification of the Reinhartz circuit, employing a Bremer-Tully vernier tuning unit. With this circuit I have been able to obtain usually good results, bringing in several out-of-town stations even on other nights.

I enjoy your radio section and want to congratulate you on your magazine feature.—S. J. Trost, 10857 Hermosa Avenue, Chicago.

ENJOYED "PROWLER" PROGRAM.

Radio Editor: As you predicted, here is one radiophan that had a good time "listening-in" to the long-distance stations. I heard distinctly and enjoyed the programs (parts, of course), from the following: WGR, Buffalo; WEAF, New York city; WGM, Atlanta; WMC, Memphis; WEAA, Dallas; WOAW, Omaha; KDKA, Pittsburg (very fine); WAG, Minneapolis; WDAF, Kansas City, and several others. Elgin and Zion City, of course. Sunday night heard San Francisco, KPO, very plainly. Have a simple one-tube receiver. It certainly is a great joy to me. Great magazine you are giving us. Thank you.—Edwin S. Monroe, 5300 Ellis Avenue, Chicago.

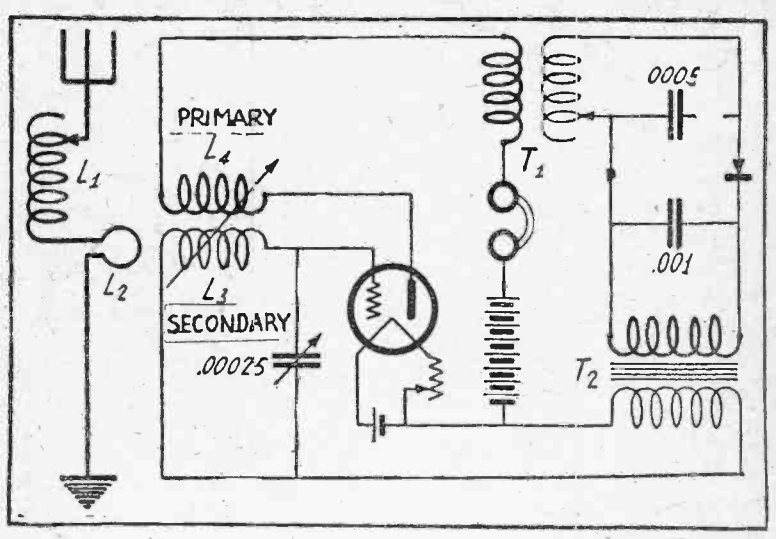
TEN ON EVERY SILENT NIGHT.

Radio Editor: In regard to our telephone conversation of Saturday, re the raising of the meter wave length of the ultra-audion detector unit using an extra variometer, wish to state that, following your several suggestions—namely, shunting a fixed condenser .001 between ground and aerial or using a fifty-turn coil in series before the variometer—that both have proved successful, the former, however, being the clearest. The stations that I get regularly using a hundred-turn coil and no variometer are WGY, KDKA, KSD, WOAW, WOC, WTAC, KSD, WFAA, WCX, WLAG, WMC, WOS, WSB and WWJ.

Ten stations on Monday nights is a general occurrence. I have put two stages of audio-frequency in the set, and altho most stations come in good, I get a whistle like a peanut stand while listening to KYW. Can you advise me how to eliminate same?—J. M. Bush, 3207 West Argyle Street, Chicago.

Note—Your trouble with the whistle on KYW was too much regeneration, very likely.—The Editor.

Here's a Prize-Winner



This circuit won first prize in a recent contest conducted by the Radio News. Volume, selectivity, economy and simplicity of operation were considered in the award.

Phans Perform Radio Miracles

Continued from Page 3.

nals; 11 a. m., luncheon music by the Tea Room orchestra; 3:45 p. m., grand organ and trumpets; 4 p. m., sports and police reports.

Night 8:55 p. m., United States naval observatory time signals; 9 p. m., United States weather forecast.

WRC—Washington, D. C., 469 meters; silent Tuesday, Thursday and Saturday.

Evening, 8 to 10, vocal and instrumental music.

Midwest Programs.

WCX—Detroit, Mich.; 517 meters: Silent Saturdays:

Evening, 7:30, musical program.

WJAX—Cleveland; 390 meters; Silent every night except Tuesday and Thursday:

WLAG—Minneapolis, Minn., 417 meters. No silent nights.

Evening, 10:30 to 1 a. m., musical program.

WLW—Cincinnati; 309 meters; silent Friday, Saturday and Sunday.

Day—10:30 a. m., weather forecast and business reports; 1:30 p. m., market reports; 3 p. m., stock quotations; 4 p. m., piano recital by Adelaide Apfel.

Evening—10 p. m., American Negro night. Program arranged by James H. Robinson, graduate of Yale and Fisk universities, and executive secretary of the Negro Civic Welfare association, department of the community chest, and council agencies. Entertainment by the Alpha Omega Glee club, directed by N. W. Ryder, formerly of the famous Fisk quartet. Singing of Negro spirituals, plantation melodies and popular songs. Orchestral and other features to be announced. Gist of negro philosophy, selected from the writings of Booker T. Washington; "Credo," by Dubois; "The Way to Universal Peace," by G. E. Haynes, and from the works of Marcus Garvey; 11:15 p. m., entertainment of popular music, by the Woody Meyer dance "Maggie," "My Rose" orchestra; "Sobbin' Blues"; "Missing You," and other numbers. Vocal duets by Edward Kruse and Miss Knolte.

WOC—Davenport, Iowa; 481 meters; silent Tuesdays.

Day—3:30 p. m. (musical numbers to be announced). Lecture by Karl G. Stephan. Subject, "The Anatomy of the Kidney"; 8 p. m., musical program (one hour), P. S. C. orchestra, Gerald M. Barrow, director, featuring "Mean, Mean Mamma," "Remember the Waltz," "Argentine," "Sobbin' Blues," "Oklahoma Indian Jazz," "I'm On My Way to Chi"; V. B. Rochte, barytone soloist.

WTAM—Cleveland; 300 meters.

Evening—7 to 7:30 p. m., musical program.

WWJ—Detroit, Mich.; 517 meters: Silent Saturday.

Evening—8:30 p. m., Wolston Randall, barytone; Miss Mildred Heineman, pianist; Mrs. Vera Schultz, mezzo-soprano; dance music by Jean Goldkette's orchestra broadcast from the Graystone ballroom; 10 p. m., music by Jean Goldkette's orchestra broadcast from the Graystone ballroom.

Southern Programs.

KSD—St. Louis; 546 meters; silent Thursday, Sunday:

Day—Beginning at 8:40 a. m. and continuing thruout the day at intervals of an hour until and including 2:40 p. m., markets are broadcast; the closing markets are at 4 p. m.

Evening—8 p. m., broadcasting concert given by St. Louis symphony orchestra, Carolina Lazzari, contralto, soloist, direct from the Odeon.

WBAP—Fort Worth, Texas; 476 meters:

Day—10 a. m. to 4 p. m., markets and financial review.

Evening—7:30 to 8:30 p. m., dance concert by Tommie's Texans, Meadowmere club orchestra. (E. L. O. announcing.) 9:30 to 10:45 p. m., organ concert presented by Will Foster, organist of the First Methodist church. (G. C. A. announcing.)

WDAF—Kansas City, Mo.; 411 meters:

Day—3:30 to 4:30 p. m., musical matinee: Tom Beckman's Novelty orchestra.

Day—3:30 to 4:30 p. m., musical matinee, the D. Ambert Haley dance and concert orchestra; 6 to 7 p. m., tuning-in piano number on the Duo-Art; market, weather forecast and road report; address, speaker from the William Jewell college, Liberty, Mo.; the children's story and information period; music, Fritz Hanlein's Trianon ensemble, Hotel Muehlebach; 11:45 p. m. to 1 a. m., the "Merry Old Chief" and the Coon-Sanders Novelty-Singing orchestra. Plantation grill, Hotel Muehlebach.

WFAA—Dallas, Texas; 476 meters: Silent Wednesday.

Day—12:30 to 1 p. m., music and markets.

Evening—8:30 to 9:30 p. m., Elks' band, from Dallas Lodge No. 71.

WGM—Atlanta, Ga.; 429 meters:

Evening—6 to 7 p. m., concert; 9:30 to 10:30 p. m., concert.

WGV—New Orleans; 350 meters:

Evening—7 to 8 p. m., concert.

WHAS—Louisville; 400 meters: silent Mondays:

Day—4 to 5 p. m., selections by Gus Edward's orchestra; from the Seelbach hotel; selections by Barney Rapp's orchestra, from the Brown hotel; selections by the Alamo theater organ, played by Mrs. Myrtle Fulks Zahn Jr.; selections by the Walnut theater orchestra, L. V. Davidson, director.

Evening—7:30 to 9 p. m., soprano solos: Miss Constance Thurstensen, with violin obligato by Mrs. Lawreen English Evans, accompanied by William E. Pilcher; violin solos, Mrs. Lawreen English Evans, accompanied by William E. Pilcher; barytone solos: Frank R. Doblens of the Louisville Conservatory of Music, accompanied by Reginald H. Billin; Four-minute digest of international Sunday school lesson for Sunday, Nov. 25, by Harry M. Lukins; four-minute radio Forum talk; official central standard time announced at 9 o'clock.

WHB—Kansas City, Mo.; 411 meters: silent Monday, Wednesday, Friday and Saturday.

Evening, 7 p. m., concert.

WMC—Memphis; 500 meters: silent Wednesdays.

Day, 9 a. m. to 4 p. m., markets, financial and news.

Evening, concert 8:30 to 9:30 p. m.

WOAI—San Antonio, Texas; 385 meters: silent night, Mondays, Wednesdays and Thursdays.

WOS—Jefferson City, Mo.; 441 meters: silent Tuesdays, Thursdays and Saturdays.

WSB—Atlanta, Ga.; 428 meters: no silent night.

Day, 12 to 1 p. m., musical program for industrial workers; 2:30 p. m., weather forecast; 4 p. m., Howard relay concert; 5 to 5:30 p. m., bed-time story.

Evening, 8 to 9 p. m., popular concert; 10:45 p. m., transcontinental radiowl concert.

Pacific Coast Programs.

KDZE—Seattle, Wash.; 455 meters: silent nights Tuesdays, Thursday and Sundays.

KFDB—San Francisco; 509 meters.

Evening, musical program from midnight to 1:30 a. m.

KGW—Portland, Ore.; 492 meters.

Evening, midnight to 1 a. m., vocal; 2 a. m., hoot owl frolic.

KHJ—Los Angeles, 395 meters.

Evening, 10:45, 11:30 p. m., 1 a. m.

KPO—San Francisco; 423 meters.

Evening, concert, midnight to 1 a. m.

Six Causes of Weak Signals in Radio Sets

If the signals which are customarily loud from a station are suddenly found to be quite weak, the difficulty may be caused by one or more of the following:

The transmitting station may have reduced its power.

The crystal detector of the receiving set may be out of adjustment or may have become dirty. In the latter case the metal point which touches the crystal may be filed and the surface of the crystal washed with benzine or alcohol. Care should be taken not to touch the surface of the crystal with the fingers.

The receiving antenna may have become disconnected, or the ground connection may have become ineffective due to existence of insulating paint or gaskets used in making pipe connections.

The plate battery may be exhausted.

The filament battery may have become discharged.

The telephone plug may not be making good contact.

BE SENSIBLE.

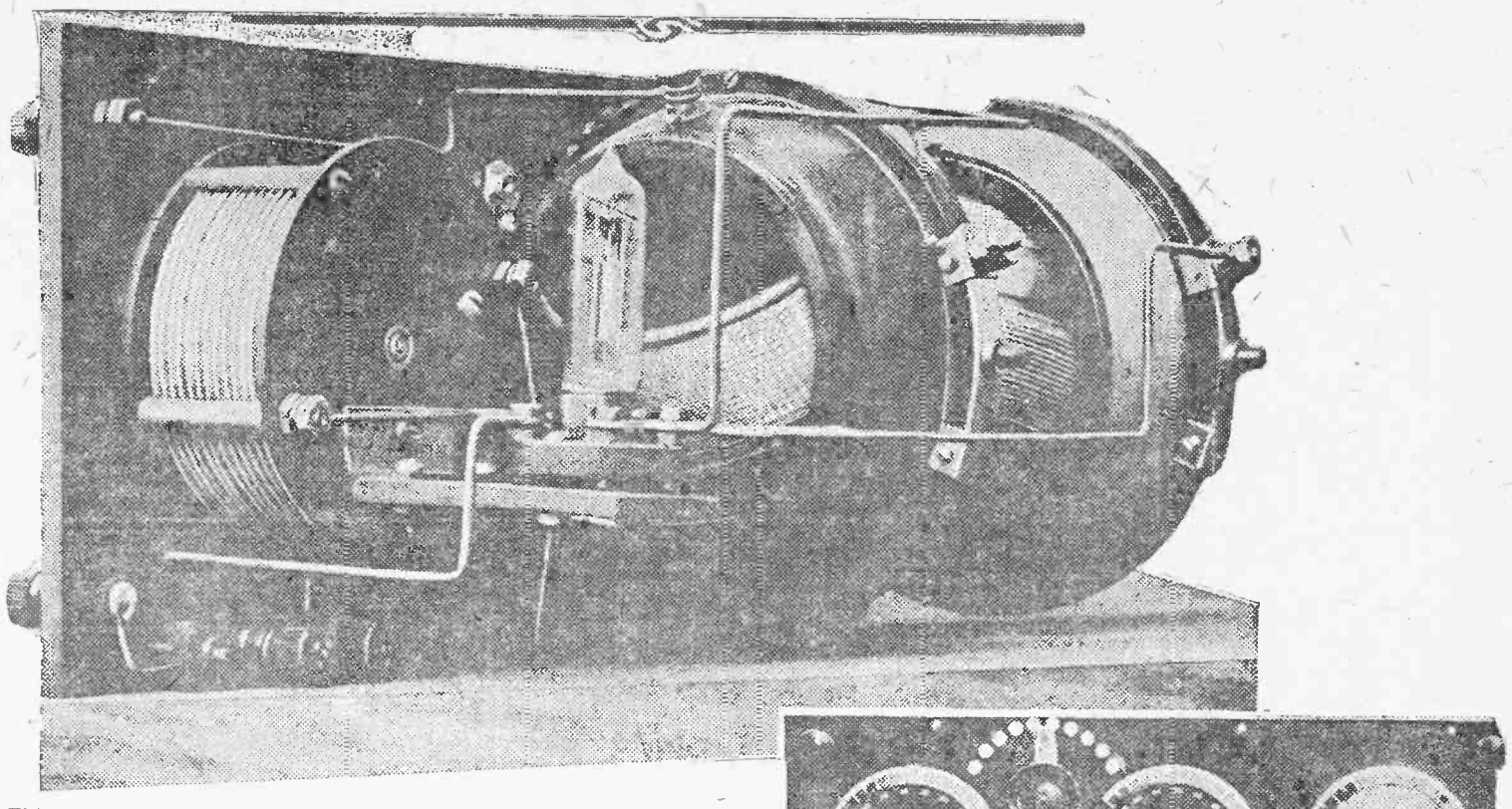
No credence should be given to newspaper predictions of weather conditions for long periods in the future, even tho such forecasts purport to come from the government. A case in point is a recent prediction in a Boston newspaper to the effect that the "coming winter will be the coldest and snowiest winter in history" in New England.

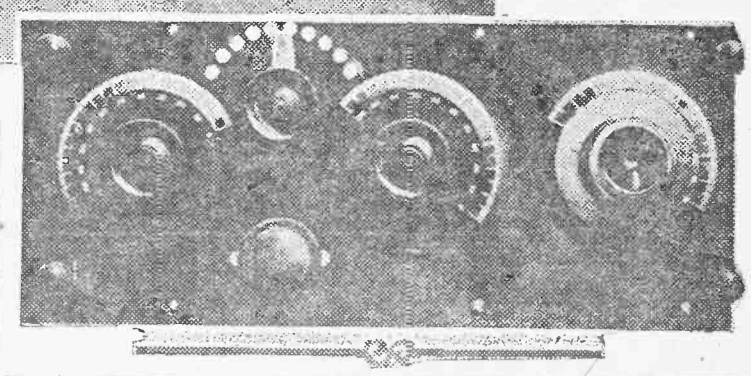
The weather bureau of the United States department of agriculture absolutely disclaims any responsibility for such a statement. The bureau does not attempt to issue predictions even of a general character for weeks or months in advance. The subject of forecasting for seasons or considerable periods ahead has long engaged the attention of meteorological scientists, but thus far no laws of sequences have been discovered whereby long-range forecasts of a reliable character can be made.

Reputable meteorologists thruout the world agree that the science has not advanced to the point where it can be done.

New "N" Tube Gives Forth Surprising Results in Armstrong Feed Box Circuit

HERE'S a hook-up for the "N" Tube, which is a little dry cell tube, difficult to find in many markets, but which is a very efficient little fellow and worth seeking. We are indebted to Theodore F. Vollten in "Radio in the Home" for the illustrations and conclusions of a test of the tube with the circuit described.—The Editor.





This is Mr. Vollten's regenerative hook-up, which he used in his experiments with the new "N" tube. The lower photo shows the front panel.

LITTLE or nothing is known of the "N" tube (Western Electric 215A) by the average radiophan. There are several reasons for this. One is because the manufacturers have an idea that new tubes should first be tied up with sets until the introductory period has passed. Then they release it to the general public.

The tube is made for use in apparatus of the telephone companies as a repeater or amplification booster. None are sold in this country for radio work. However, a Canadian company manufactures the "N" tube under license and thru this source a limited supply leaks across the border line into this country. You may be fortunate enough to find a dealer who has some on hand.

The "N" tube is rated as an unusually efficient detector and radio-frequency amplifier. In fact there are experimenters who place it far above some of the other popular tubes for use in circuits that employ radio-frequency.

The tube is much smaller than the new UV199, being only 1½ inches in height and about 9-16 of an inch in diameter. It retails for $7. It has the regulation plate, grid and filament connections but requires, of course, a special socket. It burns at a very dull cherry glow and uses a 1½ volt dry cell battery and consumes one-quarter of an ampere. The plate voltage, when used as a detector, is between 17 and 22 and when used as an amplifier should never be more than 45.

The tube functions unusually well as a detector in any of the standard hook-ups, but is especially efficient in radio-frequency circuits.

Hook-up Used With Tube.

Theodore F. Vollten, a writer in "Radio in the Home," is popularizing the tube with a regenerative hook-up, which was his first experience. He, in common with other experimenters, is experimenting with radio-frequency.

A schematic diagram of the standard two-circuit hook-up used by Mr. Vollten is shown in the accompanying illustrations. Photographs also show the completed set.

Construction details provide for a panel 12x5, which is the proper size for the parts used, but it may be smaller or larger if other parts are used. The parts used were:

1 variometer (Langbein & Kaufman).
1 variocoupler (Langbein & Kaufman).
1 .0005 variable condenser (Rathbun).
1 variable grid leak.
1 grid condenser, .00025 (Dublier).
1 215A tube.
1 dry cell battery (1½ volts).
1 variable "B" battery (22½ volts.)
1 panel 12x5.
1 rheostat (Bradleystat).
8 binding posts.

These specified parts are not necessary. They merely happened to be at hand when the test set was hooked up. However, good quality instruments are necessary or the results will not be satisfactory.

The primary of the variocoupler used has eighteen taps. Nine of these are single turns for the finer adjustments and the other nine taps are for the coarser adjustments. In this circuit the experimenter did not have sufficient room for all of these taps and employed only ten of them, using all of the taps of ten each and the beginning of the unit tap and the end of the unit tap, which makes ten taps in all.

Now as to the hook-up. The circuit used, as can be seen in the schematic diagram, is the Armstrong standard regenerative feedback. When mounting the parts the variocoupler is placed at the extreme right, viewing the panel from the rear, with the variometer close to it and the variable condenser just to the left of this. The socket and tube are mounted in a small bracket and shelf behind the condenser. The battery binding posts are on a strip of bakelite beneath the condenser. The Bradleystat is mounted on the panel just between the condenser and the variometer. It cannot be seen in the photo. The grid leak can be mounted just beneath the tube shelf or in front on the panel.

Looking at the panel from the front you will see two binding posts. One is at the lefthand top and is for the antenna connection. At the lower left corner is the post for the ground connection.

The first dial at the left is for the variocoupler. Just above it is the inductance switch. Below the switch is the knob for the rheostat. To the right of these is the dial for the variometer and to the right of this the one for the condenser.

To the right, upper corner, and lower corners, are the output or telephone binding posts.

The battery connections are all made from binding posts placed on a shelf mount attached to the rear of the panel as shown in the photo, as there is no baseboard used in the set constructed by the writer.

If the variable condenser is used in the antenna circuit, as indicated in the schematic diagram, the panel will have to be made longer than is shown in the photo. This condenser will be placed just before the variocoupler and will be the first instrument on the mounting, viewing the set from the front.

If the mounting of the tube and socket puzzles you let me describe how it is done. Procure a small strip of brass and bend it to the shape of an angle, placing screw holes in either end. Fasten one end to the bakelite back of the condenser with small screws, being careful that these be not so long they will touch the condenser plates when placed in position. Attach a small square of bakelite to the other end of the angle and mount the tube socket on this.

Now, as to the wiring. If the extra, or antenna condenser, is used, attach a wire from the aerial binding post to the rotor of the instrument. Run a wire from the stator to the switch arm. The switch arm ,of course, makes the connection from the condenser to the primary of the variocoupler thru the switch points.

If this condenser is not employed run the wire from the antenna binding post direct to the switch arm.

The end winding of the variocoupler goes to the ground and the rotor of the variocoupler is connected directly across the variable condenser, one terminal of which goes to the grid leak and condenser and from there to the grid of the tube. The other connection from the variable condenser goes to the plus filament lead of the A battery.

The plate lead of the tube goes to one side of the variometer and the other side of the variometer goes to one of the binding posts for the telephones. The other telephone binding post goes to the plus B battery and the minus B battery goes to the plus A battery. The plus A battery is hooked to the plus A of the tube socket and the minus A battery goes to the rheostat and the other side of the rheostat goes to the minus filament on the socket.

Mr. Vollten, in commenting on this circuit with the "N" tube employed, says:

"After I had completed this circuit I was trying it out in comparison with the neutrodyne circuit in Philadelphia. First we would tune in on the neutrodyne circuit with, let us say, Pittsburg, and then we shut off the neutrodyne and I picked up Pittsburg with the small set. Then we tuned around and got WMAF, Round Hills, Mass., and then I got the same on the small set and we got Springfield on the neutrodyne and the same on the small set.

"We had New York city and then WCAP at Washington, D. C., on both sets. In fact, everything that we tuned in on the neutrodyne we brought in on the small set, but, of course, it was a great deal more trouble in getting it.

"We couldn't sit down as we do with the neutrodyne and just turn a dial and have the station come in. We had to fool and tune around here and there the same as you do with any other regenerative circuit, but it proved the fact that sensitiveness of the circuit was there.

"All you need is a little patience to bring it out. The carrier waves sounded like a canary bird shop. There were whistles everywhere and all we had to do was use a little patience to bring down these stations to where they were audible.

"The 'N' tube is a wonderful detector and a wonderful radio-frequency amplifier."

The Chicago Evening Post radio department would like to have reports from readers who try this tube.

Road Conducts Booking Agency for Radio Music

By M. LIEBERMAN.
Radio Editor, Pennsylvania News, Employes' Paper of the Pennsylvania Railroad System.

AS GREAT as radio has become it has yet to possess a booking agency, other than the stations themselves. The legitimate stage has its strings of booking agencies—the central office and swarms of eager actors; the moving picture industry has its distributing offices, but for radio each station stands alone to draw its entertainers.

However, there is a near approach to the "booky," and that is the radio department of the Pennsylvania News, the employes' paper of the Pennsylvania Railroad system, northwestern region. The radio editor, on one hand, is in contact with radio stations, and on the other with musical bodies and individual entertainers among the employes of the road, who are anxious to give their services free.

Employes Have Many Bands.

On the Pennsylvania railroad, northwestern region—that part of the system which covers Ohio, Indiana, Michigan and Illinois—the employes have organized into many musical units. There are three bands, one in Fort Wayne, Ind., one in Logansport, Ind., and one in Chicago. Also, four orchestras, one in each of the above mentioned cities and an extra one in Chicago for the office employes, as distinguished from the rail men on the Chicago terminal division.

Besides these Grand Rapids has a glee club and Logansport a boys' choir, composed of boys, some of whom are sons of employes and others actually employed on the road. Of course, among the 23,000 employes on the region, there are many individually talented musicians, singers and entertainers.

M. LIEBERMAN.

All of these bodies are professional in quality, altho they are organized by the employes for their own amusement and pleasure. For instance, the orchestras will entertain at dances, and bands—each member in full uniform—will lead parades in outdoor activities of the employes.

On Air at KYW Nov. 28.

For nearly a year, now, Pennsylvania railroad employes' concerts have been heard from Chicago radio stations. Next Wednesday night, Nov. 28, the Chicago Terminal band, composed of forty pieces, will occupy an hour in KYW. Last month the orchestra from Fort Wayne gave a popular and successful concert on a Friday night program from the same station.

These Friday night concerts are usually three hours in length, and many specialty features are heard. At the time Fort Wayne entertained, the chorus of "I'll Say She Is," popular loop comedy, came up to the station after their regular performance and shared the evening.

Pennsylvania concerts will be regular monthly features in station KYW since the successful program broadcast by Fort Wayne, the first from that station. It happened that I had been arranging one concert a month from station WMAQ (Chicago) and thought that it would be well to increase this number to two a month, as they were growing in popularity.

Miss Waller, director of WMAQ, told me that she was kept quite busy opening letters from listeners of our programs.

So I went to Mr. Eastman and asked him if he would also book our entertainers for a monthly program. He had heard them before and was acquainted with them, but he said: "I'll give you a date and if it turns out good, we can see about the future. If you don't come up to our standard of quality, it's all off."

Win Studio Test.

That was reasonable enough, of course, and I told the Fort Wayne orchestra that they had better put in a lot of practice. They appeared at the station Oct. 19 and telephone calls came in a steady stream. Mr. Eastman was quite impressed and gave the date for the Chicago band, Nov. 28.

This band is directed by C. S. Horn, also a director of the Chicago Commandery band. He is not an employe of the road, but is hired by the employes for his services. He is the only person connected with employes' activities who is not an employe of the road.

The concert to be given by the band will be followed by the Logansport orchestra from station WMAQ, Dec. 1, only three days later.

Concerts arranged by the radio department of the Pennsylvania News, now boasting to be the only booking agency for radio entertainment in the world, have grown so numerous that music for them is received directly from publishers in large quantities. All publishers who are not members of the Association of Publishers, Composers and Authors, and, consequently, acceptable to radio stations, have our department on their mailing list and the latest numbers are sent to us.

While booking agencies, as related to the stage, have been considered necessary evils, the part that we play in bringing the many musical organizations and individual entertainers to Chicago stations has been found helpful to the stations and highly popular with the employes.

Move your dials slowly—exceedingly slow. Distant stations usually come in weak, and have to be built up with regeneration. If dials are turned and twisted rapidly you pass over the signal unheard.

Broadcasts Jazz Music in Mid-Air from Airplane

Paul Specht, New York, orchestra leader, and the members of his orchestra, while abroad recently, took part in an event that is unique in the annals of radio history. Specht, in order to fill an engagement, found it necessary to travel from London to Paris in a short time.

He chartered a Handley-Page bombing plane at London and embarked for Paris, with his entire band of eleven pieces on the same ship. The plane was equipped with an up-to-date Marconi broadcasting outfit, the microphone being placed directly in back of the pilot's seat inside the compartment occupied by the orchestra.

While in flight the orchestra broadcast several syncopated musical selections which were picked up by receiving sets in several cities. Letters from many of those who listened in stated that the Specht concert came thru with remarkable clarity, due, in a measure to the height from which the music was broadcast, over 3,500 feet.

It was at first feared that the intense vibration of the plane would interfere with the broadcasting, or that the noise would be heard above or thru the music. This was found not to be the case. The traveling compartment was practically air-tight and sound proof and acted as efficiently as the best specially constructed rooms in radio broadcasting stations.

Protection for Tubes

Vacuum tubes may be protected from "burning out" by a very simple method. Small flat fuses such as are used by telephone companies for safeguarding telephone transformers are attached to the filament leads.

Batteries Become Thirsty

Storage batteries, like camels, can go a long time without a drink, but become thirsty, after a time, just as do the water-cars of the desert. Be sure to keep the batteries well-filled with distilled water.

QUESTIONS AND ANSWERS

Aerial Wave Lengths.

14—CHICAGO: What is the wave length of an aerial 100 feet long with a lead-in of thirty-five feet? It is forty feet above the roof.

Assuming your aerial is a single wire, the wave length, approximately, is 180 meters.

Length of Aerials.

12. ELMHURST: What is the proper length for a good aerial for long-distance reception? I am considerably confused as I have before me now four different magazine articles on the subject and they contradict themselves.

The length of the aerial depends on conditions. If you are not so particular about selectivity and want to reach out for long distance and volume a single-wire aerial of 150 feet, which includes the lead-in wires to the receiver, is excellent. Stranded wire is best to use but plain copper wire is more commonly employed. The aerial should be from thirty to forty feet in height. This means above the ground or above the roof. If you prefer eastern and western reception run the aerial in that direction with the lead-in at the end from which you want the best reception. Vice versa if north and south is preferred. If you have a very sensitive or selective set you won't have much trouble from interfering stations. However if you haven't, better shorten the aerial to about 50 to 60 feet, especially if you are bothered by local stations. This will cut down your volume and range somewhat, however.

HAS LOCAL INTERFERENCE.

108—JUDD, Iowa: I believe the Radio department of The Post is a wonderful thing. In no paper can this popular information be found.

I have a two-stage Atwater Kent. For aerial have a four-fire about 175 feet, 55 feet high. I seem to be getting most everything in the east. West I get Denver plainly, while Los Angeles comes in faintly about 11 o'clock. I do not seem to be able to tune out completely other stations from certain stations.

The most regrettable thing is I am unable to get KYW. Was very much disappointed when I was unable to get the grand opera. Is that on account of the high wave lengths which they work under (536)?

I also have not found anyone that could tell me how to find the different wave lengths on most any set. I would appreciate it if you could give me the desired information regarding getting in on KYW. I am your ardent supporter for the radio news in the Chicago Evening Post. Your daily program does not get here until the next morning when your program is obsolete. Can you not give the next day's program instead?

Your information is incomplete as to the details of construction of your set. Would suggest that only one wire be used in your antenna. A seventy-five turn coil in series with the antenna of your set probably would bring in KYW, but depends upon your hook-up.

CRYSTAL DX CIRCUIT.

109—CHICAGO: Enclosed is a description of a DX crystal hook-up that I cut out of your Radio Magazine section for Nov. 15, 1923, on page ten. I find that this gives the information on the construction of aerial and ground but in the first sentence it says: "With the crystal hook-up shown." I do not find any crystal hook-up on page ten, or any other page of the Thursday Radio section. Could you please inform me as to where I can find this hook-up, or I would appreciate it very much if you would send me a copy of it.

The cut was omitted thru an oversight. It appears on this page with explanation.

CAN'T CUT LOCAL STATIONS.

109—CHICAGO: I inclose a hook-up which I have. It is very rare if I get anything outside of the city stations since the wave length has been changed. I use a WD-11 tube and 1½-volt dry battery and a 22½-volt dry battery. Can you assist me in making any change so I can get outside of the city stations, and better results?

Wire set as shown in sketch mailed you. Use .00025 grid condenser with C. R. L. variable leak. Try 45 volts on plate of WD-11 tube. Omit phone cord. Aerial should be at least 100 feet long, exclusive of lead-in 6 to 10 feet above all obstacles. Ground to a water pipe. Insert 35-turn coil in antenna circuit.

INTERFERENCE KILLS DX.

110—CHICAGO: Have one-tube Erla reflex set using UV-199 tube. Cannot tune out other stations and get KYW, altho I can get any other stations fine. Please tell me if I can do anything to enable me to get KYW.

In the next issue of our Radio Magazine will appear pictures and diagrams of a very efficient wave trap, which probably will give you the selectivity you desire. Shortening your antenna might help. Also see wave trap described in Nov. 15 issue. Several readers tried it the past week with pronounced success.

COILS FOR AUTOPLEX.

102—CHICAGO: After reading your article on M. L. Muhlemann's autoplex circuit, I want to build a set but need more information. (1) Is the inductance coil stationary or variable? (2) What kind of variometer is required? (3) In a price list the range of a 1,250 turn coil is given as 25,000 meters when used with a variable condenser of .001 mfd. Is it all right to use one of these? (4) Can a UV-201 A tube be used? (5) Have you diagram of one stage of audio-frequency and one stage of radio-frequency?

(1) Stationary. (2) See article in this issue on autoplex or one in issue of Nov. 15. (3) Coil mentioned is proper for autoplex. Circuit different from other circuits. (4) Yes. (5) Audio amplification hook-up will be printed next Thursday. Radio-frequency is not satisfactory with the autoplex. You don't need it anyway.

TWO-STAGE AMPLIFIER.

102—CHICAGO: Have a very good one-tube set. Want to add two-step amplifier using WD-11 tubes which I have. Also have two UV-712 transformers and two Howard rheostats. Send me hook-up, please.

Diagram has been mailed you.

93—CHICAGO: Submitted is a blue print of the hook-up I am now using. With it I have had Omaha, Minneapolis, Detroit, Schenectady, Pittsburg, Memphis, St. Louis and Dallas. I am not able to get these stations strong enough to enjoy their programs. Can you tell me how I can increase the strength of reception by adding to or changing the present hook-up? For the time being I will be satisfied if I can bring in the stations mentioned strong enough to enjoy their programs the same as I do the local broadcasting. Mighty glad to have The Post take up radio in such a fine big way. Many times since I became a radiophan I have considered writing The Post and suggesting that they do just what you have now done.

Use hook-up mailed you. Aerial should be of the "L" type, 100 feet long, one wire, 6 to 10 feet above all obstacles.

FREE SERVICE

QUESTIONS asked on any subject pertaining to radio will be answered in this department in either the daily edition or The Radio Magazine section published each Thursday. No charges are made for this service. If personal reply is desired by return mail, enclose self-addressed and stamped envelope. Write on only one side of the sheet, and where a check is desired on a faulty circuit be sure to send legible diagram as used in the hook-up.

SINGLE CIRCUIT REGENERATIVE.

94—CHICAGO: Will you have the kindness, please, to favor me with your comments on the circuit submitted, also state whether or not you think I would get better results from this hook-up in comparison with the simplified Muhleman circuit or hook-up which was given in your Radio Magazine of Nov. 15? Hook-up that I have reference to is the one that brings in long distance "with the kick of a Missouri mule." Can you consistently send me diagram showing lay-out of this last mentioned set?

The circuit you have inclosed is the famour old reliable single circuit regenerative set. This set, with two stages of amplification as you show, with a good outdoor aerial, will give good results. We have added a 23-plate vernier condenser. After adding this I would not advise changing to autoplex unless you wish to experiment. Hook-up of autoplex has been mailed you. Also see in this issue article on autoplex.

LONG DISTANCE CRYSTAL.

95—CHICAGO: Would you please tell me the best kind of a crystal set that is cheap to build and that has no overhead aerial as I live in a building that won't allow it—one that will take in a radius of fifty miles.

We are mailing hook-up of a crystal set that with a Ducon plug for an aerial may give you the results you desire. Be sure to have a good ground. Parts necessary: 1 Ducon plug, 1 variometer, 1 crystal detector (not fixed), 1 43-plate condenser, panel, dials, wire, binding posts, etc. See forthcoming issue of Nov. 29 for special article on a long distance crystal set.

LOOSE COUPLER CRYSTAL HOOK-UP.

111—CHICAGO: Will you please send plan to make a loose coupler set or a crystal detector without the tube?

A crystal set to meet your requirements will be published in the next issue of our radio magazine. Better wait for it as it is a long-distance getter, and brings in local stations on loud speaker.

TOO MUCH "HIGH BROW."

112—HINSDALE, Ill.: I have just taken an interest in radio as my interest has been held back by too highbrow articles on radio. I think your articles are excellent, and especially commend Mr. Cardwell on his helps to beginners. I live eighteen miles from Chicago, and want a one-tube set for Chicago stations that I can later improve for distance with a head set. Can you mail me a wiring diagram and a complete detailed list of parts necessary?

The diagram sent you by mail is of a very efficient set that we believe will suit your requirements. Parts necessary are: One variometer, one twenty-three-plate vernier condenser, one socket, one six-ohm rheostat, one WD or tube, one 22½-volt "B" battery, one C. R. L. grid lens and cord, one pair phones, one dry cell, one 6x14x⅛ panel, one 6x14 cabinet, eight binding posts, wire, screws, etc., for construction.

TOO MUCH LOCAL BARAGE.

113—CHICAGO: The writer may be called a "radiophan" and is very much pleased to know that you have established a radio department in connection with your newspaper. The writer heretofore has been obliged to depend upon another paper to secure programs, etc., but this want can now be supplied thru your paper.

The writer has a problem which perhaps you can make a suggestion as to how to best solve. I have no difficulty in getting outside stations from Springfield, Mass., to Omaha, Neb., and from Minneapolis to Texas on Monday nights, but am unable to tune out the powerful stations located in Chicago on other nights. I have the following equipment: two vernier condensers, twenty-three plates, one vacuum tube detector, two amplifying transformer tubes, one grid, three dry batteries and a "B" battery. Have you any suggestion to offer which would enable me to tune out Chicago stations?

In our next issue of the Radio Magazine will be given a diagram and pictures of an efficient wire trap that will solve your troubles. There also was a good one described and illustrated in the Nov. 15 issue.

Autoplex Hook-up.

114—CHICAGO—Will you mail me a diagram of the single tube Autoplex hook-up, and also a diagram of a crystal hook-up, one where the results will be better than the usual run of these so-called "detector" sets? Am a daily reader of your "Radio column," and your "Radio Section" in Thursday evening's paper was a "knockout." What tube would be best on the Autoplex?

Hook-ups wanted were mailed you. Also note story by Mr. Wells in this issue and Nov. 15 issue. Use Western Electric 216-A tube.

115—CHICAGO—Please reserve for me one of your binders for the Thursday Radio Magazine section. I think you have a big thing in this new magazine feature. In an early issue of the magazine I would appreciate your opinion of the submitted hook-up. It was given to me without the grid leak and condenser being shown, so I added them on my diagram, being under the impression that they are necessary in all cases. Is it necessary or advisable to use a fixed phone condenser, and if so, of what capacity? I propose to use in construction of this set an Amrad vario-coupler and Duntley 23-plate vernier condenser that I have. I will appreciate any information you can give thru your magazine section, or in the daily edition as you find convenient.

Use hook-up mailed you. Would advice forty-three vernier condenser. No phone condenser is necessary.

MORE LOCAL INTERFERENCE.

116—CHICAGO: I built an ultra audion-receiving set with two stages of amplification. When tuning in I can hear all Chicago stations that happen to be broadcasting, and the most powerful station survives. Adjusting the condenser makes very little change in reception as Chicago stations are heard in any position. Further I cannot get out-of-town stations. Where shall I look for my trouble?

Your information as to details of construction of your set, aerial, ground, batteries, would suggest using a wire trap, one type of which is mailed you. Also see Radio Magazine, Nov. 15. Another wave trap will be printed in the Nov. 29 issue.

INCORRECT RHEOSTAT OHMAGE.

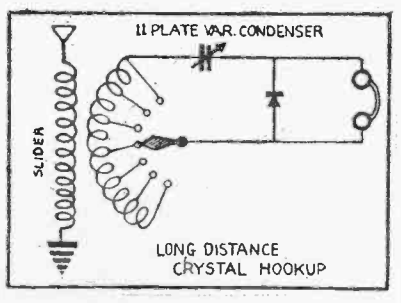
90—CHICAGO: Every time I listen in on my set I have to turn the detector tube on full, and if I turn it down the least bit I lose the stations. The type of set I am using is a three-circuit regenerative set with two stages of audio-frequency amplification. Please advise me as to what is wrong with my set.

From your information I would judge that your rheostats are of too high ohmage for type tube you are using. Below is given a list of standard make tubes and ohmage of rheostat required. For UV-200, UV-201, C-300 and C-301 tubes use six ohms. For UV-201A and C301A tubes use twenty-five ohms. For UV-199 and C-299 tubes use forty ohms. For WD-11, WD12 and C-12 tubes use six ohms.

CRACKING NOISES IN SET.

97—CHICAGO: I am submitting a sketch of my set. Can you give me any advice on the prevention of loud cracking noises that start when I hook up the "B" battery? I have tried reducing the voltage. I did have good luck one night (only) when I placed the ground wire in my mouth grounding myself (not the set) and I also got Edgewater Beach hotel with neither aerial or ground. Do you recommend another hook-up than the Flewelling? I understand it is very sensitive but very good.

Test bank of condensers for shorts. Noise might be caused by poor soldered connection. Grid condenser



This is the crystal, long-distance hook-up diagram omitted last week.

should be of .00025 mfd. capacity. Your leak is not satisfactory. Use C. R. L. made by Central Radio Laboratories, Milwaukee, Wis. A Flewelling is a very good set if built properly.

Economical Portable Circuit.

123—CHICAGO—Many compliments on your new radio section. I consider it equal to a local weekly radio paper which sells at 10 cents. I am desirous of building (or buying complete) a one-tube set to work on a aerial run around my room, and to be of such a size that I can carry it in a drawer of my wardrobe trunk. Living near Wilson avenue and WJAZ, I will consider selectivity of greater importance than attaining long-distance records. I do not care to spend more than $25 or $30 outside of headphones, which I have. Will you kindly send me a circuit and detailed information on a set which would suit my needs? The set described on page 7 of Thursday's (Nov. 15) Post requires 150-V "B" battery, which I think I could not get in a cabinet of a size I desire. I do not think that your circuit was very clear or readable as I could not list the specific items required.

Circuit has been mailed you which we believe will meet your requirements. Parts used are: One 001 fixed condenser; one U V-199 tube; one socket; one 40-ohm rheostat; one variometer; one C R L variable grid leak and cord; one 43 plate vern. condenser; 45-V "B" battery; two dry cells; six binding posts; panel, baseboard, wire.

Rewinding Neutroformers.

20. CHICAGO: I have a neutrodyne set with UV-199s and get fair results with same, the neutroformer being as follows: Primary, six turns double spaced S. S. C. Secondary, fifteen turns to tap, seventy turns in all, No. 24 D. S. C. wire, single spaced, being used. There are .006 fixed condensers across terminals of both detector plate and battery 22½ volts and amplifier plate battery of 90 volts. (Am using a six-volt "C" battery.) Now I have been informed that these parts were designed for the UV-201A tube and to get full efficiency for the UV-199 the primary of the neutroformer should be rewound with fifteen turns of No. 22 S. S. C. wire double spaced. Also substitute .006 condenser across amplifier plate with one of one microfarad. If you have any data on these or any other changes to adapt parts to UV-199, will you kindly let me have same?—H. B. B.

It will be advisable to rewind the primary coil with fifteen turns of No.

Continued on Page 15.

Finds Friends by Radio

The bishop of Birmingham, in England, broadcast a talk recently and was surprised to receive many letters from old friends of whom he had altogether lost track and who communicated with him after hearing his voice again thru the ether. Radio provides, the bishop says, a new and unexampled way to extend one's personal touch to thousands of people whom one cannot hope to meet face to face.

How to Select Variable Condensers for Your Set

By HARRY A. BREMER.
(Vice President and Chief Engineer Bremer-Tully Manufacturing Company.)

MANY radiophans assume that a condenser is a condenser, and if the plates do not audibly form contact with each other when rotated, it passes their inspection. There are, however, several important factors which should be considered in the selection of a condenser, and which every radiophan should know.

Even the most crude and inferior apparatus, if not actually short or open circuited, will suffice to receive powerful near-by broadcasting stations, at least in some degree. Unfortunately, many radiophans, learning of this fact, conclude that it is unnecessary to purchase high-grade apparatus.

The advantage of good apparatus is very apparent in reception of long distance or weak signals. The average antenna will deliver to your receiving set the signals of practically every transmitting station.

Distance Depends on Condenser.

Signals from the broadcasting stations of Alaska, Honolulu, South America and even more distant regions are being delivered to your receiving set whenever these stations are in operation, and whether or not you are able to make them audible depends in very great measure on quality of the aparatus used. The best circuit and skill in tuning will not avail against inferior apparatus.

The actual amount of energy picked up by the antenna on distant signals is so small that it is beyond the imagination of the average persons. In addition, this energy is of extremely high frequency, which requires greater precaution against losses than electric currents of ordinary frequencies. The energy picked up from high-powered local stations is so comparatively great that otherwise serious losses may not prevent strong reception.

Losses in condensers are in the main caused by poor electrical connections or conductivity, and by an action which takes place in the insulation separating the stationary plates from the rotating plates. The latter is known as dielectric loss and depends in extent upon the nature of the insulation separating the plates or their supports.

Air has a much lower loss than any solid insulation, and, consequently, is the logical insulation to use in so far as possible. A condenser using any insulation other than air between the plates will have much greater losses than an air condenser.

Insulator Plates Important.

Some solid insulator must be used to support the rotor shaft and stationary plates. This material should preferably be bakelite, formica or similar composition cut from the sheet. These compositions offer very low losses and have great mechanical strength. Hard rubber offers still lower losses, but is mechanically weak, due to its flowing property under stress. Moulded compositions are inferior to sheet, and black fibre is extremely bad.

In order to further reduce this dielectric loss, the metallic parts in contact with the supporting insulators should be small and well spaced. The supporting plates should contain as small amount of material as consistent with strength and good spacing of supports.

Condensers having only small insulating bushings offer considerable losses, due to the short distance between large metallic supports, and there is great danger of additional leakage thru the inevitable dust or other foreign matter.

Good electrical contacts are extremely important. The plates should be locked firmly to prevent any possibility of a loose contact. The preferable construction is to space plates with washers locked firmly in place by means of well threaded end bushings, which method insures permanent contacts of large surface.

Contact Wires Must Be Firm.

The contact brought out from the rotor to the wiring connection should be a firm positive connection, making permanent heavy spring contact with both the main rotor and vernier plate.

The stator wiring connection should make positive metallic connection to the plates. For instance, a simple screw extending from end plate to end plate may, after slight corrosion, have no connection to the plates at all, or at best, a most uncertain connection.

When inspecting a condenser, make certain that the stator is square. Note a point on the outside edge of a rotor plate which is central between two stationary plates. If the stator is square, this point on the rotor plate will remain central when rotated thruout 180 degrees. It will not be possible to center the rotor plates thruout the arc of rotation, unless the stator is square and, consequently, the condenser may fail with very little use.

The stationary plates should be locked into square position by means of studs and bushings independently of the end supporting plates, so that the removal of either or both end plates, if necessary, will not disturb the adjustment of the stationary plates.

Plates of Aluminum.

Rotor and stationary plates should be of hard aluminum and generous thickness, in order to be free from warping and remain true under ordinary conditions of service. All rotor plates should be equally and centrally spaced between stationary plates, and should not show warped edges when rotated.

If a vernier knob is used, make certain that it is locked to the shaft and not loosely screwed on. In using a vernier condenser, the vernier plate should always be placed half out when tuning with main rotor. The adjustment may then be completed by turning the vernier either in or out as required. Therefore, make certain that the vernier remains in position independent of the rotation of the main rotor, and that rotation of the vernier does not disturb the main rotor.

The capacity of the vernier should not be greater than 1-25 of the main rotor. A three-plate vernier is of too great capacity for satisfactory results on any sharp tuning circuit. This may not be apparent on strong local signals. The condenser is used to tune frequencies approaching one million per second, and consequently, very minute adjustment is required if even fairly approximate resonance is to be attained.

The full possibilities of a good receiving set in bringing up weak signals will not be realized unless the vernier is capable of very small capacity adjustment.

The three requirements in reception of distant signals are: First, high-grade and real vernier apparatus; secondly, a good standard circuit; third, skill in tuning acquired thru an understanding of the circuit used.

How to Tune In on Neutrodyne

Continued from Page 7.

the capacity in the tube will have been balanced with that in the small condenser and the tube will operate without oscillation and without distortion.

The same procedure is taken with the second radio-frequency tube and the tube replaced in position.

Now the set is operative. If the neutralizing has been done carefully there should be no oscillations of the tubes and the reception should be in good volume and clear.

In the efficient operation of the circuit none of the characteristic howls and whistles of the regenerative circuits is noticeable. The tubes are silent until the station signal is brought in. Music and voice come in as if from the blue sky—clear as a bell and with volume.

Each time a new tube is inserted or the tubes are changed, this same process of neutralization must be gone thru. This is true even with the replacement of a tube by one of the same type and manufacture, as no two tubes are identically alike in characteristics.

This method of neutralization may give as fine an adjustment as might be required to give perfect reception, but it will show the novice the possibilities of the set. In a later issue the Radio Magazine will publish a more pretentious method for neutralizing, one which will reduce the tube capacity to the minimum.

A series of articles, also, are under preparation showing construction details of a neutrodyne set.

Rumor Arctic Ship Crushed Denied by WNP Station

TOPSHAM, Me., Nov. 22.—Erroneous reports circulated recently thruout the middle west to the effect that a message had been received by an amateur from Capt. Donald B. MacMillan, Arctic explorer, stating that his vessel, the Bowdoin, now in winter quarters near Refuge Harbor, gradually was being crushed by ice, were denied in a radio message picked up here today by L. L. Hamilton of this place, member of the American Radio Relay league. In the message Capt. MacMillan branded as untrue the account that his ship was in great danger from crushing by ice floes. On the contrary, all was well on the Bowdoin and the crew was even then preparing for a birthday celebration. Two of the Eskimos had gone south and they were expected to return with many others.

Seek to Aid U. S. Bureau

A movement is on foot among radio manufacturers to raise a suitable fund for the United States bureau of standards to prosecute its work of research and standardizations on a greater scale. Lack of congressional aid prompts this effort.

How to Adapt a Circuit in Constructing a Home-Built Receiver Set

THIS is the second installment of Mr. Cardwell's wonderfully instructive series of articles on "Everyday Engineering for the Home Builder." His subject today is "How to Adapt the Circuit." Mr. Cardwell is writing this series exclusively for The Chicago Evening Post Radio Magazine Section. —The Editor.

By ALLEN D. CARDWELL.
(Consulting Radio Engineer.)

HAVING selected your circuit, taking care to familiarize yourself with its tuning characteristics, the good and bad points in its operating efficiency, the convenience factors, etc., you are now ready to consider making it into a finished product.

Regardless of how simple a circuit may look, it is usually the best procedure to mount all the parts on a wooden panel and base such as you can tack together easily from an old soap box. By making the drillings in the wood in the same way that you will later drill your panel, you can avoid wasting an expensive panel and at the same time you can study the effect of the controls as you have them spaced.

As soon as you begin piecing the different units in position you will note how many different arrangements or groupings of parts are possible. You should be careful, however, to make the connecting wires run as straight and direct as you can, at the same time avoiding parallel wiring on the radio-frequency side of the circuit.

In making your test assembly use some plain No. 18 wire. Obviously, do not solder your connections. When you are satisfied that the circuit is O. K. and the position of the parts is satisfactory, you can then plan your panel drilling and begin mounting the parts into the set.

Visualize the Circuit.

In adapting a circuit, it is important to visualize the function and effects of each unit before the set is built.

For example, see Fig. 1, in which you will note an inductance coil having a number of taps. These taps will be carried to the panel and the switch mounted on the panel. This means possibly eight connection taps, two end stops and the switch. In all you have eleven holes to drill.

The question arises whether you would not do better to use a variometer. Provided the variometer gives you the equivalent wave length ranges, you gain because you can make a neater and more compact unit assembly. (See Fig. 2.)

Thus you have an alternative which means a good deal in convenience. To tune the tapped coil you must set your switch on one of the eight points, while with the variometer you get easier adjustment and more satisfactory assembly and appearances.

Again, to show how important it is to visualize the different units you intend to use, consider Fig. 3. Here is a symbol for a vacuum tube and a filament rheostat. Let us say you have two audio stages and a detector. When you sketch your panel you see that you have (with a radio-frequency step) four bezels and four rheostats to account for. Now you can use a single rheostat to control both the audio tubes—lower in resistance naturally. This would eliminate one knob on the panel.

You also could put the two audio sockets in a line back of one bezel, which would eliminate one bezel. You could even use a filament control jack on these tubes and instead of the rheostat use a special filament regulator and thus eliminate one rheostat.

These are the sort of points you should have in mind when you plan the circuit and many ways are open for the home designer to economize in space and controls if he sets out with the proper information.

Must Use Right Constants.

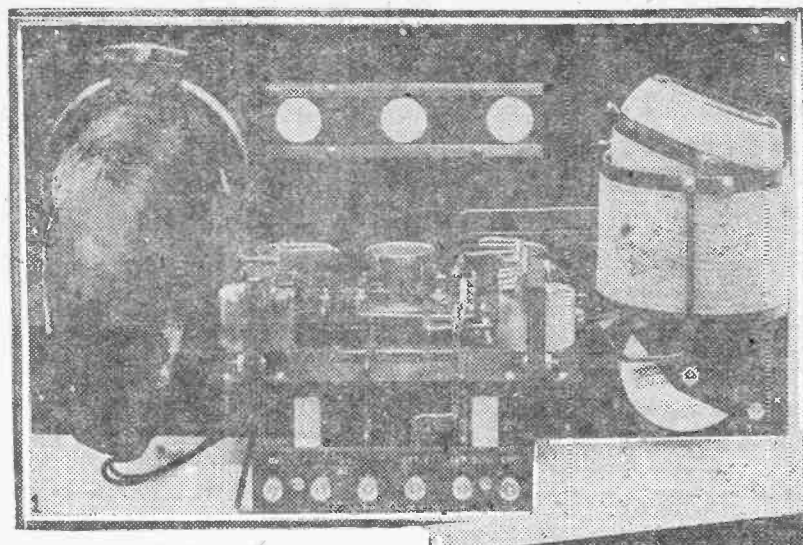
Another thing of importance in adapting a circuit is to secure the proper constants for the different units. For example, do not buy any condenser to use in the Fig. 4 circuit. You will need a certain capacity—just enough to cover broadcasting ranges—200-600. The coupling is tight and hence the secondary will tune the primary somewhat. The proper condenser capacity required obviously will depend on the number of turns and diameter of the secondary.

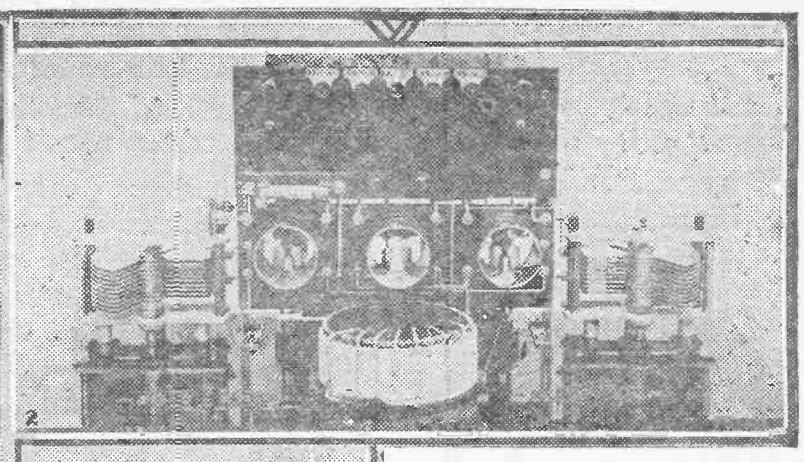
With your constants known in advance, you are not wasting time and patience when you lay out the set. Had you put in a twenty-one-plate condenser without checking up first, you might find that you can only use half the dial for tuning.

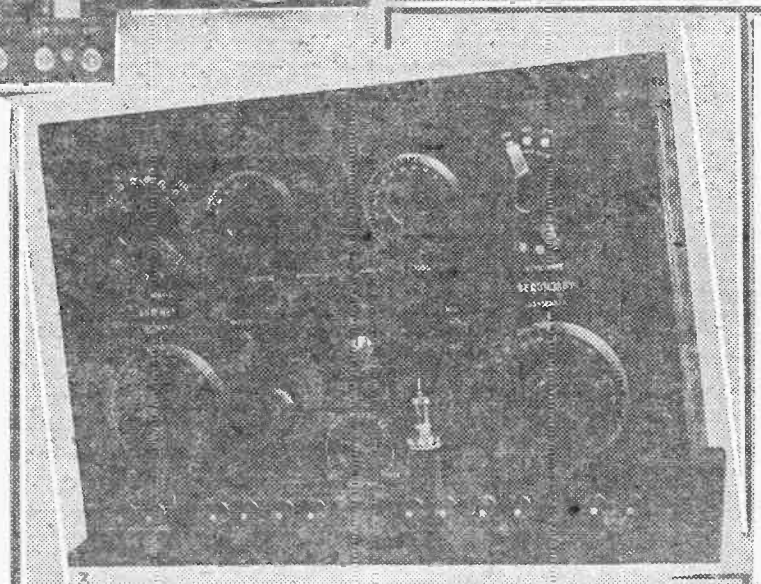
By using an eleven-plate condenser we might get the results of tuning indicated in Fig. 5.

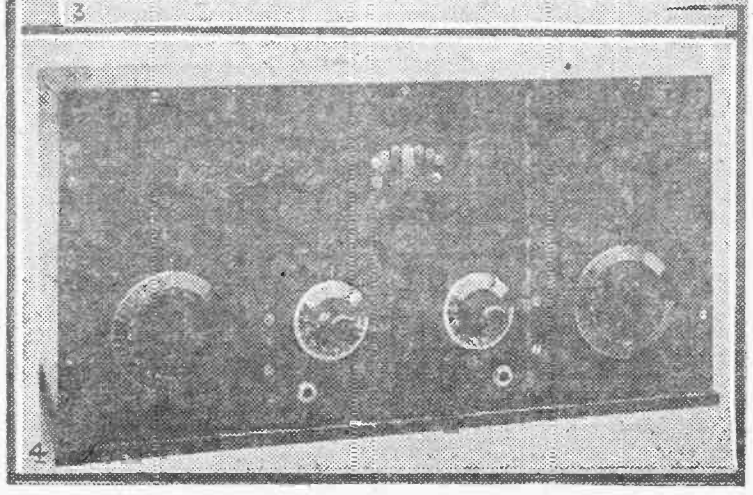
Here it is seen that if the dial has 100 markings for its 180-degree turn, the eleven-plate condenser will give more "vernier," since it must turn twice as far to secure the same change in wave length as the twenty-one-plate condenser.

The interpretation of a circuit is also a matter of wiring for special conveniences. If you make a practice of copying circuits, you can acquire considerable skill in plotting new ways to hook up. Plotting a diagram is half of your visualization process. By it you take the schematic circuit and convert into a practical circuit.









Here are several types of receivers, which show the possibilities of adaptation of circuit hook-ups. Fig. 1 is a standard three-tube regenerative set with loud speaker installed in cabinet—an unusual arrangement. Fig. 2 is a little different, but efficient treatment of the Cockaday circuit. Figures 3 and 4 show the front panels of these two sets.

This can be carried to extremes of visualization, as shown in Fig. 6.

At the top you have the schematic diagram, while below you have the "floor plan." It is even possible to draw some kinds of circuits "in elevation" showing the parts in different planes.

A Complicated Circuit.

To appreciate what can be done in a complicated circuit, note Fig. 7. This is one of the most complicated circuit jobs ever built as a single measuring unit. It performs one measurement on telephone cables, and you will note that it requires vacuum tube circuits among these two detectors and two amplifiers. The wiring shows how such a complicated device can be made to look simple. This is due to visualization of the job before it is even started.

Half of the trick in converting a circuit into a satisfactory receiver is in knowing what parts can be bought and how they can be used. For example, the use of a stamped frame to support the shelves.

Frames of this type should be a standard piece of radio hardware, yet few stores carry such accessories. By these frames it is possible to mount a large number of parts. The shelves also are used as part of the tube sockets which are built into them. This is a special point the set planner could capitalize if he knew where to get such shelves, only a few companies making such shelving.

You will note in Fig. 7 the use of a special anti-capacity switch. This is neutral at center, at the position shown (to operator's left when set is in normal position). It grounds the aerial and throws off all filament current, while at the right it closes the filament circuit and leaves the aerial in regular circuit.

A particular feature in the receiver shown in Fig. 7 was to have all moving contacts visible when the cabinet lid was opened. The moving contacts, jacks, rheostats, etc., are thus readily inspected if any trouble develops.

Provide for Easy Repairs.

Trouble "shooting" is one of the factors of design which must not be overlooked. Hardly a set can be built which will not at some time suffer from some wear, loosened connection or even foreign matter lodging in the instrument. If you so locate the various units in your set that readjustments cannot be made easily, it will mean very costly repairs even to tighten a set screw or bend a tube contact spring.

In planning a receiver, it is good practice to secure a number of really complete radio catalogs—even buying them, for the really useful catalog, giving over 100 pages of various parts, costs the dealer a large sum of money to print. There are possibly a score of dealers or supply houses in the United States which get out complete catalogs. To these you should devote a good deal of study, and when you start to adapt your circuit you can know exactly what you have to get and what it will cost.

Sometimes you cannot buy just the piece or unit you are looking for. If it can be made at home, you will stamp your set with originality by making the part yourself. For example, in some circuits a bank winding of about six layers, tapped, can be used for the tuning inductance. These are obtainable now for standard wave lengths, but where you may wish a special diameter for the coil tube or you may want a mounting support to use it with a coupler, it may be necessary to wind it "to order."

Sums Up Points Made.

So far I have pointed out these general principles of procedure:

1. Visualize the position of each unit.
2. Visualize the functions of each control.
3. "Project" the actual wiring or make a loose assembly to approximate the circuit conditions when permanently assembled.
4. Study all the types of parts you need and select the types which give the "refinements" and conveniences.
5. Study every combination or multiple control that can be used to simplify the device.
6. Plan your assembly so that trouble corrections can be made later.

These are the intangibles of radio engineering which the set builder may learn by experience, but if he is wise he will accept the advice given, and when he tackles a new circuit it will not be thrown together indiscriminately.

These matters you have possibly noted have been elaborated upon without any discussion of circuits. You cannot intelligently select or use a circuit unless you are considering its physical interpretation.

If, for example, you decided to build a Reinartz receiver without considering just what space the special spider coils used would require, you might be seriously disappointed after buying all the parts to find that these coils would have to go on the front of the panel. Or, if you decided to build a super-heterodyne and having the parts assembled suddenly appreciate that the shields called for would require entirely different construction, it might make your cabinet, panel and shelves useless.

Do not start on a circuit until you have estimated how the set will look as assembled, how each unit will be mounted, and exactly what space it will require.

Have Enough Controls.

As to circuits themselves, one thing I would suggest: On all radio-frequency tubes be sure you are using an adequate number of controls.

A vacuum tube is as delicate as a fine watch. You probably know how easy it is for a watch to get "out of regulation." When the spring is wound tight it is exerting more pressure on the escapement and speeds it up and when it is run down the escapement may slow down. Often a movement of a hair's breath on the regulator means a gain or loss of several minutes a day. Similarly with a vacuum tube, the grid potential, plate voltage, filament brightness, etc., all are factors of its efficiency and even the capacity of the tube in the socket. These are exceedingly important cnosiderations in radio-frequency circuits and will determine the efficiency of the set to a large degree.

Therefore, do not attempt to build a radio-frequency set without providing for the proper filament and grid controls. The differences in results will be as great as between a watch which gives true time and one which only tells time after a fashion.

For example, you will note in Figure 8-A a conventional regenerative circuit. This is wired as shown in 8-B to bring the connections to a connector block at the rear of the set. It will be seen that the rheostat is here placed in the negative side of the filament lead. The grid return is on the negative filament side which gives a bias to the grid negatively equal to the drop in the rheostat and the filament. This connection should be close to the filament.

Sometimes the return connection is placed between the rheostat and the filament which is wrong. The connection will be on the positive on some tubes and on the negative side for others, depending on the tube and whether the tube is to be used for a detector amplifier. Thus you are obliged to know what tube you will use and how it should be connected in the circuit.

Again in Figure 8-A you note a variable condenser used to tune the secondary. It will make some difference in the efficiency of the circuit if you use a condenser, the rotor of which should be grounded and then ground the stator. Further, you will uote the dotted line XY in A, which is represented by a jumper from the ground post to the negative A post.

Unless you count on holding some part of the circuit at zero potential it will affect your signals. Grounding the circuit also tends to give a slight variometer effect to the coupler. Note also the use of by-pass condensers across the batteries and phones.

If we use a tubing about five inches long, with two rotors, and one main primary which will be coupled to the plate circuit and act as a tuner, coupler and feed-back. The amount of wire used can be very small, and a semifixed coupling devised which will eliminate one control and the one which is often seldom used in practice.

By introducing a potentiometer we will secure the full amplifying characteristic of the tube. A by-pass condenser is also used on the potentiometer. Leaving off variable condensers will reduce the weight somewhat. Note the switch which cuts the A battery so that the potentiometer will not drain the current when set is not in use.

A possible version of this is shown in Figure 10. This is a slanting panel type now coming back into vogue, in which the tuning controls are at the bottom of the panel where the two hands can normally rest with comfort. The potentiometer is on the right and would be used more than the rheostat.

A push-pull switch to cut off the battery can be used as shown. The telephone jack is on the base to the right. A large bezel is cut in the upper center and by having the door or "lid" at the back access can be obtained to the parts. By making box compartments, dry batteries can be used inside the cabinet.

A calibration plate can be fixed on the panel for convenience after the aerial is "logged" for all wave lengths.

Worth While the Labor.

The instrument as devised is not a simple set to construct. It does give something that is distinctive, practical and neat and by selecting attractive dials, getting good panel engraving and having the wiring all carefully soldered, the objective of this circuit is realized. It has "points" all the way thru and these are what make for engineering success.

To show how government engineers

Continued on Page 15.

Broadcasting Stations and Schedules

Central, or Chicago time, is shown on all stations. If necessary to ascertain local time on any station deduct two hours from time shown for Pacific coast stations, one hour from time shown for the Rocky mountain stations and add one hour to those stations using eastern time. Hawaiian island time is four hours and a half slower than Chicago time. In the list the call number of the station is first given, followed by the location, the owner's name, wave length used and broadcasting schedule in order named. THE POST is making a thoro canvass of all stations in order that this directory may be complete and accurate. Changes are so frequent in stations and schedules that no list can be satisfactory which is not corrected frequently. Corrections and additions to this list will be made from week to week. Stations are urged to co-operate by sending information of changes in schedule to Radio Editor, The Chicago Evening Post.

AQG—Canton, Ohio, headquarters 135th F. A., O. N. G., 425 meters.
ASG—San Antonio, Texas, Camp Travis, U. S. A., 480 meters.
BEI—Tacoma, Wash., Camp Lewis, U. S. A., 360 meters.
KDKA—Pittsburg, Pa., Westinghouse Electric and Manufacturing company, 326 meters. Day schedule—9 a. m., music and live stock markets; 10:55 a. m., Arlington time signals; 11:50 a. m., U. S. bureau of market reports; 12:30 p. m., luncheon concert. Evening schedule—5:15 p. m., dinner concert; 6:45 p. m., bedtime story; 7-8:55 p. m., program.
KDPM—Cleveland, Ohio, Westinghouse Electric and Manufacturing company, 270 meters.
KDPT—San Diego, Cal., Southern Electric company, 360 meters.
KDYL—Salt Lake City, Utah, Salt Lake Telegram, 485 meters.
KDYM—San Diego, Cal., Savoy theater, 360 meters.
KDYQ—Portland, Ore., Oregon Institute of Technology, 360 meters.
KDYS—Great Falls, Mont., Great Falls Tribune, 485 meters.
KDYW—Phoenix, Ariz., Smith, Hughes & Co., 360 meters.
KDYX—Honolulu, Hawaii, Star Bulletin company, 360 meters.
KDBZ—Bakersfield, Cal., Frank Siefert, 360 meters.
KDZE—Seattle, Wash., The Rhodes company, 455 meters. Evening schedule—6:30-7:30 p. m., children's hour; 10:30 p. m., musical program. Silent Tuesday, Thursday and Sunday nights.
KDZF—Los Angeles, Cal., Automobile Club of Southern California, 360 meters.
KDZI—Wenatchee, Wash., Electric Supply company, 360 meters.
KDZK—Reno, Nev., Nevada Machinery and Electric company, 360 meters.
KDZQ—Denver, Colo., William D. Pyle, 360 meters.
KDZR—Bellingham, Wash., Bellingham Publishing company.
KFAD—Phoenix, Ariz., McArthur Bros. Mercantile company, 360-485 meters
KFAE—Pullman, Wash., State College of Washington, 360 meters.
KFAF—Denver, Colo. Western Radio corporation, 360 meters. Evening schedule—9-10 p. m., concert.
KFAJ—Boulder, Colo., University of Colorado, 360 meters.
KFAN—Moscow, Idaho, Electric shop, 360 meters.
KFAP—Butte, Mont., Standard Publishing company, 360 meters.
KFAQ—San Jose, Cal., City of San Jose, 360 meters.
KFAR—Hollywood, Cal., Studio Lighting service, 360 meters.
KFAT—Eugene, Ore., Pacific Radio company, 360 meters.
KFAU—Boise, Idaho, Independent School district of Boise City, 360 meters.
KFAV—Boise, Idaho, Boise high school, 360-485 meters.
KFAW—Santa Ana, Cal., Radio Den, 360 meters.
KFBB—Havre, Mont., F. A. Buttrey company, 360-485 meters.
KFBC—San Diego, Cal., W. K. Azbill, company, 360 meters.
KFBE—San Luis, Obispo, Cal., Horn's Radio shop, 360 meters.
KFBG—Tacoma, Wash., First Presbyterian church, 360 meters.
KFBK—Sacramento, Cal., Kimball-Upson company, 360 meters.
KFBL—Everett, Wash., Leese Bros., 360 meters.
KFBS—Trinidad, Colo., Chronicle News and Gas and Electric Supply company, 360 meters.
KFBU—Laramie, Wyo., Bishop N. S. Thomas, 360 meters.
KFCD—Phoenix, Ariz., Nelson Radio Supply company, 360 meters.
KFCD—Salem, Ore., F. S. Barton, 360 meters.
KFCF—Walla Walla, Wash., Frank D. Moore, 360 meters.
KFCH—Billings, Mont., Electric Service station, 360 meters.
KFCK—Colorado Springs, Colo., Colorado Springs Radio company, 360 meters.
KFCC—Los Angeles, Cal., Los Angeles Union stockyards, 360 meters.
KFCM—Richmond, Cal., Richmond Radio shop, 360 meters.
KFCP—Ogden, Utah, Ralph W. Flygare, 360 meters.
KFCV—Houston, Texas, Fred Mahaffey Jr., 360 meters.
KFCY—LeMars, Iowa, Western Union college, 360 meters.
KFCZ—Omaha, Neb., Omaha Central high school, 360 meters.
KFDA—Baker, Ore., Adler's Music store, 360 meters.
KFDB—San Francisco, Cal., California Mercantile Trust company, 360 meters. Evening schedule—Midnight-1:30 a. m., musical program.
KFDC—Spokane, Wash., E. V. Craney, 360 meters.
KFDD—Boise, Idaho, St. Michael's cathedral, 360 meters.
KFDF—Casper, Wyo., Wyoming Radio corporation, 360 meters.
KFDA—Tucson, Ariz., University of Arizona, 360 meters.
KFDJ—Corvallis, Ore., Oregon Agricultural college, 360 meters.
KFDL—Denver, Colo., Knight-Campbell Music company, 360 meters.
KFDO—Bozeman, Mont., H. Everett Cutting, 360 meters.
KFDP—Des Moines, Iowa, Hawkeye Radio and Supply company, 360 meters.
KFDR—York, Neb., Bullock's Hardware and Sporting Goods, 360 meters.
KFDU—Lincoln, Neb., Nebraska Radio Electric company, 360 meters.
KFEC—Portland, Ore., Northwestern Radio Manufacturing company, 360 meters. Day schedule—1 p. m., children's hour. Evening schedule—6 p. m., concert and features; 8:30 p. m., weather reports.
KFEJ—Tacoma, Wash., Guy Greason, 360 meters.
KFEL—Denver, Colo., Winner Radio corporation, 360 meters.
KFEQ—Oak, Neb., J. D. Scroggin, 360 meters.
KFER—Fort Dodge, Iowa, Auto Electric Service company, 360 meters.
KFEV—Douglas, Wyo., Radio Electric shop, 360-485 meters.
KFFA—San Diego, Cal., Dr. R. C. Shelton, 360 meters.
KFFB—Boise Idaho, Jenkins Furniture company, 360 meters.
KFFE—Pendleton, Ore., Eastern Oregon Radio company, 360 meters.
KFFQ—Colorado Springs, Colo., Marksheffel Motor company, 360 meters.
KFGH—Palo Alto, Cal., Stanford university, 300-310 meters.
KFHJ—Santa Barbara, Cal., Fallon & Co., 360 meters.
KFI—Los Angeles, Cal., Earl G. Anthony, 495 meters. Evening schedule—7-7:30 p. m., 8:45-9:30 p. m., 10 p.m.-2 a. m., features, drama, music.
KGB—Tacoma, Wash., William A. Mullens Electric company, 360 meters.
KGG—Portland, Ore., Halock & Watson, 360 meters. Day schedule—2:45-3 p. m., market reports and news. Evening schedule—7:30 p. m., music and sports; 9:30 p. m., general news; 10 p. m., radio talk.
KGN—Portland, Ore., Northwestern Radio Manufacturing company, 360 meters.
KGO—Altadena, Cal., Altadena Radio laboratory, 352 meters.
KGU—Honolulu, Hawaii, Marion A. Mulkay, 360 meters.
KGW—Portland, Ore., Oregonian Publishing company, 492 meters. Day schedule—5:30-6 p. m., children's program. Evening schedule—9:30-9:45 p. m., forecast and markets; 10 p. m.-2 a. m., lecture and concert.
KGY—Lacey, Wash., St. Martin's college, 360 meters. Day schedule—None. Evening schedule—10:30 p. m., musical program.
KHJ—Los Angeles, Cal., C. R. Kierulff & Co., 400-485 meters. Day schedule—4:30-5:30 p. m., varied program, news and music. Evening schedule — 8:45-9:30 p. m., children's hour; 10 p. m.-2 a. m., concert.
KJQ—Stockton, Cal., C. O. Gould, 360 meters.
KJR—Seattle, Wash., Northwest Radio Service company, 360-485 meters. Day schedule—7:45-8:30 p. m. Evening schedule—9:30-10:30 p. m., varied programs.
KJS—Los Angeles, Cal., Bible Institute of Los Angeles, 360 meters.
KLN—Del Monte, Cal., Monterey Electric shop, 360 meters.
KLS—Oakland, Cal., Western Radio Institute, 360 meters.
KLX—Oakland, Cal., Warner Bros., 360 meters.
KLZ—Denver, Colo., Reynolds Radio company, 360 meters.
KMJ—Fresno, Cal., San Joaquin Light and Power corporation, 360 meters.
KMO—Tacoma, Wash., Love Electric company, 360 meters.
KNJ—Roswell, N. M., Roswell Public Service company, 360-485 meters.
KNT—Aberdeen, Wash., Grays Harbor Radio corporation, 360 meters.
KOB—State College, N. M., New Mexico College of Agriculture and Mechanical Arts, 360-485 meters.
KOP—Detroit, Mich., Detroit Police department, 360 meters.
KPO—San Francisco, Cal., Hale Bros., 400 meters. Day schedule—3 to 4 p. m. Evening schedule—6:30 to 7:30 p. m., 10 p.m. to 3 a. m.
KQI—Berkeley, Cal., University of California, 360 meters.
KQP—Hood River, Ore., Blue Diamond Electric company, 360 meters.
KQV—Pittsburg, Pa., Doubleday-Hill Electric company, 360 meters.
KQW—San Jose, Cal., Charles D. Herrold, 345-360 meters.
KRE—Berkeley, Cal., Maxwell Electric company, 360 meters.
KSD—St. Louis, Mo., Post-Dispatch, 546 meters. Day schedule—Children's program Saturday, 3 p. m. Evening schedule—8 p. m., concert program.
KSS—Long Beach, Cal., Pres & Dean Radio Research laboratory, 360 meters.
KTW—Seattle, Wash., First Presbyterian church, 360 meters.
KUO—San Francisco, Cal., Examiner, 485-525 meters.
KUS—Los Angeles, Cal., City Dye Works and Laundry company, 360 meters.
KUY—El Monte, Cal., Coast Radio company, 360 meters.
KWG—Stockton, Cal., Portable Wireless Telehone company, 360 meters.
KWH—Los Angeles, Cal., Examiner, 360-485 meters.
KXD—Modesta, Cal., Herald Publishing company, 360 meters.
KYQ—Honolulu, Hawaii, Electric shop, 360 meters.
KYF—San Diego, Cal., Thearle Music company, 360 meters.
KYW—Chicago, Ill., Westinghouse Electric and Manufacturing company, 536 meters. Daily except Sunday, 9:30 a. m., financial, market; 10 a. m., market; 10:30 a. m., news; 10:58 a. m., time signal; 11 a. m., market; 11:05 a. m., weather; 11:30 a. m., news, market; 11:35 a. m., table talk; 12 m., market; 12:10 p. m., Saturday, final market; 12:30 p. m., news; 1 p. m., market, except Wednesday, Saturday; 1:20 p. m., closing quotations except Wednesday, Saturday; 2:15 p. m., news; 2:30 p. m., closing quotations; 3 p. m., news and sport bulletin; 4 p. m., news; 4:15 p. m., stock reports; 4:30 p. m., news and sports; 5 p. m., news; 6:30 p. m., financial summary; 6:50 p. m., bedtime stories; 8 p. m., musical program; 8:58 p. m., time signal; 9 p. m., weather; 9:05 p. m., special services. Tuesday, Thursday, 2:35-3 p. m., 9-9:25 p. m., concert. Friday, 10-11:30 p. m., late show. Saturday, 9-9:25 p. m., reading. Sunday, 11 a. m., church services; 6 p. m., concert, Evening Post program.
KZM—Oakland, Cal., Tribune, 360 meters. Evening schedule—8:45 p. m., concert.
KZN—Salt Lake City, Utah, Desert News, 360-485 meters. Evening schedule—8 p. m., concert.
KDZQ—Denver, Colo., William D. Plye, 360 meters.
WAAB—New Orleans, La., Valdemar Jensen, 360 meters.
WAAC—New Orleans, La., Tulane university, 360 meters.
WAAD—Cincinnati, Ohio, Ohio Mechanics' institute, 360 meters.
WAAF—Chicago, Union Stock Yards and Transit company, 485 meters. Day schedule—8:40, 10:30, 10:45 a. m., 12:30, 12:45, 3, 4:30 p. m., live stock reports.
WAAH—St. Paul, Minn., Commonwealth Electric company, 360 meters.
WAAK—Milwaukee, Wis., Gimble Brothers, 360 meters.
WAAM—Newark, N. J., I. R. Nelson company, 360 meters.
WAAN—Columbia, Mo., University of Missouri, 360 meters.
WAAP—Wichita, Kan., United Electric company, 360 meters.
WAAW—Omaha, Neb., Omaha Grain company, 360-485 meters. Evening schedule—8-9 p. m., concert.
WAAZ—Emporia, Kan., Hollister Miller Motor company, 360 meters.
WAH—El Dorado, Kan., Midland Refining company, 485 meters.
WBAA—West Lafayette, Ind., Purdue university, 370 meters.
WBAD—Minneapolis, Minn., Sterling Electric company, 360 meters.
WBAF—Moorestown, N. J., Fred M. Middleton, 360 meters.
WBAH—Minneapolis, Minn., Dayton company, 360 meters.
WBAN—Paterson, N. J., Wireless Phone corporation, 360 meters.
WBAO—Decatur, Ill., James Millikin university, 360 meters.
WBAP—Fort Worth, Texas, Star Telegram, 476 meters. Day schedule—10 a. m.-4 p. m., markets and finance. Evening schedule—7:30-8:30 p. m., and 9:30-10.45 p. m., musical programs.
WBAU—Hamilton, Ontario, Republican Publishing company, 360 meters.
WBAV—Columbus, Ohio, the Ernor Hopkins company, 360 meters.
WBAW—Marietta, Ohio, Marietta college, 360 meters.
WBAX—Wilkes Barre, Pa., John H. Stenger company, 360 meters.
WBAY—New York City, American Telegraph and Telephone company, 400 meters.
WBL—Anthony, Kan., T. & H. Radio company, 360 meters.
WBS—Newark, N. J., D. W. May, 360 meters.
WBT—Charlotte, N. C., Southern Radio corporation, 360 meters.
WBU—Chicago, City of Chicago, 286 meters.
WBZ—Springfield, Mass., Westinghouse Electric and Manufacturing company, 422 meters. Day schedule—10:55 a. m., time signals; weather; markets. Evening schedule—5 p. m., world market survey; 5:30 p. m., University Extension lecture; 6 p. m., concert; 6:30 p. m., bedtime story; 7 p. m., concert.
WCAC—Fort Smith, Ark., John Fink Jewelry company, 360 meters.
WCAD—Canton, N. Y., St. Lawrence university, 200-480 meters.
WCAE—Pittsburg, Pa., Kaufman & Baer company, 360 meters. Day schedule—5:30 p. m., dinner concert. Evening schedule—6:45 p. m., bedtime story; 7:30 p. m., musical program.
WCAG—New Orleans, La., Clyde R. Randell, 360 meters. Day schedule—11:30 a. m., news, weather; 3:30 p. m., stock market reports; 5:30 p. m., dinner concert. Evening schedule—6:30 p. m., news; 6:45 p. m., bedtime story; 7:30 p. m., musical program.
WCAH—Columbus, Ohio., Entrekin Electric company, 360 meters.
WCAJ—University Place, Neb., Nebraska Weslyn university, 360-485 meters.
WCAK—Houston, Texas, Alfred D. Daniel, 360 meters.
WCAL—Northfield, Minn., St. Olaf college, 360 meters.
WCAO—Baltimore, Md., Sanders & Staymen company, 360 meters.
WCAR—San Antonio, Texas, Alamo Radio Electric company, 360 meters.
WCAJ—Minneapolis, Minn., William H. Dunwoody Industrial institute, 360 meters.
WCAT—Rapid City, S. D., South Dakota School of Mines, 360 meters.
WCAU—Philadelphia, Pa., Durham & Co., 360-485 meters.
WCAY—Little Rock, Ark., J. C. Dice Electric company, 360 meters.
WCAX—Burlington, Vt., University of Vermont, 360 meters.
WCAY—Milwaukee, Wis., Kesselman-O'Driscoll Music house, 360-485 meters.
WRAM—Carthage, Ill., Robert E. Compton (Carthage college), 360 meters.
WCBD—Zion, Ill., Wilbur Glenn Voliva, 345 meters. Broadcasts only on Monday and Friday evenings, Wednesday afternoons and Sundays. Monday, 8 p. m., band concert; Wednesday, 2:30-3:45 p. m., sacred concert and address by Voliva; Sunday, 9-9:30 a. m. and 2:30-5:30 p. m., religious services.
WCE—Minneapolis, Minn., Findley Electric company, 360 meters.
WCK—St. Louis, Mo., Stix-Baer-Fuller company, 360-485 meters.
WCN—Worcester, Mass., Clark university 360-485 meters.
WCM—Austin, Texas, University of Texas, 360 meters.
WCX—Detroit, Mich., Detroit Free Press, 580 meters. Day schedule—2 p. m., news bulletins; 2:15 p. m., stock quotations; 2:50 p. m., weather; 4:15 p. m., music. Evening schedule—musical program.
WDM—Washington, D. C., Church of the Covenant, 360 meters.
WDT—Stapleton, N. Y., Shipowners' Radio service, 360 meters.
WDZ—Tuscola, Ill., James L. Bush, 360 meters.
WEAA—Flint, Mich., Fallain & Lathrop, 360 meters.
WEAB—Fort Dodge, Iowa, Standard Radio Equipment company, 360-485 meters.
WEAD—Atwood, Kan., Northwestern Kansas Radio Supply company, 360-485 meters.
WEAE—Blacksburg, Va., Polytechnic institute, 360 meters.
WEAF—New York city, American Telephone and Telegraph company, 492 meters. Evening schedule—6:30-11 p. m., concert.
WEAG—Edgewood, R. I., Nichols-Hineline-Bassett laboratory, 360 meters.
WEAI—Ithaca, N. Y., Cornell university, 360 meters.
WEAJ—Vermillion, S. D., University of South Dakota, 360 meters.
WEAK—St. Joseph, Mo., J. B. Abercrombie, 360 meters.
WEAL—North Plainfield, N. J., borough of North Plainfield, 360 meters.
WEAN—Providence, R. I., Shepard company 360 meters. Evening schedule—9-11 p. m., musical program.
WEAO—Columbus, Ohio, Ohio State university, 360 meters.
WEAP—Mobile, Ala., Mobile Radio company, 360-485 meters.
WEAR—Baltimore, Md., News and American Publishing company, 360-485 meters.
WEAS—Washington, D. C., the Hecht company, 360 meters.
WEAU—Sioux City, Iowa, Davidson Bros. company, 360 meters.
WEAY—Houston, Texas, Iris theater, 360 meters.
WEB—St. Louis, Mo., Benwood Company, Inc., 360 meters.
WEV—Houston, Texas, Hurlbutt-Still Electric company, 360-485 meters.
WEW—St. Louis, Mo., St. Louis university, 360-485 meters. Day schedule—8 a. m. and 9 a. m., quotations and live stock reports; 10 a. m., weather and markets; 11-11:30 a. m. and 1 p. m., marketgrams.
WFAA—Dallas, Texas, Dallas News and Dallas Journal, 476 meters. Silent Wednesdays. Day schedule—12:30-1 p. m., features and talks. Evening schedule—8:30-9:30 p. m. and 11 p. m., to midnight, musical programs.
WFAB—Syrcause, N. Y., C. F. Woese, 360 meters.
WFAF—Poughkeepsie, N. Y., R. C. Spratley Radio company, 360 meters.
WFAH—Port Arthur, Texas, Electric Supply company, 360 meters.
WFAJ—Asheville, N. C., Hi-Grade Wireless Instrument company, 360 meters.
WFAM—St. Cloud, Minn., Granite City Electric company, 360-485 meters.
WFAN—Hutchinson, Minn., Hutchinson Electric Service company, 360-485 meters.
WFAQ—Cameron, Mo., Cameron Radio company (Missouri Wesleyan college), 360 meters.
WFAT—Sioux Falls, S. D., Argus-Leader, 360-485 meters.
WFAV—Lincoln, Neb., University of Nebraska, 360-485 meters.
WFI—Philadelphia, Pa., Strawbridge & Clothier, 360 meters. Day schedule—9:15 a. m., produce and live stock markets. Evening schedule—8 p. m., concert.
WGAL—Lancaster, Pa., Lancaster Electric Supply and Construction company, 360 meters.
WGAN—Pensacola, Fa., Cecil E. Lloyd, 360 meters.
WGAQ—Shreveport, La., W. G. Patterson, 360 meters.
WGAR—Fort Smith, Ark., South West American, 360 meters.
WGAU—Wooster, Ohio, Marcus G. Limb, 360 meters.
WGAW—Altoona, Pa., Ernest C. Albright, 360 meters.
WGAY—Madison, Wis., North Western Radio Company, Inc., 360 meters.
WGAZ—South Bend, Ind., South Bend Tribune, 360 meters.
WGI—Medford Hillside, Mass., American Radio and Research corporation, 360 meters. Day schedule—11 a. m., music; 11:40 a. m., weather; 11:45 a. m., markets; 2 p. m., music; 5 p. m., news and sports; 5:30 p. m., Boston police news. Evening schedule—7 p. m., concert.
WGL—Philadelphia, Pa., Thomas F. G. Howlett, 360 meters.
WGM—Atlanta, Ga., Atlanta Constitution, 400 meters. Evening—6-7 p. m. and 9:30-10:30 p. m., musical programs.
WGR—Buffalo, N. Y., Federal Telephone company, 360 meters.
WDAD—Lindsborg, Kan., Central Kansas Radio Supply, 360 meters.
WDAE—Tampa, Fla., Tampa Daily Times, 360-485 meters.
WDAF—Kansas City, Mo., Kansas City Star, 411 meters. Day schedule—3:30-4:30 p. m., musical matinee. Evening schedule—6-10 p. m., concert and varied program.
WDAG—Amarillo, Texas, J. Lawrence Martin, 360 meters.
WDAH—El Paso, Texas, St. Patrick's cathedral, 360-485 meters.
WDAI—Syracuse, N. Y., Hughes Radio corporation, 360-485 meters.
WDAK—Hartford, Conn., Courant, 360 meters.
WDAL—Jacksonville, Fla., Times-Union, 360 485 meters.
WDAO—Dallas, Texas, Automotive Electric company, 360 meters.
WDAP—Chicago, Ill., Board of Trade, 360 meters. 9:35 a. m., 10:01 a. m., 10:31 a. m., 11:01 a. m., 12:01 p. m., 12:31 p. m., 1:01 p. m., 1:25 p. m., market reports; 3:15 p. m., closing quotations; 6 p. m., market summary. Saturday, 12:05 p. m., closing quotations. Daily except Sunday, 1:35 p. m., concert. Tuesday, Thursday, Saturday, 10 p. m., concert. Sunday, 9:15 p. m., concert. Tuesday, Thursday, 7-8 p. m. Wednesday, Friday, Saturday, 7-8:30 p. m. Wednesday, Friday, 10-12 p. m., concerts.
WDAR—Philadelphia, Pa., Lit Brothers, 360 meters. Day schedule—3:30 p. m., varied program. Evening schedule—6:30 p. m., concert.
WDAS—Worcester, Mass., Samuel A. Waite, 360 meters.
WDAU—New Bedford, Mass., A. H. Smith, 360 meters.
WDAX—Centreville, Iowa, First National bank, 360 meters.
WDAY—Fargo, N. D., Fargo Radio Service company, 360 meters.

THE CHICAGO EVENING POST TABLOID RADIO SCHEDULES

These stations are those most commonly tuned in evenings by the Chicago broadcast listeners. The time given is central standard. Pacific coast time is two hours earlier than that shown here. Mountain time is one hour earlier, and eastern time one hour later. Evening program schedules only are given. This list was compiled by The Chicago Evening Post Radio Department and is protected by copyright.

STATION	Miles	Met	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Chicago—									
KYW, Comm. Edison Bldg		536		6:30- 9:30	6:30-12:00	6:30- 9:30	6:30- 9:30	6:30-12 m.	6:30- 9:30
WAAF, Union Stock Yards		286	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00		
WMAQ, Hotel La Salle		448		7:00- 9:55	7:00- 9:55	7:00- 9:55	7:00- 9:55	8:00-10:00	
WDAP, Drake Hotel		360		7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	9:15-10:30
WJAZ, Edgewater Beach Hotel		448		10:00-12:30	10:00-12:30	10:00-12:30	10:00-12:30	10:00- 2:00	6:00- 9:00
Suburban—									
WCBD, Zion, Ill	39	345	8:00- 9:00				8:00- 9:00		
WIAB, Rockford, Ill	77	252			8:00- 9:00				
WRM, Urbana, Ill	120	360			8:50- 9:30				
WTAS, Elgin, Ill	37	275			7:30-10:00				
Eastern—									
KDKA, East Pittsburg	430	326	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WBZ, Springfield, Mass	802	337	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	
WEAF, New York City	733	495	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00
WGI, Medford Hillside, Mass	875	360	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	7:30- 9:00
WHAZ, Troy, N. Y	748	380	8:00- 9:30						
WGY, Schnectady, N. Y	698	280	6:45-11:30	6:45- 9:00	6:45- 9:00	6:45- 9:00	6:45-11:30	6:45- 9:00	
WGR, Buffalo	472	319	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	
WJY, New York City	733	405							2:30- 6:00
WJZ, New York City	733	455	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	
WOO, Philadelphia	677	509	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	
WRC, Washington, D. C.	612	469	8:00-10:00		8:00-10:00		8:00-10:00		
Midwest—									
WCX, Detroit	245	517	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00		
WJAX, Cleveland	323	390		7:30- 9:30		8:00-10:30			
WLAG, Minneapolis	358	417	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	
WLW, Cincinnati	262	309	8:00-10:00	10:00-12:00	8:00-10:00	10:00-12:00			
WOC, Davenport	105	481	7:00-11:00		7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WTAM, Cleveland	323	300	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30
WWJ, Detroit	245	517	8:30-10:00	8:30-10:00	8:30-10:00	8:30-12 m.	8:30-10:00		
Southern—									
KSD, St. Louis	270	546	8:00-11:00	8:00-11:00	8:00-11:00		8:00-11:00	8:00-11:00	
WBAP, Fort Worth, Texas	855	476	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00		
WDAF, Kansas City, Mo	430	411	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	
WFAA, Dallas, Texas	853	476	6:45- 9:30	6:45- 9:30	6:45- 9:30	6:45- 7:30	6:45- 9:30	6:45- 9:30	9:30-11:00
WGV, New Orleans	858	350	7:00- 8:00		7:00- 8:00			7:00- 8:00	
WHAS, Louisville	271	400			7:30- 9:00				4:00- 5:00
WHB, Kansas City, Mo	430	411		7:00- 9:00		7:00- 9:00	7:00- 9:00		8:00-10:00
WMC, Memphis	480	500		11:00-12:00			11:00-12:00	8:00-10:00	8:00-10:00
WOAI, San Antonio, Texas	1,080	385		9:30-10:30				9:30-10:30	
WOS, Jefferson City, Mo	337	441	8:00- 9:30		8:00- 9:30		8:00- 9:30		
WSB, Atlanta, Ga	605	428	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	7:30- 9:00
Pacific Coast—									
KFDB, San Francisco	1,910	509	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30
KGW, Portland, Ore	1,895	492	1:00-2 a.m.	10:00-11:00	10:00-11:00	10:00-11:00	1:00-2 a.m.	10:00-11:00	9:00-10:00
KHJ, Los Angeles	1,795	395	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	10:00-12:00
KPO, San Francisco	1,910	423	6:30-12 m.	6:30-12 m.		6:30-12 m.		6:30-12 m.	10:30-12 m.

Continued on page 15.

Broadcasting Stations and Schedule of Programs

Continued from page 14.

and Telegraph company, 360 meters. Day schedule—9:45 a. m., weather; 12 m., agn'ograms; 5:30 p. m., tea-time music. Evening schedule—6 p. m., news. Concerts Monday, Wednesday and Friday.

WGV—New Orleans, La., Interstate Electric company, 360 meters. Evening, 7-8 p. m., concert.

WGY—Schenectady, N. Y., General Electric company, 380 meters. Day schedule—11:55 a. m., time signals; 12:30 p. m., stock market report; 12:40 p. m., produce market report; 1 p. m., music and reading. Evening schedule—6:45 p. m., musical program, vocal and instrumental.

WHA—Madison, Wis., University of Wisconsin, 360-485 meters.

WHAA—Iowa City, Iowa, Iowa State University of Iowa, 360 meters.

WHAB—Galveston, Texas, Clark W. Thompsson, 300-360-485-600 meters.

WHAC—Waterloo, Iowa, Cole Bros. Electric company, 360 meters.

WHAD—Milwaukee, Wis., Marquette university, 360-485 meters.

WHAG—Cincinnati, Ohio, University of Cincinnati, 360 meters.

How to Adapt the Circuit

Continued from Page 13.

have planned a receiver I call your attention to the panel used in the army portable set. Here are the points of this instrument:

1. Vacuum tube detector.
2. Crystal detector standby.
3. Buzzer to test the crystal.
4. Wave lengths from 250 to 3600.
5. Regenerative control.
6. Rheostat control.
7. Ground gap.
8. Coupling.
9. Oscillation tester.
10. Vernier tuning dials.
11. Loading coil posts for long wave lengths, etc.

This set was built for severe use, and its ruggedness cannot be appreciated without actual inspection. As these instruments cost about $150 each, it shows how much importance can be placed on a one-tube receiver. Hence, do not feel that you have too easy a job if you only use one tube—as in writing it is often harder to express a thought in a few words than in many, so in radio if is sometimes harder to construct a small receiver than a large one.

(Mr. Cardwell's third article on "Every-day Radio Engineering" will take up "The Importance of Sharp Tuning." It appears next week in this magazine section of The Chicago Evening Post.—The Editor.)

Questions and Answers

Continued from Page 12.

24 double cotton covered wire. These turns can be spaced from each other by using string of about the same thickness as the wire. In this way you can get a very neat wiring job with even spacing of wire. The results to be obtained from this with UV-199 tubes will be perfectly satisfactory.

A single .001 fixed condenser across the telephones of the primary of the first audio-frequency transformer is all that is necessary in the way of fixed condensers.

In order to assist in neutralizing the feed-back fifteen turns on the primary should be on the same end of the tube as the fifteen turns that are tapped off the secondary.

This system permits the use of a larger neutralizing condenser than would be possible if the whole secondary coil were used. You need have no hesitation in making this change, as tests I have made show that this is the correct wiring data for the UV-199 tube.

Location Makes Difference.

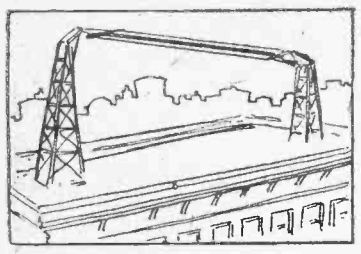
25. ENGLEWOOD: Recently a friend leaving the city sold me his receiver—a three-circuit standard regenerative set with two stages of audio. I have heard concerts on the set in his home on several occasions and the results were the best I have ever heard. However, when I set up this set in my home, using the same aerial, batteries, etc., I have had very disappointing results. Why is it?

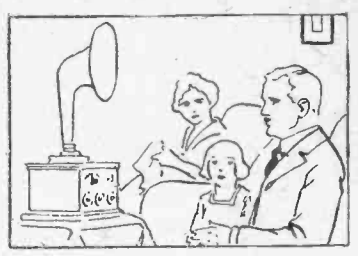
There might be several contributing causes. Two of the most likely are location and tuning. The next most probable cause is the directional feature of the aerial wire. As to the location: There may be nearby interference such as masses of steel structures which absorb the energy which should go on your aerial. You may be situated in a "dead pocket," there being a number of such in Chicago, according to reports and tests. Your aerial may be too close to the roof, which acts as a ground. Ideal aerials are at best thirty feet above roofs or the earth. Some operators pass over station signals by too rapid tuning. Others, thru inexperience, are unable to tune in a signal when it is found in the receiver. Aerials show pronounced directional effects. A wire pointing east and west will bring in stations from those directions much stronger. One pointing north and south will bring better signals from those points of the compass. The end of the aerial from which the leadin goes to the receiver gives better reception from stations toward which it points than the open or other end does from its direction. It may be, too, that your "B" batteries are weak. It may be they have been discharged thru an accidental "short." This can and does happen to new batteries. Test your batteries. It can be seen there are many possible contributing causes to poor reception in your case. It is just a problem of experimenting until you discover the right one.

WHAH—Joplin, Mo., Hafer Supply company, 360 meters.
WHAK—Clarksburg, W. Va., Roberts Hardware company.
WHAL—Lansing, Mich., Capitol News, 360 meters.
WHAM—Rochester, N. Y., University of Rochester, 360 meters.
WHAO—Savannah, Ga., F. A. Hill, 360 meters.
WHAP—Decatur, Ill., Dewey L. Otta, 360 meters.
WHAQ—Washington, D. C., Seems Motor company, 360 meters.
WHAR—Atlantic City, N. J., Paramount Radio and Electric company, 360 meters.
WHAS—Louisville, Ky., Courier-Journal, Louisville Times, 400 meters. Silent Mondays. Day schedule—4 p. m., concert; 4:55 p. m., markets and sports. Evening schedule—7:30-9 p. m., concert and news bulletins. Time announced at 9 p. m.
WHAV—Wilmington Del., Wilmington Electrical Specialty company, 360 meters.
WHAY—Huntington, Ind., Huntington Press, 360 meters.
WHAZ—Troy, N. Y., Rensselaer Polytechnic institute, 380 meters. Broadcasts only on Monday evenings.
WHB—Kansas City, Mo., Sweeney Auto and Tractor school, 400-485 meters. Broadcasts Tuesdays and Thursdays only. Concerts at 12:40 p. m., 2 p. m. and 7 p. m.
WHD—Morgantown, W. Va., West Virginia university, 360 meters.
WHK—Cleveland, Ohio, Warren R. Cox, 360 meters.
WHN—Ridgewood, N. Y., Ridgewood Times, 360 meters.
WHX—Des Moines, Iowa, Register-Tribune, 400 meters.
WIAB—Rockford, Ill., Joslyn Automobile company, 360 meters. Evening schedule—8-9 p. m., concert.
WIAC—Galveston, Texas, Galveston Tribune, 360 meters.
WIAD—Ocean City, N. J., Ocean City Yacht club, 360 meters.
WIAF—New Orleans, La., Nola Radio company, 360 meters.
WIAH—Newton, Iowa, Continental Radio Manufacturing company, 360 meters.
WIAI—Springfield, Mo., Herr Stores company, 360 meters.
WIAJ—Neenah, Wis., Fox River Valley Radio Supply company, 360 meters.
WIAK—Omaha, Neb., Journal Stockman, 278 meters.
WIAO—Milwaukee, Wis., School of Engineering of Milwaukee, 360 meters.
WIAQ—Marion, Ind., Chronicle Publishing company, 360 meters.
WIAR—Paducah, Ky., J. A. Ruddy & Sons, 360 meters.
WIAS—Burlington, Iowa, Hawkeye Home Electric company, 360 meters.
WIAT—Tarkio, Mo., Leon T. Noel, 360 meters.
WIAU—LeMars, Iowa, American Trust and Savings bank, 360 meters.
WIAY—Washington, D. C., Woodward & Lothrop, 360 meters.
WIK—McKeesport, Pa., K. & L. Electric company, 360 meters.
WIL—Washington, D. C., Continental Electric Supply company, 350 meters.
WIP—Philadelphia, Pa., Gimbel Bros., 395 meters. Evening schedule—5 p. m., weather forecast; 6 p. m., bedtime stories; 7-11 p. m., varied program, lectures and music.
WJAD—Waco, Texas, Jackson's Radio Engineering laboratory, 360-485 meters.
WJAJ—Norfolk, Neb., Huse Publishing company, 360-485 meters.
WJAM—Cedar Rapids, Iowa, D. M. Perham, 360 meters.
WJAN—Peoria, Ill., Peoria Radio Sales company, Peoria Star, 360 meters.
WJAP—Duluth, Minn., Kelly Duluth company, 360 meters.
WJAQ—Topeka, Kan., Capper Publications, 360 meters.
WJAR—Providence, R. I., Outlet company, 360 meters. Evening schedule—7 p. m., musical program.
WJAS—Pittsburg, Pa., Pittsburg Leader and Pittsburg Radio Supply company, 360 meters.
WJAT—Marshall, Mo., Kelly Vawter Jewelry company, 360 meters.
WJAX—Cleveland, Ohio, Union Trust company, 390 meters. Broadcasts Tuesday and Thursday nights. Tuesday, 7:30-9:30 p. m., concert. Thursday, 8-10:30 p. m., concert.
WJAZ—Zenith Edgewater Beach hotel, 448 meters. Daily except Sunday. Monday, 10 a. m.-2 a. m. Wednesday, 12 m., news of McMillan expedition. Sunday, 6-9 p. m.
WJD—Granville, Ohio, Dennison university, 360 meters.
WJX—New York, N. Y., De Forest Radio Telephone and Telegraph company, 360 meters.
WJY—New York, N. Y., Radio Corporation of America, 405 meters. Broadcasts on Sundays only from 2:30 to 6 p. m.
WKAA—Cedar Rapids, Iowa, H. F. Parr and Republican Times, 360 meters.
WKAD—East Providence, R. I., Charles Loof, 360 meters.
WKAF—Wichita Falls, Texas, W. S. Radio Supply company, 360 meters.
WKAN—Montgomery, Ala., Alabama Radio Manufacturing company, 360 meters.
WKAM—Granston, R. I., Wilcox Flint, 360 meters.
WKAQ—San Juan, Porto Rico, Radio Corporation of Porto Rico, 360 meters.
WKAR—East Lansing, Mich., Michigan Agricultral college, 360 meters.
WKAS—Springfield, Mo., L. E. Lines Music company, 360 meters.
WKAV—Laconia, N. H., Laconia Radio company, 360 meters.
WKAW—Beloit, Wis., L. M. Turner, 360 meters.
WKAX—Bridgeport, Conn., William A. MacFarlane, 360 meters.
WKAY—Gainesville, Ga., Brennan college, 360 meters.
WKC—Baltimore, Md., Joseph M. Zeniski company, 360 meters.
WKY—Oklahoma City, Okla., Oklahoma Radio shop, Daily Oklahomian, 360-385 meters.
WLAC—Raleigh, N. C., North Carolina State college, 360 meters.
WLAG—Minneapolis, Minn., Cutting & Washington Radio corporation, 400-485 meters. No silent nights. Day schedule—9:30-10:30 a. m., news and markets; 10:45 a. m., household hints; 11:30 a. m., markets; 12 m., lecture; 4 p. m., lecture; 5:30-6 p. m., children's program. Evening—6-7:30 p. m., lectures; 8:30 p. m., concert.
WLAH—Syracuse, N. Y., Samuel Woodworth, 360 meters.
WLAJ—Waco, Texas, Waco Electric Supply company, 360-485 meters.
WLAK—Bellows Falls, Vt., Vermont Farm Machine company, 360 meters.
WLAL—Tulsa, Okla., Tulsa Radio company, 360 meters.
WLAN—Houlton, Maine, Putnam Hardware company, 360 meters.
WLAP—Louisville, Ky., W. V. Jordan, 360 meters.
WLAQ—Kalamazoo, Mich., A. E. Schilling, 360 meters.
WLAT—Burlington, Iowa, Radio and Specialty company, 360 meters.
WLAV—Pensacola, Fla., Electric Shop, Inc., 360 meters.
WLAX—Greencastle, Ind., Greencastle Community Broadcasting station, 360 meters.
WLB—Minneapolis, Minn., University of Minnesota, 360 meters.
WLW—Cincinnati, Ohio, Crosley Manufacturing company, 309 meters. Silent Friday, Saturday and Sunday. Day schedule—10:30 a. m., markets; 1:30 p. m., business reports; 3 p. m., grain and stock quotations; 4 p. m., women's program. Evening—10 p. m., concert.
WMAB—Oklahoma City, Okla., Radio Supply company, 360 meters.
WMAC—Cazenovia, N. Y., C. B. Meredith, 360 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WMAH—Lincoln, Neb., the General Supply company, 360 meters.
WMAK—Lockport, N. Y., Norton laboratories, 360 meters.
WMAL—Trenton, N. J., Trenton Hardware company, 362 meters.
WMAM—Beaumont, Texas, Beaumont Radio Equipment company, 360 meters.
WMAN—Columbus, Ohio, First Baptist church, 360 meters.
WMAP—Easton, Pa., Utility Battery service, 360 meters.
WMAQ—Chicago, Ill., Chicago Daily News, 448 meters. Daily except Saturday. Sunday, 4:30-5 p. m.; Tuesday, Wednesday, Thursday, Friday, 7-8 p. m., 9-10 p. m.; Saturday, 8-10 p. m.
WMAV—Auburn, Ala., Alabama Polytechnic institute, 360 meters.
WMAY—St. Louis, Mo., Kingshighway Presbyterian church, 360 meters.
WMAZ—Macon, Ga., Mercer university, 360 meters.
WMC—Memphis, Tenn., Commercial Appeal, 500 meters. Silent Wednesdays. Market and financial reports and news, 9 a. m.-4 p. m. Evening—8:30-9:30 p. m., concert.
WMH—Cincinnati, Ohio, Precision Equipment company (also 8 XB), 360 meters.
WMV—Washington, D. C., Doubleday Hill Electric company, 360 meters.
WNAB—Bowling Green, Ky., Park City Daily News, 360 meters.
WNAD—Norman, Okla., Oklahoma Radio Engineering company, 360 meters.
WNAP—Springfield, Ohio, Wittenberg college, 360 meters.
WNAQ—Charleston, S. C., Charleston Radio Electric company, 360 meters.
WNAR—Butler, Mo., C. C. Rhodes, 360 meters.
WNAS—Austin, Texas, Texas Radio corporation, 360 meters.
WNAT—Philadelphia, Pa., Lenning Brothers company, 360 meters.
WNAV—Knoxville, Tenn., Peoples Telephone and Telegraph company, 360 meters. Evening—7:30 p. m., musical program.
WNAX—Yankton, S. D., Dakota Radio Apparatus company, 360 meters.
WNJ—Albany, N. Y., Shotton Radio Manufacturing company, 360 meters.
WNO—Jersey City, N. J., Wireless Telephone Company of Hudson County, 360 meters.
WOAA—Ardmore, Okla., Dr. Walter Hardy, 360 meters.
WOAB—Grand Forks, N. D., Valley Radio company, 360 meters.
WOAC—Lima, Ohio., Mans Radio company, 360 meters.
WOAD—Sigourney, Iowa., Friday Battery and Electric company, 360 meters.
WOAF—Tyler, Texas, Tyler Commercial college, 360 meters.
WOAG—Belvidere, Ill., Apollo theater, 360 meters.
WOAH—Charleston, S. C., Palmetto Radio corporation, 360 meters.
WOAI—San Antonio, Texas, Southern Equipment company, 360 meters. Silent Mondays, Wednesday and Thursdays. Evening schedule—9:30-10:30 p. m., concert.
WOAJ—Parsons, Kan., Ervins Electric company, 360 meters.
WOAK—Frankfort, Ky., Collins Hardware company, 360 meters.
WOAL—Webster Grove, Mo., William E. Wood, 360 meters.
WOAN—Lawrenceburg, Tenn., James D. Vaughan, 360 meters.
WOAP—Kalamazoo, Mich., Kalamazoo college, 360 meters.
WOAQ—Portsmouth, Va., Portsmouth Radio association, 360 meters.
WOAR—Kenosha, Wis., H. P. Lundstrom, 360 meters.
WOAV—Erie, Pa., Pennsylvania national guard, 360 meters.
WOAW—Omaha, Neb., Woodmen of the World, 360 meters. Evening—9-11 p. m., musical programs.
WOAZ—Stanford, Texas, Penick Hughes company, 360 meters.
WOI—Ames, Iowa, Iowa State college, 360 meters.
WOK—Pine Bluff, Ark., Arkansas Light and Power company, 360 meters.
WOO—Philadelphia, Pa., John Wanamaker, 400 meters. Broadcasts Mondays and Wednesdays. Evening—6:30-9 p. m., music.
WOQ—Kansas City, Mo., Western Radio company (also operate 9XAB), 360 meters. Weather, markets and time daily at 9:45, 10:55, 11:30 a. m., 12:30, 2 and 7:30 p. m.
WOR—Newark, N. J., L. Bamberger & Co., 405 meters. Evening—8-10 p. m., concert.
WOS—Jefferson City, Mo., Missouri State Marketing bureau, 441 meters. Silent Tuesdays, Thursdays and Saturdays. Day schedule—8 a. m.-noon, live stock and grain market reports; 10 a. m., weather. Evening—8 p. m., concert.
WPAB—State college, Pennsylvania State college, 360 meters.
WPAC—Okmulgee, Okla., Donaldson Radio company, 360 meters. Evening schedule—10 p. m., musical and educational programs.
WPAD—Chicago, Ill., W. A. Weiboldt & Co., 360 meters. This station closed last Sunday. It will be operated by Armour institute when removal has been completed.
WPAH—Waupaca, Wis., Wisconsin department of markets, 360 meters.
WPAJ—New Haven, Conn., Doolittle Radio company, 360 meters.
WPAK—Fargo, N. D., North Dakota Agricultural college, 360 meters.
WPAL—Columbus, Ohio, Superior Radio and Telephone Equipment company, 360 meters.
WPAM—Topeka, Kan., Auerbach & Guettel, 360 meters.
WPAQ—Frostburg, Md., General Sales and Engineering company, 360 meters.
WPAP—Winchester, Ky., Theodore D. Phillips, 360 meters.
WPAR—Beloit, Kan., R. A. Ward, 360 meters.
WPAS—Amsterdam, N. Y., J. & M. Electric company, 360 meters.
WPAT—El Paso, Texas, St. Patrick's cathedral, 360 meters.
WPAU—Moorhead, Minn., Concordia college, 360 meters.
WPAW—Wilmington, Del., Radio Installation company, 360 meters.
WPAZ—Charleston, W. Va., Dr. John R. Koch, 360 meters.
WPI—Clearfield, Pa., Electric Supply company, 360 meters.
WQAA—Parkersburg, Pa., Horace A. Beal Jr., 360 meters.
WQAB—Springfield, Mo., Southwest Missouri State Teachers' college, 360 meters.
WQAC—Amarillo, Texas, E. B. Gish, 360 meters.
WQAD—Waterbury, Conn., Whitall Electric company, 360 meters.
WQAF—Sandusky, Ohio, Sandusky Register, 360 meters.
WQAH—Lexington, Ky., Brock-Anerson Electrical Engineering company, 360 meters.
WQAL—Mattoon, Ill., Cole County Telephone and Telegraph company, 360 meters.
WQAM—Miami, Fla., Electrical Equipment company, 360 meters.
WQAN—Scranton, Pa., Scranton Times, 360 meters.
WQAO—New York, N. Y., Calvary Baptist church, 360 meters.
WQAQ—Abilene, Texas, West Texas Radio company, 360 meters.
WQAS—Lowell, Mass., Prince Walter company, 360 meters.
WQAV—Greenville, S. C., Huntington & Guerry, Inc., 360 meters.
WQAW—Washington, D. C., Catholic university, 360 meters.
WRAA—Houston, Texas, Rice institute, 360 meters.
WRAB—Savannah, Ga., board of public education, 360 meters.
WRAD—Marion, Kan., Taylor Radio shop, 360 meters.
WRAO—St. Louis, Mo., Radio Service company, 360 meters. Day schedule—4:30-5:30 p. m., musical program.
WRAR—David City, Neb., Jacob Carl Thomas, 360 meters.
WRAQ—Amarillo Texas, Amarillo Daily News, 360 meters.
WRAV—Yellow Springs, Ohio, Antioch college, 360 meters.
WRAY—Scranton, Pa., Radio Sales corporation, 200-1000 meters.
WRK—Hamilton, Ohio, Doron Brothers Electrical company, 358 meters.
WRM—Urbana, Ill., University of Illinois, 360 meters. Evening schedule—8:50-9:30 p. m., news and lectures.
WRP—Camden, N. J., Federal Institute of Radio Telegraphy, 360 meters.
WRR—Dallas, Texas, City of Dallas, 360 meters.
WRW—Tarrytown, N. Y., Tarrytown Radio and Research corporation, 360 meters.
WSAA—Marietta, Ohio, B. S. Sprague Electrical company, 360 meters.
WSAB—Camp Girardeau, Mo., S. E. Missouri Teachers' college, 360 meters. Day schedule—3:15 p. m., lecture. Evening schedule—9 p. m., concert.
WSAC—Clemson College, S. C., Clemson Agricultural college, 360 meters.
WSAH—Chicago, Ill., A. J. Leonard Jr., 350 meters.
WFAI—Cincinnati, Ohio, U. S. Playing Cards company, 400 meters.
WSAJ—Grove City, Pa., Grove City college, 360 meters.
WSAL—Brookville, Ind., Franklin Electric company, 360 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WSB—Atlanta, Ga., Atlanta Journal company, 429 meters. No silent night. Day schedule—12-1 p. m., musical program; 2:30 p. m., weather; 5-5:30 p. m., bedtime story. Evening—8-9 p. m., popular concert.
WSL—Utica, N. Y., J. & M. Electric company, 360 meters.
WSY—Birmingham, Ala., Alabama Power company, 360 meters.
WTAC—Jonstown, Pa., Pennsylvania Traffic company, 360 meters.
WTAS—Elgin, Ill., Charles E. Erbstein, 275 meters. Evening schedule—7:30 p. m., musical program.
WTAU—Tecumseh, Neb., Ruegy Battery and Electric company, 360 meters.
WTAW—College Station, Texas, Agricultural and Mechanical college, 360 meters.
WTG—Manhattan, Kan., Kansas State Agricultural college, 485 meters.
WWAD—Philadelphia, Pa., Wright & Wright, 360 meters.
WWAX—Laredo, Texas, Wormser Brothers, 360 meters.
WWB—Canton, Ohio, Daily News Printing company, 360 meters.
WWI—Dearborn, Mich., Ford Motor company, 360 meters.
WWJ—Detroit, Mich., Detroit News, 580 meters. Silent Saturday. Day schedule—8:30 a. m., household hints and talks for women; 9:25 a. m., weather; 10:55 a. m., time signals; 2 p. m., concert. Evening schedule—8:30 p. m., concert.
WWL—New Orleans, La., Loyalo university, 360 meters.
WWT—Buffalo, N. Y., McCarthy Brothers & Ford, 360 meters.
WWZ—New York city, Wannamaker's department store, 360 meters.

THE CHICAGO EVENING POST

RADIO MAGAZINE





Published Every Thursday

WEDNESDAY, NOVEMBER 28, 1923.

Issued as a Supplement to
The Chicago Evening Post

BROADCASTING

HOME RADIO

RADIO SETS

HOOK-UPS

AMATEUR RECEPTION

HOME-WORKSHOP

RADIO SCIENCE-

RADIO PROGRAMS

LOCAL NEWS

U.S. RADIO NEWS

FOREIGN RADIO NEWS

DEALERS NEWS

MANUFACTURERS NEWS

JOBBER NEWS

NEW EQUIPMENT

COMMERCIAL

RADIO PRACTICE-

D.X. RECORDS

INVENTIONS

RADIO STATIONS

AMATEUR TRANSMISSION

HOME LABORATORY

MISS MARY L. CASEY, program editor of station KYW, Chicago. It is she who passes judgment on the various "acts" and musical numbers of the entertainment each evening which thousands of the invisible audience thruout the United States enjoy.

IN THIS ISSUE

The Appreciation of Radiophans

for

THE CHICAGO EVENING POST

RADIO MAGAZINE

And the Daily Radio Department

of The Chicago Evening Post has amply justified our estimate of the importance Radio has assumed in American homes. We believed that Radio was well worthy of a separate magazine that once each week would treat the subject in full—a magazine that would give complete service in the matter of programs and broadcasting station data—also authoritative articles upon developments, improvements, inventions—a real text book for radiophans to read thruout the week as a guide to enable them to obtain the utmost out of Radio.

Radiophans Have Approved This Magazine

in the most enthusiastic, whole-hearted manner. Everyone who sees the Radio Magazine has words of commendation for it. We quote a few taken at random from the hundreds that have been received—just to indicate a cross-section of the spirit of appreciation that is unanimous. Indeed, if you believe that some radiophan friend of yours has not yet seen this magazine—show it to him—he will thank you sincerely. He would not be without it any more than you would. It was our aim to make this magazine the best published by any newspaper in America, and the generous approbation of radiophans has assured us that we have succeeded.

All Radio News, Facts, Data, Treated Impartially

with only one object in view—that of being of utmost service to the radiophan and all enterprises in the Radio industry—with no interest other than the desire to benefit all—the user and the maker—by providing the most authentic and complete information on Radio and its use.

The Radio Department in The Post Every Day

is in line with the unequaled service given radiophans in the big mid-week Radio Magazine of The Post. All the facts are there—complete and reliable—from authentic sources. You can depend on the information given being absolutely correct. It gives all important Radio news and all programs for the day, with more of the essential details than will be found in any other Chicago newspaper. To get the utmost satisfaction in Radio

Read THE POST Every Evening

APPRECIATIONS

I want to congratulate you on your wonderful Radio section.
JAMES DE LANEY,
5447 Michigan Avenue, Chicago.

Kindly advise me when the Radio covers are ready. Your magazine last Thursday was very interesting.
L. JOSEPH SCHNEIDER,
5473 Harper Avenue, Chicago.

Inclosed find remittance to cover cost and postage for one of your Radio portfolios. You are to be complimented on your excellent Radio supplement, as it is more than worth the money asked.
ALBERT J. FLYNN,
49 South Broadway, Aurora, Ill.

The writer has just become a radiophan and had decided that he must give up The Evening Post in favor of some other evening paper, but am very glad to see you are publishing by far the best Radio page in the city.
L. A. PROUTY,
226 West Adams Street, Chicago.

Your magazine section is surely a great scoop, and am sure will have a wide circulation, as well as being a great help to the amateur in his troubles. I. C. ERNST,
9655 South Hoyne Avenue, Chicago.

Your Thursday magazine is great.
GEORGE S. BALLARD,
1026 Michigan Avenue, Evanston, Ill.

You sure have a fine Radio sheet. Keep up the good work.
JOHN ASCHER,
123 South Oakley Boulevard, Chicago.

I want to compliment you on your Radio Magazine. It sure is the berries. HARRY KRATOCHVEIL,
2315 South Kedzie Avenue, Chicago.

I have been a reader of The Post for the last two years, and like it very much, especially since Radio programs have been published. I was just on the point of stopping delivery of The Post on account of not having a Radio department when you started publishing daily programs, but now that you have added Radio Magazine I must say it is the best paper of all the Chicago dailies published and should be so considered by every radiophan.
LESLIE W. OTTO,
7231 South Park Avenue, Chicago.

Kindly reserve for me a copy of the binder for the Radio Magazine and notify me when same is ready.
You are to be congratulated on such a wonderful addition to your fine paper, and I know that it is going to make a great hit with all of the radiophans in the middle west.
With best wishes for your further success, I am, yours very truly,
ARTHUR E. MATSON,
6335 North Claremont Avenue, Chicago.

My hat off to your Thursday Radio Magazine. It is fine.
ROY E. PETERSON,
2450 Sunnyside Avenue, Chicago.

I take this opportunity to congratulate you and The Chicago Evening Post on its remarkable Radio Magazine. WILLIAM J. LENNON,
Care Commonwealth Edison Co.,
Chicago, Ill.

So glad of the Radio Section. Now I won't have to take two evening papers. SETH HILL,
3027 Washington Boulevard, Chicago.

I enjoyed very much the reading of your magazine, and am certain that it is a welcome help to us amateurs.
THOMAS F. SHERIDAN,
Marquette Building, Chicago, Ill.

APPRECIATIONS

Congratulations and thanks for your Radio page, and especially for the Thursday magazine. It fills a desire of your readers who have probably sought their daily dope elsewhere. As usual, The Post has done well what it has undertaken. Good luck. Very truly yours,
JAMES M. MORAN,
5107 Washington Boulevard, Chicago.

Will you please reserve for me one of the Radio Magazine covers?
Congratulations to The Evening Post. The new Radio Magazine has all other Radio publications outclassed. Yours very truly,
JAMES A. ROBERTSON,
830 Altgeld Street, Chicago.

I wish to express my enthusiasm over the first issue of your splendid Radio Magazine. It is by far the best I have seen and will fill a great need in the way of reliable information on programs in other cities.
Please reserve a binder for the Radio Magazine for me. I understand you will advise me when they are ready. Very truly yours,
O. L. COOK,
603 Fullerton Parkway, Chicago.

Please send me one of your Radio Magazine binders, for which I am inclosing cost and postage. Your Radio Magazine is great. It gives all the Radio news in detail.
ROBERT SADD,
5101 Windsor Avenue, Chicago.

Inclosed please find remittance for which please mail me one of your Radio Magazine binders. Living out of town, I cannot call at your office for it. I wish to congratulate you on your new Radio Magazine. It is worthy of The Post.
MRS. H. S. HULBERT,
218 Benton Street, Aurora, Ill.

You will find inclosed check to cover cost and mailing for two of your binders. I appreciate your Radio articles, and am now a daily reader of your paper.
JOHN H. WHEELER,
90 Board of Trade, Chicago.

Read the first issue of The Chicago Evening Post Radio Magazine thru, and wish to say it is the best magazine going at any price. Keep up the good work and reserve a binder for me. E. H. SOURBY,
4028 Newport Avenue, Chicago.

Your Radio Magazine is great. I want a binder when they are ready.
R. V. LEWIS,
Room 2127, 175 West Jackson Boulevard, Chicago.

Words fail me in trying to express appreciation of your Radio dope.
F. A. ZETSCHE,
1524 Glenlake Avenue, Chicago.

Inclosed please find remittance, for which send me one binder for my Radio Magazine of The Post. I find your magazine the greatest radio magazine yet published, and I take a number of them. Keep up the good work. C. M. STICKLER,
112 Lincoln Street, Marseilles, Ill.

Congratulations on your new Radio Section. You sure have the right idea when you fill your Radio Section with something more than ads.
JOS. F. MISICKA,
1109 W. 19th Place, Chicago

Congratulations on your six-cylinder Radio section.
R. E. HALLBERG,
3627 North Janssen Avenue, Chicago.

Congratulations on the new Radio Magazine Section and the daily department. Just what I wanted.
NATHAN G. BURGSTER,
810 Lawrence Avenue, Chicago.

IVERSON C. WELLS
EDITOR

Assisted by a Staff of Regular and Special Contributing Writers.

The RADIO MAGAZINE Section is edited with the view of giving authentic news of the radio broadcasting field and authoritative information on the subjects of home construction of receiving and transmission sets, of the operation and maintenance of apparatus, and as an exchange of opinion for its readers.

THE CHICAGO EVENING POST

RADIO MAGAZINE

Published Every Thursday

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WEDNESDAY, NOVEMBER 28, 1923.

Weekly Subscription $1.35 Per Year.

Opera On Tonight in Radio

By THE NIGHT PROWLER.

Two programs published today. That's because tomorrow is a holiday and The Post, in common with all good people who have much to be thankful for, is going to close shop and not issue the regular editions.

This evening's program is given on this page, and also tomorrow's. And there's a lot of good things for the radiophan who is equipped to get it. I mean by this you who have been wise enough to buy or build a truly selective set and those of you who have taken the pains to learn how to operate it.

Grand opera is on for this evening. WMAQ (Chicago) is breaking into this meritorious work, sharing the honors with KYW (Chicago) once a week. "Aida" is the bill for the evening. WMAQ is going to make this a regular Wednesday night feature.

Crystal Phans Get Busy.

KYW will continue to broadcast once or twice a week from the Auditorium as of yore. Some weeks two operas may be given and some weeks only one. This all depends upon whether the operas scheduled will lend themselves to broadcasting.

Last Monday night's crystal phans must have had a merry time, for not a few have sent in their reports on long-distance work. I must assume that these are all truthful, especially after my experience with the phans who heard Cuba last week.

And, by the bye, if you will turn to the Letter Box department on another page you will find that some of these phans have produced evidence of their reception that most any court of law would accept.

Next week's Radio Magazine is going to have some unusual features and also a greatly improved list of the broadcasting stations with the programs and schedules. A special force of compilers have been busy for two or three weeks. This list is going to be the most complete published anywhere in the United States. Did you get that? ANYwhere. That's a mighty broad statement, but is absolutely the fact.

Average List Out of Date.

There are call books published once a year that give what is purported to be complete lists and schedules. Also there are monthly magazines that perform this same service once a month, and there are even weekly publications that seek to print a part of the schedules every week, but lawsy! by the time you get them they are obsolete.

It's just like looking up a fellow's name and address in a city directory published ten years ago. Removals, changes and deletions make it necessary to have corrected lists regularly and frequently. The Post Radio Magazine is doing that.

Next week's Radio Magazine list of stations and schedules will be correct up to the day of going to press each week. That's the sort of list that will be worth while to you Night Prowlers.

Radio Programs

Below are given the complete schedules of all the Chicago and suburban broadcasting stations and those of the out-of-town stations which are most commonly tuned by local radiophans for Wednesday and Thursday.

These schedules are a regular daily feature in The Chicago Evening Post.

On Thursday of each week a complete list and schedule of every broadcasting station in the United States is published in The Chicago Evening Post's sixteen-page Radio Magazine section.

CHICAGO STATIONS

(Central Time Is Shown.)

KYW—Located in Commonwealth Edison building; 536 meters; Wilson J. Wetherbee, director.

Wednesday.

Day—9:30 a. m., news and markets; 10 a. m., market reports; 10:30 a. m., financial news and comment; 10:58 a. m., naval observatory time signals; 11 a. m., market reports; 11:05 a. m., weather report 11:30 a. m., news and comment of the financial and commercial market; 11:35 a. m., table talk by Mrs. Anna J. Peterson; 12 m., market reports; 12:30 p. m., late financial news and comment; 1 p. m., market reports; 1:20 p. m., closing market quotations; 2:15 p. m., late financial comment and news bulletin; 2:30 p. m., closing stock quotations, Chicago Stock exchange; 3 p. m., late news and sport bulletins; 4 p. m., news and sport bulletins; 4:30 p. m., late news and sport bulletins; 5 p. m., latest news of the day.

Evening—6:30 p. m., financial and final market and sport summary; financial summary furnished by the Union Trust company; 6:59 p. m., children's bedtime story; 8 p. m. to 8:58 p. m., musical program: (courtesy of the Chicago Musical college, direction of Elena DeMarco.)—R. E. Boltenstern, pupil of Mr. Sacerdote; Madeline Snyder, pupil of Dr. Lulek; Esther Felick, pupil of Mr. Boguslawski; Evelyn Stahler, pupil of Louis Victor Saar; Olga Gates, pupil of Mr. Sacerdote; Aria: "La Jolie Fille

(Continued on Page 12.)

HEADLINERS—At the top is the Muenzer Trio, in Artists' series Dec. 2 at WJAZ. In the center, Mrs. Georgie Faulkner, original "story lady," tonight at 7 p. m. at WMAQ. Below, Rev. Claude J. Perrin, S. J., Loyola university, in "Twenty Minutes' Good Reading," at KYW Thursday evening.

In Next Issue

A series of instructive articles on the push-and-pull amplification circuits with full construction details, will begin in next Thursday's issue. Be sure to get The Post Radio Magazine Section next Thursday as some new and important contributions to radio science will be made in this series of articles.

Amateurs Seek Over Sea Phones

Keypounders and amateurs who maintain a transmission station under government license are co-operating with English amateurs and broadcasting stations this week in an effort to establish two-way radiophone communication overseas.

The tests are under the auspices of an eastern radio magazine and two English periodicals. They started last Sunday night and will continue thruout the week. These tests, however, are not to be confused with the fourth annual tests that will be conducted between Dec. 22 and Jan. 10 by the American Radio Relay league.

Henry Ford spoke Sunday night from his station WWI at Dearborn, Mich., operating on the 360-meter wave length. Arrangements are under way in England to have the Prince of Wales, Premier Baldwin and Marconi speak to American listeners. Most American stations will be off the air while the English transmitters are in action.

Stations WJZ (New York) and WGY (Schenectady, N. J.) are connected by long-distance wires, so the same program will be broadcast simultaneously from both cities. Eight stations in England will be joined by land lines, so one microphone located in London will control all stations. When a voice actuates the microphone in London, it will be sent into the air simultaneously from eight different stations operating on wave lengths ranging from 363 to 415 meters.

In order to meet a request from England so those broadcasting will know immediately if they are heard in America, arrangements have been made with the Postal Telegraph Cable company to relay paid messages containing the names of all stations thruout the United States intercepting the British program. Messages should be addressed to Radio Broadcast Magazine, New York.

Americans to Receive Only.

The fourth transatlantic tests of the American Radio Relay league in December will be a receiving contest as far as American and Canadian amateurs are concerned. They will keep their transmitters silent during the entire period listening for signals from European operators.

Believing that their skill in transmitting has been tried and proven, amateurs on this continent are going to show the European radio men the courtesy of allowing them to do the sending, while their own sets and ears are sharpened and tuned to catch the incoming signals.

During the first three transatlantic tests North American amateurs were determined to get their signals across the water. Transmission was the big thing and meant everything to them. Even last year when signals from the United States transmitters were hurled across the ocean by the hundred, there was only a mild interest in the receiving end. This was a great disappointment to the French and British hams.

Opens Way to Two-Way Tests.

With the conditions for the present tests changed and the motives principally reversed, everything depends on the receiving, and the time previously used by each operator in getting his entire apparatus into trim will now be given almost wholly to the improvement of the receiving circuit. This opens the way for the free-for-all two-way tests which immediately follow the last day of the transatlantics.

The program that has been arranged by F. H. Schnell, traffic manager of the A. R. R. L., calls for transmission by the British amateur and French operators on alternate nights between 8 p. m. and 1 a. m., eastern standard time, with the latter starting on Dec. 22.

Another feature of the tests is the offer by prominent manufacturers of thousands of dollars' worth of radio apparatus for prizes, including a $1,100 transmitter.

In previous years this season found the American ham going over every detail of his transmitter, devising new ways of crowding stray watts into his set to increase his range. Now the same careful attention is being given to the receiver, while the CW sending ste stands idle with the aloof dignity of accomplishment.

Rebuild for Big Tests.

It is no novelty for the relaying amateur to rebuild his receiver, and

Continued on Page 4.

Amateurs Seek Over Sea Phones

Continued from Page 3.

it is directly in line with the present movement calling for the installation of the super-heterodyne, or another of the new types of reciving circuits that are fast gaining in popularity. This means as radical a change as it was for the amateur to revert from the old thunder-spark set to the smooth-toned CW in transmission.

The complete failure of the first transatlantic amateur tests in February, 1921, only acted as an incentive for those that followed. Transoceanic amateur radio loomed up as a tremendous achievement. The next year the experiment was considered worthy of sending an American amateur, Paul Godley, to Ardrossan, Scotland, to listen.

There, in a fishing village some twenty miles to the west of Glasgow, Godley heard nearly thirty stations and one complete message. The job of getting across was finished to all purposes. It had been proved amateurs could reach over the broad Atlantic on low power.

See Oversea Service Regularly.

The business of organizing the third transatlantics was by way of demonstrating that transoceanic amateur radio could become a common thing and was well within the realm of the practical. The signals went over to the tune of more than a score a day, and when the final total was made up, more than 300 stations had landed.

In the "west-bound" tests a total of about twenty American amateurs heard European signals, primarily from three stations, French 8AB, British 5WS and British 2FZ. American hams plan now to surpass all receiving records.

England Hears Yankees.

LONDON, Nov. 28.—By the Associated Press.)—Hundreds of British radiophans got their ears full of American accents at 3 o'clock this morning when programs broadcast by at least a half dozen stations in the United States were picked up by receiving sets on this side of the ocean.

Radio publications in London have been receiving letters and telegrams all day from amateurs who sacrificed their sleep to "hear America." Most of the listeners reported the atmospheric conditions were extremly bad, but despite this fact, several of the amateurs in London, Folkestone and elsewhere were able to hear most of what was said, sung or played by the Yankee broadcasters.

One suburbanite reported he had picked up the General Electric company's Schenectady station, heard the "Star Spangled Banner" then a speech by Owen B. Young on world peace, and Lloyd George's visit, and then "God Save the King."

The reports are being analyzed to determine which station in America obtained the best transmission across the Atlantic.

Realtors of Davenport and Denver Broadcasting

The Denver and Davenport (Iowa) Real Estate boards have announced radio service. The Denver board will inaugurate a Tuesday night service at 8 p. m., mountain time, Dec. 4. L. F. Eppich, president of the National Association of Real Estate boards, will deliver a short address, it was announced at the offices of the association. The Davenport board already has begun its service.

By-Path Condensers

By-path condensers are connected in the tube circuit to allow high-frequency currents to pass. They need not be variable. The usual capacity is .001 to .002 mfd.

Broadcasts "Scaramouche"

Sydney Blackmer, starring in "Scaramouche," with a company of assisting artists, gave a part of that play at WEAF'S studio (New York city) on Tuesday evening.

MISS MARY L. CASEY, PROGRAM DIRECTOR OF KYW STATION, CHICAGO.

Some of the Trials Broadcast Actors Face Before Their Invisible Audience

By MARY L. CASEY.
(Program Editor of KYW, Chicago.)

WHEN a broadcaster faces the microphone in the station studio to instruct, amuse or entertain his invisible audience of thousands, what is the effect on him? Miss Casey, who edits the programs of KYW (Chicago), certainly is in a position to answer this question. She does so in the following article.—The Editor.

RADIOPHANS! You, the audience of KYW's radio theater, did you ever stop to consider the various types of persons a broadcaster tries to please?

Almost every person who talks over radio has had previous platform experience, and is accustomed to "feel out" his audience. It may be cold. He must rouse it. It may be critical. He must ingratiate himself. It may be turbulent. He must calm it. It may be sympathetic and "go along" with him from the first burst of generous applause, but radio broadcasting is so different.

Talking into a microphone is a good deal like making an appeal to a wooden Indian—the energy is all on one side.

Broadcasters Face Huge Audience.

The broadcaster stands in front of the steel transmitter in the solitude and tense silence of KWY studio and entertains an audience larger than ever gathered in the largest theater or coliseum in the world.

Each one of this audience expresses his and her opinion of the actor. Some commend him and some criticize him. He hopes, however, that they are 100 per cent commending him. The actor's listeners include the dweller in the city apartment; the street crowd that has drifted into the retailer's shop; the farmer and his family gathered around the kerosene lamp in the living-room, and the lonely ranches on the western plain.

The actor visualizes each and every one, and thinks to himself: "Did ever the human voice, since man communicated his ideas to man, have such an audience as this."

Radio Actors Miss Applause.

We all need "stimulants," and there are as many stimulants as there are letters in the alphabet. The broadcaster is included in this group. His stimulant is that of applause, which he lacks.

Have you ever heard an actor or speaker condemn, or rather pretend to condemn, applause? I have? However, they are both alike—and one likes it as much as the other, and is roused to his or her best efforts by the kindly encouragement of the "hand."

The audience which is generous with applause really is serving its own best interests because under such circumstances the actor or speaker will give the best that is in him. But the radio audience is not only invisible but inaudible as well.

Perhaps the most thrilling of all radio features thus far has been the broadcasting of the Chicago university football games from Stagg field, and here the stimulus is furnished by the cheers of the students, the yelling of the crowd, the playing of the band and the excitement of conflict.

Microphone Quite Sensitive.

The average broadcaster is under constant temptation to strain his voice and overexert himself. It is to realize the extraordinary sensitiveness of the microphone.

Letters poured into our office recently from all parts of the United States and Canada, telling us how plainly listeners heard the ticking of a watch that was placed near the microphone during the Chicago Sunday Evening club service. But the speaker is appalled by the thought of listeners so many hundreds of miles distant, and is lured by the thought to an excess of loudness and a straining of expression. This causes a "blur" in the receiving set, and so diminishes his effectiveness.

When the broadcaster has learned that distinctness of utterance should be his chief aim, he will practice restraint in voice and emotion which is one of the secrets of public speaking.

While the actor on the legitimate stage hears his applause, the actor on the radio stage reads his applause in the many letters written by his audience to the offices of Westinghouse station KYW.

Notes on Wiring Home-Built Sets

A short time ago varnished cambric tubing, usually called "Spaghetti," was considered a necessary covering for all wires in a radio receiving set. The standard form of wiring at the present time is the so-called "bus" wiring, in which the wires are not covered with insulation.

One of the reasons for the change in style of wiring was that when spaghetti was used the tendency was to run the wires too close together, with the feeling of security that the wires were so well insulated that no danger was present. True, little danger was present from electrical shorting of the wires, but the wires were not shielded magnetically from the electrical field that surrounds every wire that is carrying current. It is not practical usually to insulate the wire from the magnetic field of an adjacent wire, but it is possible to reduce the transfer of energy between the two wires by running them at right angles to each other, so that each cuts as little of the magnetic field of the other as possible. A wire should not run parallel with another wire for a very long stretch, and should not cross at a distance of less than one-half inch from the other wire.

In bus wiring all turns are made at right angles, and very few or no diagonal connections are made. With this type of wiring you are not apt to run wires too close to one another. As solid wire is used, there is little danger of wires shorting, and so insulation is really unnecessary.

Measure the distance between two points that are to be wired. Now bend a right angle turn in the wire, so that one portion of the wire is equal to the vertical distance between the two points. Another bend should be placed in the wire at the correct horizontal difference between the points.

In addition, there is usually some lateral difference which will have to be taken care of by still another bend. The resultant wire should then be placed in the set and soldered to the two connections.

This type of wiring will be readily understood by examining any set made in a factory or by an experienced amateur who is also a neat workman.

Radio Aids Deaf but Does Not Cure

Radio will not cure deafness. However, it will enable the partially deaf person to hear that which he could not hear in the ordinary way. He who is hard of hearing may often "listen in" perfectly well with his brothers and sisters whose ears are unimpaired.

In order to clear up the facts about radio and deafness, which he asserts have been misrepresented in the public press, Dr. Harold Hays, president of the American Federation of Organizations for the Hard of Hearing, contributes to "What's In the Air" (Chicago) a plain statement of what radio already means to those whose hearing is affected. Writes Dr. Hays:

"Ill-advised current reports in the press heralding the curing of deafness by means of radio are likely to be misunderstood, with the result that too much may be hoped for. I have not made the statement that radio actually would be the means to improve or restore hearing. As to that only the future will tell.

Hears Human Voice Again.

"But radio offers a source of happiness to the deafened which at present is unrealizable. Our eyes were opened to its possibilities by the following case: One of the directors of the New York League for the Hard of Hearing has been hopelessly deaf for years; so much so that he can only understand when an electric device is attached to each ear.

"Altho in the music publishing business, he had not been able to hear music for more than twenty years. He never went to a concert or a banquet. He never mingled in social activities.

"A friend suggested a radio receiving set. To his amazement, he could hear so well that now he sits in his easy-chair of an evening, with headphones clapped on his ears, and hears concerts, speeches, market reports, jazz, and bedtime stories.

"When he told me about it, his eyes filled with tears of happiness and he said 'Doctor, I never expected to hear the human voice again—I feel as tho I were reborn—my life is made over again.'

"What does this mean for the future? It means two things—first it means untold happiness to those whose minds have been in darkness for many years, and secondly, so that the hearers will not only be entertained, but their ears will receive exercise at the same time.

"However, I wish to stress particularly the fact that in 90 per cent of cases, deafness begins in childhood. In many cases, it is preventable at that time. It is not preventable later in life, and; unfortunately, neither radio nor any other means has been found to later increase the hearing.

"I sincerely hope that radio will solve the problem to some extent, but if it does nothing more than give that added happiness of which the deafened have so little, it will have done a great deal."

New Circuit Uses Dish Pan Aerial

MINNEAPOLIS, Nov 29.—A radio receiver set which, with a dish-pan for an antenna, catches broadcasts from a 500-watt station 1,400 miles away, has been developed by Bowden Washington, it was announced here today by the Cutting & Washington Radio corporation.

The receiver, the result of two and a half years of laboratory efforts, works on a somewhat new principle termed cascade regeneration, which renders extremely small antennae highly effective.

With four UV-199's and a dishpan on a chair for an antenna, and another on the floor directly beneath it for a "counterpoise," signals from a 500-watt Western Electric transmitter in Dallas, Texas, was heard 1,400 miles distant on a loud speaker with such intensity as to be unpleasant. The receiver works equally well with a fly screen, a six-foot wire, a magnavox horn or any small body of metal for an antenna, the announcement said.

A six-foot steel fishing rod was stuck up for an antenna between the cushions of a large touring car and signals from WLAG station, Minneapolis, at twenty to thirty miles, could be heard for several hundred yards at a time while the car was in motion.

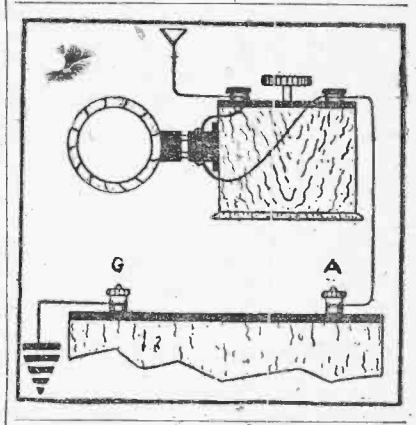
The receiver also is extremely selective, distant stations having been received thru broadcasts from the Cutting & Washington station, while the receiver was located but 400 yards from the Cutting & Washington station.

Mr. Washington is the designer of seven large commercial radio stations in the United States, including WSA, East Hampton, L. I., the most powerful spark marine station in the world, and during the war designed radio apparatus for the United States navy and allied governments. He also gained scientific recognition as a photographer of radio waves.

Eliminator of UnwantedSignals

A .0005 mfd. variable condenser, a single coil-holder, a 50-turn honeycomb coil and a small cabinet are required to construct the wavetrap shown in the sketch. The single coil-holder is attached to the panel in the cabinet, and the two contact screws are connected to the condenser terminals. When the coil is plugged into the holder, the condenser is in shunt with the coil.

This arrangement can be recommended as a simple means of tuning out any local interference. The receiver is first tuned in the usual way until the maximum strength of the desired signals is obtained, quite regardless of the existence of the trap-circuit and the interfering signals.



The trap is then adjusted until the interference is cut down to a minimum, when it will be noticed that a slight falling off of signal strength has taken place. This is again brought up to maximum intensity by carefully adjusting both the trap and receiver condensers.

By being tuned as accurately as possible to the unwanted signals the arrangement acts as a trap for same, while the desired signals pass freely to the receiver. In other words, it accepts the unwanted signals, and for this reason it is sometimes referred to as an "acceptor circuit."

Improves Wave Traps.

F. A. Zetche, 1524 Glenlake avenue, Chicago, has built a wave trap from designs published in the Radio Magazine section and is jubilant. He now can tune out local interference. Mr. Zetsche also has added a little kink or two to his trap and tells us about it. He says:

"You description of a wave trap published Nov. 15 is surely a wonderful addition to any set. I am located within eight blocks of WJAZ and could never tune them out. Friday evening, Nov. 23, I finished the trap and hooked it in and say, boy! I sent WJAZ up the alley and listened to the Drake and KYW at will and it surely makes a phan feel good to be fixed so as to tune out these stations at will.

I mounted this trap on a 5x5 panel, placing the condenser on the inside of the coil. This way of mounting helps some too.

Words fail me in trying to express appreciation of your radio dope.

F. A. ZETSCHE,
1524 Glenlake Avenue.

What Mfd. Means

The term 500 mmf means 500 micro-microfarads. Expressed in the way that you used to seeing it, it would read .0005 mfd.

Chicago Lawyer Runs Man-Size Broadcasting Station to Gratify a Hobby

ONE of the few privately owned radio broadcasting stations in the United States is that of WTAS, Elgin, Ill., located about thirty miles from Chicago. Its owner is Charles Erbstein, noted criminal lawyer, who operates the station as a hobby. This article describes it.—The Editor.

BROADCASTING stations are like most everything else—"The first cost is not the last cost." Not only does it entail thousands of dollars to install a station, but it requires an annual outlay of several thousands of dollars to maintain it. Mr. Erbstein seems to get a lot of fun out of his investment, as he must do to make it pay.

RIDING a hobby horse to the tune of many Yankee Doodle Dollars is not an uncommon thing among men of great wealth. It is rather the exception to the rule when a multi millionaire doesn't have an expensive hobby to ride.

However, hobby horses that cost into the thousands to start with and involve many additional thousands as an annual upkeep are few and far between among men of modest means.

Charles Erbstein, the noted Chicago criminal lawyer, is a man of modest means and has one of those hobbies that cost like the dickens to get acquainted with and a small fortune to maintain. It is a radio.

Mr. Erbstein is a commuter. He lives in a beautiful villa four miles from Elgin. He commutes to Chicago every morning where he has his law practice. Here he spends a busy day with his numerous clients and then commutes some more in the evening, Elginward, where he rides his hobby.

Learns Morse Code First.

Mr. Erbstein is a deeply-dyed-in-the-wool radio bug. He received the inoculation several years ago, when a tiny specimen of the radiobugorium stung him. It was not long before he began to learn the Morse code and pound the brass key with a U. S. operator's license.

Then came the big master radiobugorium and bit him. That was about a year ago. With a check book in one hand, an order book in the other and a will-defined purpose in the back of his hairless head, Mr. Erbstein bought a full-fledged broadcasting outfit, built a two-story structure to house it and started out to ride a most expensive hobby.

At first the station was operated as an amateur's experimental station. Then the scope was widened as letters began to pour in on him from all sections of the country from listeners-in who had picked up his test programs.

Once-a-week and twice-a-week programs were put on the air. Mr. Erbstein, who was his own operator and announcer, began to improve the quality of his programs. Then he employed operators and announcers.

WTAS became famous over night almost. It was heard in every state in the union and even in Canada, Cuba South America and out on the high seas.

This was all last winter. The station since has been improved. This season it is making records for long distance transmission that do credit to many of the larger and older stations.

Mr. Erbstein now announces that for the rest of the season his abbreviated schedule of twice a week soon is to be superseded by a seven-days-a-week program.

Plans Bigger Station.

Mr. Erbstein also says he is preparing to install additional and larger equipment and expects to make WTAS one of the best broadcasting stations in the land.

The station is located on Mr. Erbstein's estate four miles from Elgin. The grounds are the highest point in that section. His aerial mast, which is ninety-two feet in height, is 303 feet above the level of State and Madison streets, Chicago.

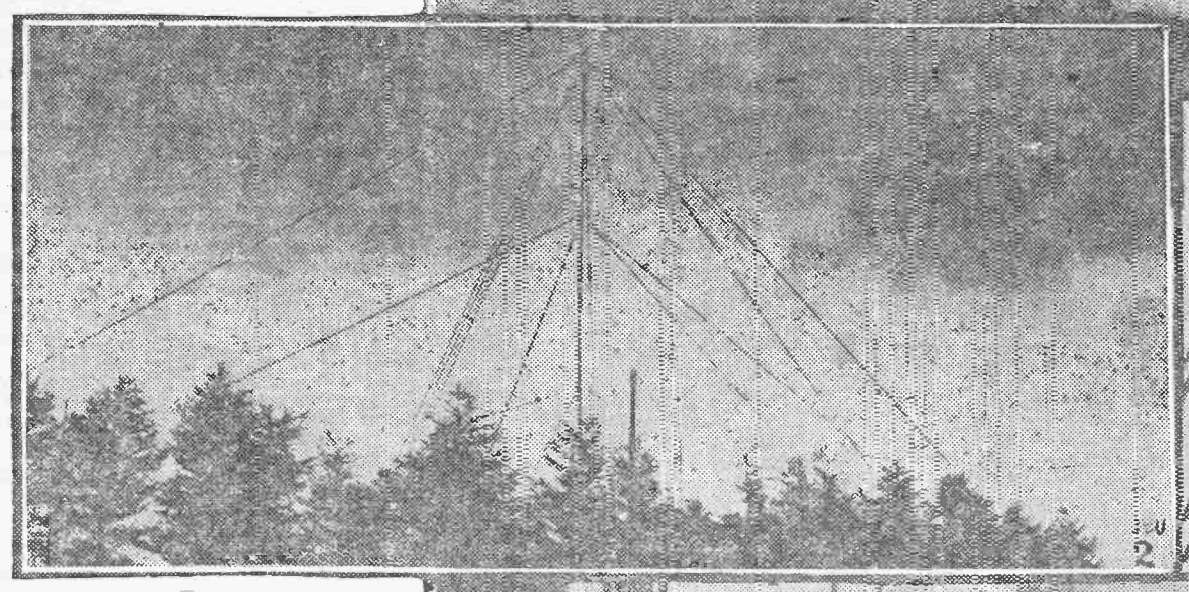
A specially built structure, two stories in height, houses the station. The first floor is for the operating-room and experimental laboratory. The second floor is devoted to the studio.

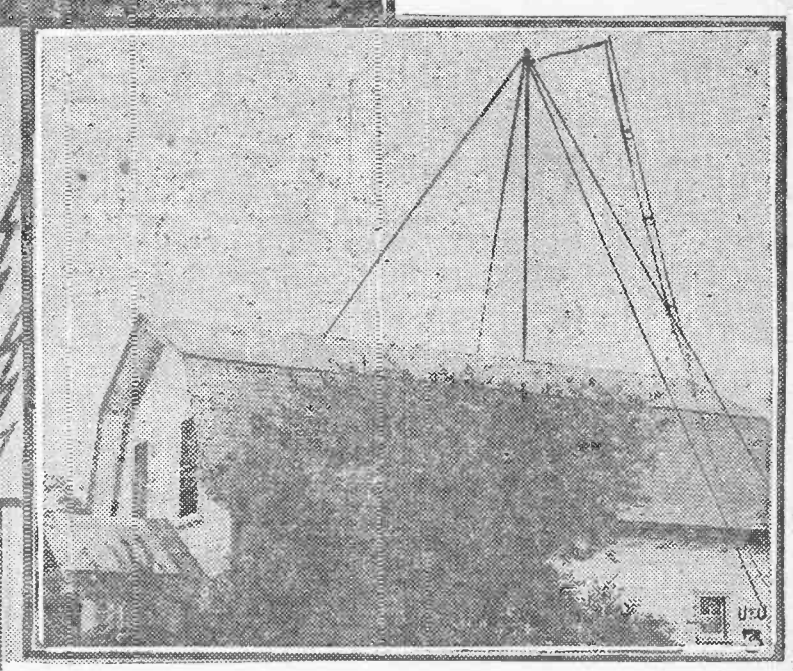
The station, aside from its call letters given it by the United States government license, carries the name of "Villa Olivia Station," which the announcer has made famous wherever a radio receiving set is located. This name comes from that of Olivia Erbstein, the 10-year-old daughter of the lawyer.

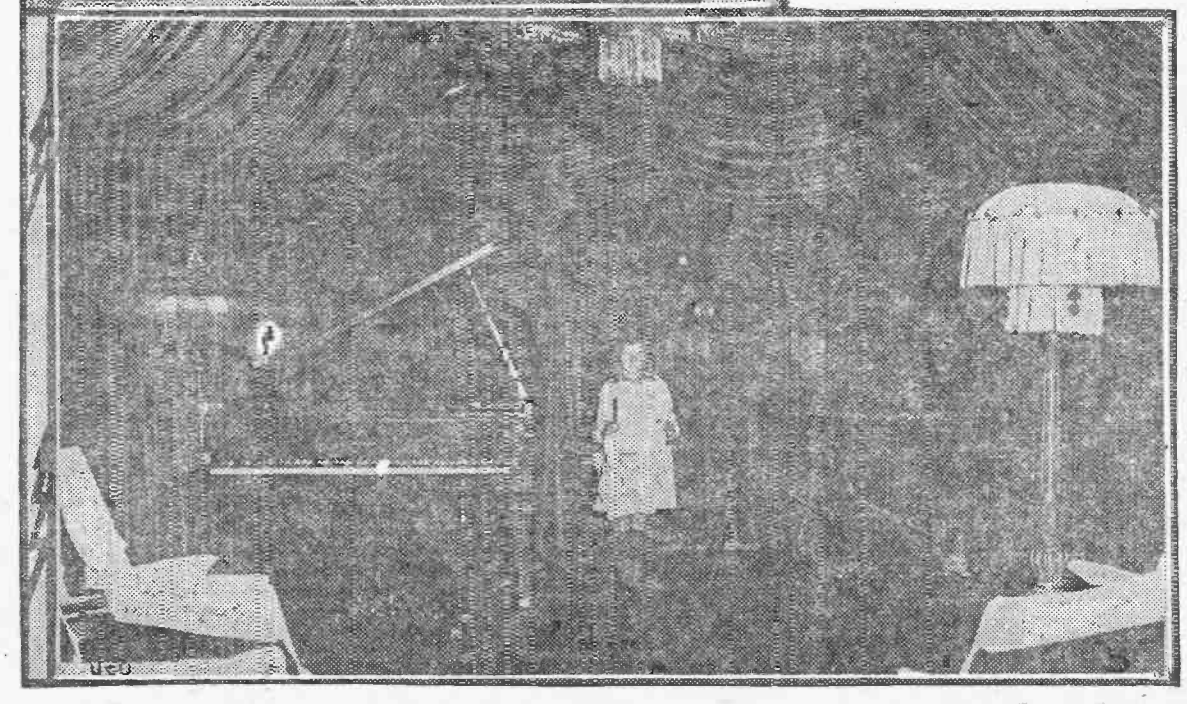
The programs sent out by this station equal those of any other broadcasting station. Near-by towns of Elgin, Aurora and even Chicago furnish the talent and aside from the usual volunteer artists, many of the artists are employed regularly for the programs.

Jazz orchestras and dance music have been regular features every Monday and Saturday evening as well as music of a more serious nature.

To maintain this station Mr. Erbstein must lay out many thousands of dollars annually. When one stops to consider that his only compensation is his enjoyment of the hobby he rides and the entertainment he gives others, one must admit that Charles Erbstein is a generous benefactor.







INTIMATE VIEWS OF STATION WTAS—At the top, in Fig. 1, is Charles Erbstein, Chicago's noted criminal lawyer, who owns and operates station WTAS, Elgin, Ill., as a pastime. He is shown at his Kennedy long-wave receiving set. Fig. 2—Aerial at WTAS. Fig. 3—Exterior of radio building devoted exclusively to the broadcasting station. Fig. 4—Mr. Erbstein talking thru the hand microphone, which is connected, thru line-amplifier, with studio in another part of the building. Fig. 5—Studio, with Mr. Erbstein's daughter, Olivia Frances, after whom the station is named.

Window Shade Type Makes Variable Loop

A variable loop in the form of a curtain shade has made its appearance. The loop consists of a roller, a curtain support and the turns of wire placed on the curtain support. When fully open this loop is quite large and serves not only for broadcasting reception but for higher wave lengths. By opening the shade member more or less, any desired inductance can be brought into play for the active loop, thus making for the greatest possible efficiency in a loop receiver. The device is provided with a wall bracket and swivel so that it may be pointed in any desired direction, or placed on any door in the house.

China Frowns on Radio Broadcast

Several attempts have been made at Shanghai to establish broadcasting stations, the first being that of the Radio Corporation of China, whose equipment was operated for a short time on the roof of the Robert Dollar building.

A little later the Electric Equipment company installed a 50-watt set on top of its building, the station being used ostensibly for experimenting and for demonstrating radio sets to its customers. This set is still in service. Broadcasting programs were next offered by the Evening News, a local paper, and by the Wing-on company, a large department store, which recently installed a station, but the right of these to continue has been questioned by the Chinese ministry of communications.

Development of radio broadcasting in China has been retarded by the fact that the importation of wireless apparatus was prohibited by the Chinese government. This embargo was based upon an article which states that all "telegraphs and telephones, whether with wire lines or wireless, are called electric communications," and another article states that "electric communications shall be operated by the government." But so keen is the local interest in radio that radio broadcasting must soon be in full swing on a satisfactory basis.—Scientific American.

Acoustic and Radio Give Location of Ships at Sea

A description of a means of locating the position of a ship at sea by the emission of a radio "dash" simultaneously with the firing of a small charge in the sea is contained in the Proceedings of the Physical society.

A station on shore records the arrival of the radio signal, and also of the explosion wave at a number of hydrophones suitably disposed in known positions on the sea bed.

The times of travel of the explosion wave, and hence the distances from the charge to each hydrophone, are indicated by an Einthoven galvanometer photographic recorder.

Altho great accuracy is attainable, for navigational purposes it is sacrificed to speed—it being possible to give a ship her location within a radius of half a mile, inside ten minutes from receiving her request for a position.

This method has been thoroly tested under service conditions and has been found absolutely reliable. A 9-ounce charge can be located at a distance of forty miles.

In hydrographical survey work the method has been tested successfully in fixing accurately the positions of certain buoys and light vessels. The possibility of screening and distortion effects produced by sandbanks has also been investigated.

Radio "Tales of Hoffman"

This evening the Grand Opera Society of New York, conducted by Zilpha Barnes Wood, will offer from WOR Offenbach's opera, "The Tales of Hoffman," in English. An augmented orchestra will play the celebrated score, assisted by an ensemble of forty trained voices.

Students to Run WGY

Union college of Schenectady, N. Y., will have entire charge of the late program Friday night of WGY. A series of short addresses will be delivered by Dr. Charles A. Richmond, president; H. M. Hallenbeck, Dean Edward Ellery, Prof. C. N. Waldron and Elmer Q. Oliphant, director of athletics. David Brockway, a Union student, will sing several barytone solos.

How to Tune Your Receiver Set Efficiently, with Notes on Various Tuners

MOST faulty radio reception is due, not to poor equipment, but to poor application of the equipment. In other words, the average radiophan does not understand and use the science of tuning. In this, the third of Mr. Cardwell's series of articles written exclusively for The Post Radio Magazine Section on "Everyday Engineering for the Homebuilder," this importance of sharp tuning is emphasized.—Editor.

By ALLEN D. CARDWELL.
(Consulting Radio Engineer.)

FIRST in importance in the design of a correct receiving set is the selection of a sharp tuning circuit. In the preceding articles, I have emphasized the importance of knowing what the receiver should do and how you intend to arrive at the result. It was also suggested that the units and assembly be considered carefully.

Now, however, I will emphasize one feature of receiver design which is a study in itself: "The Science of Tuning Circuits."

To understand exactly what is being discussed let me review the elementary theory of tuning:

A transmitting station is a generator of alternating current. Let us assume that the ether is one conductor and the earth is the other.

If we remember that instead of one broadcaster, we have ten or twenty operating on the same circuit at the same time, it is obvious that we will hear several of the transmitters if we do not provide some means of selection.

The basis of selection is the number of alternations of the transmitting station. These are fixed by the department of commerce for each station. We express these either in kilocycles or meters—one being a value in frequency and the other in wave lengths. Both are "reciprocals" of a given fraction.

Faults in Tunning.

In Figure 1 you will note a chart showing what is going on in the ether at a given hour any night. You will note six "mountains" indicated covering different wave lengths. Note that Station B has a peculiar transmitting peak. It starts at 250 and rounds over to 350. This station can be heard "all over the dial." The other stations are also heard over very large portions of the tuner.

What is the reason for this? It is due to the aperiodic characteristics of the tuner. The tuning circuit must be faulty, to register such results. Usually, it is due to the following causes:

(1) Leaky condensers.
(2) Leaky or high resistance coils.
(3) Poor insulation of circuit including aerial.
(4) Compound circuits which are not at resonance due to stray capacity, etc.

These generally pass as "losses," for we regard every leakage, resistance and absorption, as reducing the input signal.

The losses may be found to occur in a number of ways. For example, if a wood panel is used, due to the moisture in the wood, part of the signal current leaks across the wood, and damps out the signal. Or if a good insulation material is used for the panel and dust (particularly soot) is accumulated on the panel, it will also allow the current to leak off to the ground. Poor aerial insulators also do the same thing.

Again, if you were to use a variometer and depend for the contact to the winding by a friction spring it may introduce a high resistance. If a wire in the winding were broken, in some circuits the set might still operate, but enjoy a very high resistance due to the broken wire and fail to respond to tuning.

Or, if you make connections by twisting wire over a contact, it may have a variable resistance—good only when you shake up the set and the wire is set in place accidentally.

Circuit Constants Troublesome.

More usually, however, the circuit constants cause the trouble. If the secondary coupler does not have enough wire on it to reach the wave lengths you are to cover on the primary it will respond to the primary when tight coupling is used, but also respond to its own wave length, which will thus bring in interference.

A good tuner has the effect shown in Figure 2. Here the same stations as shown in Figure 1 are increased in voltage (see comparative scales) and the peaks become sharp so that one can be selected from the other.

It should be remembered that every station transmits not on one sharp wave length but on a "band" which may extend from two to three meters each side of the peak or fundamental. The station also may have "harmonics" or subpeaks, which are due to poor tuning of the aerials, capacity of buildings, etc.

To the single circuit tuner a good oscillate it will then become more selecference. In this circuit the primary (aerial) and secondary (coupler) are the same and this means that the aerial may pick up a number of stations of nearly the same wave length, if the stations are nearby.

If the single circuit set is made to oscilate it will then become more selective, but it will also radiate and this is the curse of the "canary birds" so commonly heard where several receiving aerials are close together.

A double circuit tuner, while adding to the tuning controls, will afford more selectivity, but it does not guarantee this unless you can secure very loose coupling and avoid losses in both primary and secondary circuits.

What Decremeter Shows.

In order to visualize the importance of sharp tuning let me refer to the side view of the Kolster decremeter shown in Figure 3. This is a device used to measure the damping of interrupted wave-train signals emitted by a spark station. Such stations send out signals over a band of frequencies and the instrument is used to determine whether the station radiates too broadly.

To determine this, it is essential to know at what frequency the signal is at greatest strength, and obviously the decremeter must have of the lowest possible resistance. Accordingly, a very efficient tuning condenser is used and mounted in a shielded cabinet while the inductance unit (seen to the left) is plugged in above the panel. Different coils are used for each range of frequencies. Litz wire is used on the inductance to reduce the coil losses to a minimum.

Another tuning device that should interest you is the view of the "single-control" receiver in Figure 4 where a motor shaft at the lower right will revolve the inductance and the condenser simultaneously over a variation of wave lengths from 100 to 3,800 meters.

In this instrument the view shows how the bank winding of the primary is tapped. This means that there are a large number of turns of the primary which are inactive over most of the range and hence will absorb some of the signal strength.

This is in direct contrast with the special inductance used on the decremeter where a separate coil is used for every wave length.

To secure a wide tuning range with one control the dead-end losses are unavoidable. The top wires also are so closely drawn together to reach the tops that they introduce undesirable capacity effects. Obviously, to attain the single-control result over such a long range of wave lengths, something must be sacrificed.

The view of the transmitting inductances shows a very satisfactory method of securing inductance and coupling regulation by use of air sup-

(Continued on Page 10.)

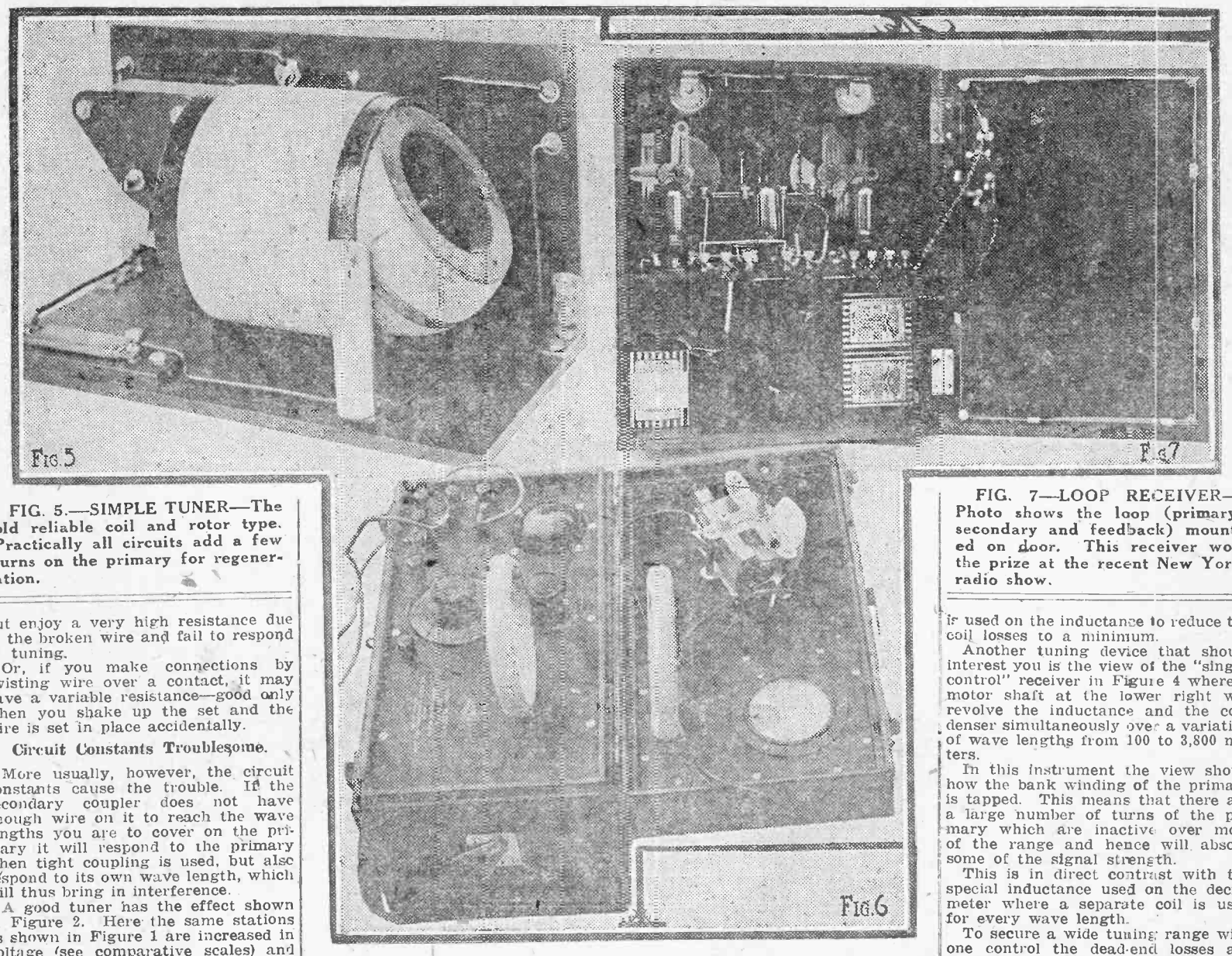
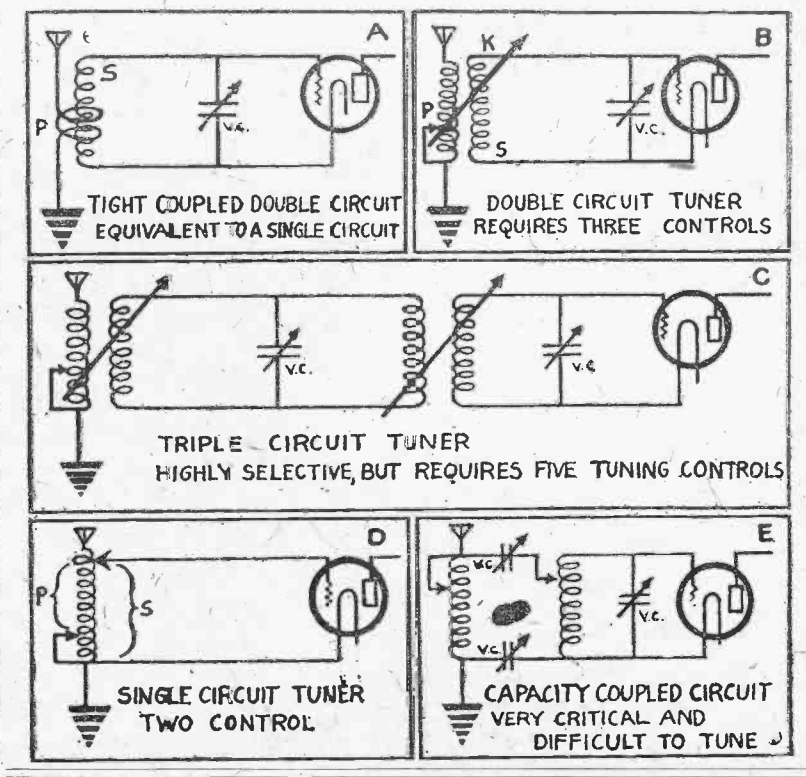
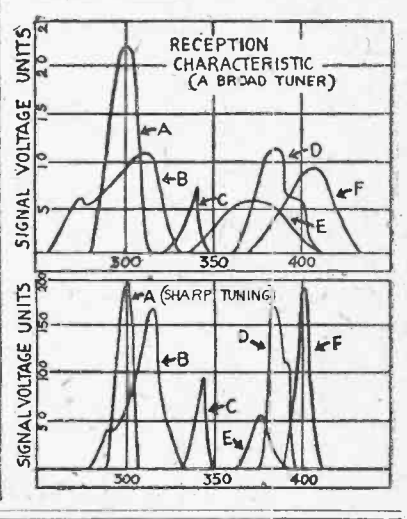


FIG. 5.—SIMPLE TUNER—The old reliable coil and rotor type. Practically all circuits add a few turns on the primary for regeneration.

FIG. 7—LOOP RECEIVER—Photo shows the loop (primary, secondary and feedback) mounted on door. This receiver won the prize at the recent New York radio show.





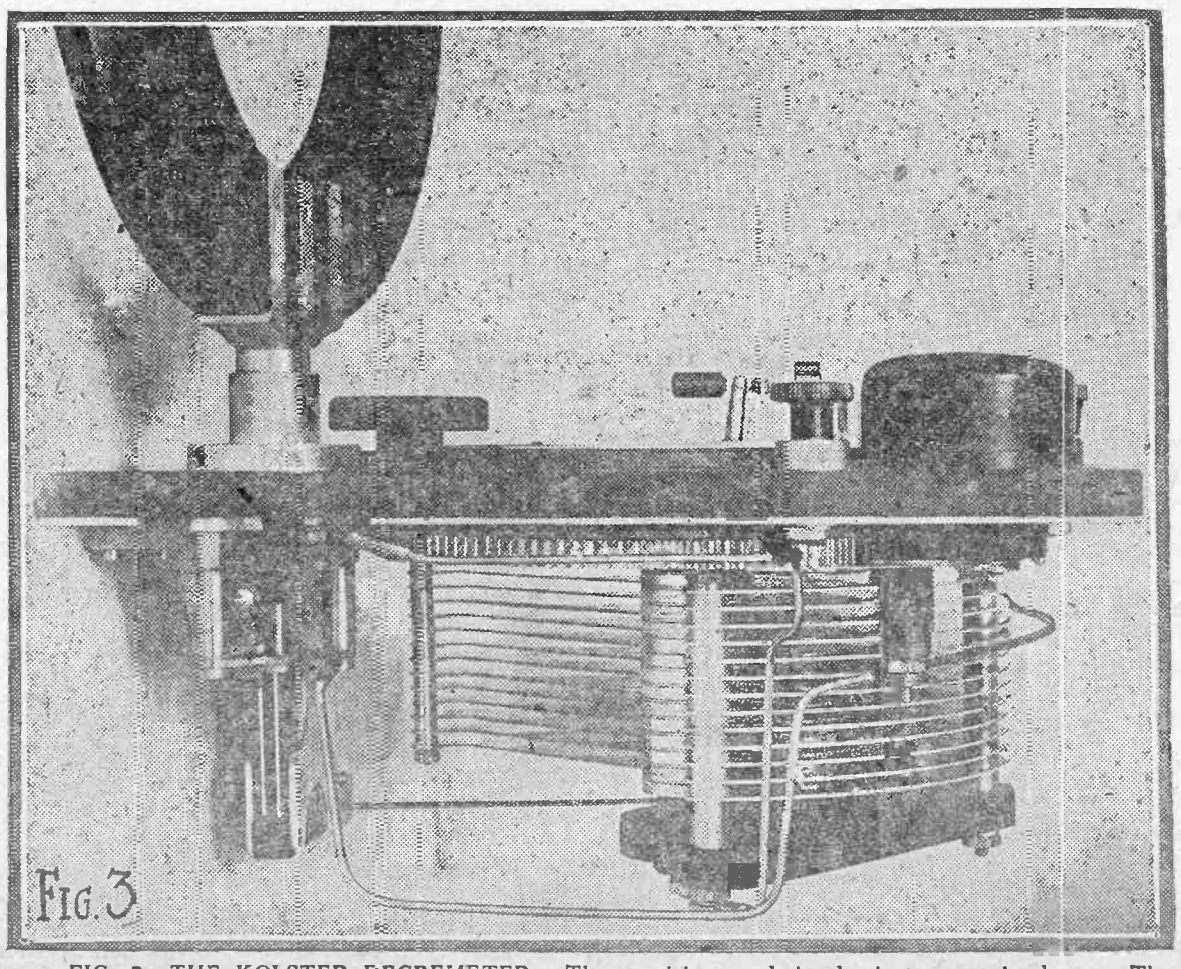


FIG. 3—THE KOLSTER DECREMETER. The precision work in the instrument is shown. The over-all of the condenser is 9 inches.

Construction Details of New Autoplex Circuit, with Notes on Operation

TODAY The Post Radio Magazine gives complete construction details of the new Autoplex Super. The design and panel layout are especially made for The Post and are protected by copyright.—The Editor.

By IVERSON C. WELLS.
(Radio Editor of The Post.)

GETTING long distance on a loud speaker with one tube appeals to admirers of the Autoplex circuit. The low cost of construction and simplicity in design makes an additional appeal to the home builder.

There are only three instruments necessary for the efficient operation of the circuit. There are two variometers, an inductance coil, minus taps, and a vacuum tube. A rheostat and a grid leak may be added if 301A tubes are employed, but even in this case they can be eliminated. With such a small handful of parts, compactness can be obtained and wiring is as simple as a crystal hook-up.

The set illustrated here today, construction details for which are herewith given, was designed to operate either a high amplifying tube like the 301A or a power tube like the 216A or the VT-2. Therefore, a rheostat is included in the plans, as the smaller tube may require a fairly close adjustment of the filament voltage.

At this point I want to state that in my experiments with this circuit I have not found the smaller capacity tubes very efficient. They will work fairly well on local broadcasting, but do not have the capacity to carry the great volume of energy the 1,250 or 1,500 turn inductance coil shoots thru it.

However, there are many who, either from economy or because of conditions, insist on the smaller tube. In this case it will be best to have the rheostat to control the filament current:

List of Parts Used.

Complete parts for the Autoplex, as designed and constructed for this presentation, can be bought at list price for $36.79. Shopping around will reduce this figure considerably. In fact the parts in this particular set were really bought for less than $20. Here is the list of material and equipment

One Formica panel, 9½ by 13¼ by ⅛ inches	$1.89
One 4 by 4 by ⅛ inch Formica panel for sub base	.25
One 2¼ by 2¼ inch Formica panel for coil clamp	.10
One 9½ by 13¼ inch mahogany finish cabinet	5.00
Two Columbia variometers	11.00
One Columbia honeycomb coil, (1,250 turn)	2.00
One Frost rheostat, plain, (6 ohm)	1.00
One Firco tube socket	.75
One 216A or VT-2 vacuum tube	12.00
Two 3-inch bakelite dials	1.00
One Pacent single circuit jack	.75
Six binding posts	.60
Two 1-inch angles for brackets	.20
Two six or 8-32 flat head brass machine screws 1½ inches long; 2 6 or 8-32 inch flat head brass machine screws 1 inch long; 8 6 or 8-32 inch flat head brass machine screws ½ inch long; 1 dozen nuts to fit screws selected	.25
Total	$36.79

I have specified the exact parts used in this test set, but any apparatus that is of equal value will suffice.

The extras required in this set are those required in any receiver. A six-volt storage battery will be necessary, of course, and it should be at least 120 ampere hour capacity if the power tubes are used If the 301A tube is used the "B" battery should have the maximum voltage for these tubes, which is about 130 volts. If the power tubes are used up to 200 volts are necessary.

Must Use Good Phones.

Whichever tube is used, however, bear in mind that they must be given the maximum voltage on the plate if you would secure the great volume this circuit is capable of delivering.

The headphones for this circuit can be any good low-resistance headset, but they should be of the very best. The terrific pounding the circuit shoots into the phones will make an ordinary phone rattle like a Ford going over a rocky road.

Picture shows Benjamin Freund, constructor and designing engineer for the Chicago Salvage company. It was Mr. Freund who, working under the supervision of Editor Wells, made the panel layout and hooked up the set you see in this and other illustrations.

The panel and sub base layout, with the proper dimensions, the location of the holes to be bored for the instruments specified, and other construction details are shown in an accompanying sketch.

A very clever arrangement of the parts has been provided for, the sub base panel for the tube socket carrying the coil underneath. The plans are complete and no further interpretation is necessary for a clear understanding.

Begin construction by preparing the front panel and the sub base. Carefully drill each hole, making such changes in location and sizes as may be necessary if parts are used other than those specified.

Mount first the tube socket on the subbase. Follow this with the coil undereath. Now put into place the rheostat and attach the subbase on the brackets as shown in layout. Wire the rheostat and socket. Place the two variometers into position, removing the feet and screwing onto panel with the screw holes provided on the instruments.

Solder Each Joint.

Run the various leads to their respective places. The pictorial diagram and the photos show the details of this very clearly. Solder each joint carefully, making sure that the connections and contacts are perfect. There is no necessity for spaghetti insulation. Plain bus bar wire is best to use. Follow the general scheme of wiring as shown in the photos.

The cabinet here shown is one that was picked up at a bargain sale. Other shapes and sizes may be procured, if desired. In that case changes in the panel layout must be taken care of.

In operating this set to get maximum results power tubes—any of the five-watt capacity are essential with high plate voltage. Many readers of The Post Radio Magazine have been inquiring lately if they cannot use the 199 tubes.

These tubes can be used, of course, but they are not built to deliver the output that the power tubes will give forth. If they are used, disappointment will result.

With some aerials it may be necessary to load up the circuits a little to bring in the higher wave stations. If this is found necessary insert a fifty-turn coil—either a plain or honeycomb—in the grid circuit, from the variometer to the grid post of the tube, and another from the plate post of the tube to the other variometer.

It is essential that these two loading coils be exactly of the same value so that the variometers will be kept at equal value. This is important.

The autoplex does not work so well on local stations as it does on the long-distance fellows, altho experimenters have reported that they have had unusual volume on this class of broadcast reception.

Ground Is Good Collector.

The autoplex works as well, if not better, on a ground alone, than on a ground and aerial. It also is quite efficient on the aerial alone, but not so good as the single ground.

Some of The Post Radio Magazine readers have been advised by numerous counselors to insert small Estru variometers in the circuit as verniers, these being shunted across the larger variometers. The idea was that these would sharpen up the tuning.

It is evident that such counselors have not tested the circuit to any extent, or they would have discovered that it is a very sharp tuning circuit without any addition to the variometers.

The fact is the circuit is so sharp vernier knobs on the dials of the variometers greatly add to the tuning. Adding the Estru variometers would increase this sharpness.

The Estru variometer would answer

Continued on Page 8.

Letter Box

GETS IN 61 STATIONS.

Radio Editor: Here is a record of which I believe I can be justly proud. It contains sixty-one different stations, most of which came in loudly and clearly. Last Monday night I got thirty-one different stations, including KFI, Los Angeles, Cal.:

KDKA, East Pittsburg, Pa.; KFDL, Denver, Colo.; KFI, Los Angeles, Cal.; KFKB, Milford, Kan.; KHJ, Los Angeles, Cal.; KLZ, Denver, Colo.; KOP, Detroit, Mich.; KSD, St. Louis, Mo.; WAAK, Milwaukee, Wis.; WAAR; WABA, Lake Forest, Ill.; WBAD, Minneapolis, Minn.; WBAH, Minneapolis, Minn.; WBAK, Harrisburg, Pa.; WBAP, Fort Worth, Texas; WBAV, Columbus, Ohio; WBZ, Springfield, Mass.; WCAE, Pittsburg, Pa.; WCAP, Washington, D. C.; WCAS, Minneapolis, Minn.; WCBD, Zion, Ill.; WCG, New York, N. Y.; WCK, St. Louis, Mo.; WCX, Detroit, Mich.; WDAF, Kansas City, Mo.; WDAR, Philadelphia, Pa.; WEAF, New York, N. Y.; WFAA, Dallas, Texas; WFI, Philadelphia, Pa.; WGI, Medford Hillside, Mass.; WGR, Buffalo, N. Y.; WGY, Schenectady, N. Y.; WHA, Madison, Wis.; WHAS, Louisville, Ky.; WHAZ, Troy, N. Y.; WHB, Kansas City, Mo.; WIAO, Milwaukee, Wis.; WJAX, Cleveland, Ohio; WJZ, New York, N. Y.; WKY, Oklahoma City, Okla.; WLAG, Minneapolis, Minn.; WLW, Cincinnati, Ohio; WMAR, Waterloo, Iowa; WMC, Memphis, Tenn.; WOAD, Sigourney, Iowa; WOAI, San Antonio, Texas; WOAW, Omaha, Neb.; WOC, Davenport, Iowa; WOO, Philadelphia, Pa.; WOR, Newark, N. J.; WOS, Jefferson City, Mo.; WOV, Omaha, Neb.; WRC, Washington, D. C.; WRW, Tarrytown, N. Y.; WSAI, Cincinnati, Ohio; WSAJ, Grove City, Pa.; WSB, Atlanta, Ga.; WTAM, Cleveland, Ohio; WWJ, Detroit, Mich.; WTAS, Elgin, Ill.; new Joliet station, which at the time had no letters.

The set I am using is a Casey ultra-audion single-tube outfit, indoor aerial. Would like to challenge anybody for the single-tube record. HARRY C. IRONS,
3720 North Kenneth Avenue, Chicago.

Radio Editor—I am interested in the Autoplex receiver, having built one. It does all you claim and more. I get several New York stations on a speaker. I succeeded in getting former President Wilson's speech also. You sure have a fine radio sheet. Keep up the good work.—John Ascher, 123 South Oakley boulevard, Chicago.

Radio Editor—The writer has just become a radiophan and had decided that he must give up The Chicago Evening Post in favor of some other evening paper, but am very glad to see that you are publishing by far the best radio page in the city.

I have a new Frede-Eiseman neutrodyne set and apparently can pick up anything in the United States with ease, but in prowling around I often get the name of the city in which the broadcaster is located, but fail to get the station call letters. Is there any list printed giving the cities in alphabetical order showing the call number of the station located therein?—L. A. Prouty, 226 West Adams street, Chicago.

(Editor's Note—We will publish such a list in next week's Radio magazine and make it a regular weekly feature.)

GETS EVERYTHING.

Radio Editor: I want to report progress on my Autoplex just hooked up in the rough, as I am following you in the Radio Magazine (which, by the way, is a humdinger). With the Western Electric unit for victrola hand speaker, I have had everything on the list from Kansas City to Schenectady, N. Y. I believe there are wonderful possibilities for the Autoplex, and I am looking forward with interest to your next article. WILLIAM G. COOPER,
618 South Grove Avenue, Oak Park.

BOUQUETS AND BRICKS.

Radio Editor: I have been a reader of The Post for the last two years, and like it very much, especially since radio programs have been published.

I was just on the point of stopping delivery of The Post, on account of not having a radio department, when you started publishing daily programs, but now that you have added the Radio Magazine, I must say it is the best paper of all the Chicago daily's published, and should be so considered by every radiophan.

Now that I have this "out of my system," I wish to make a few remarks on your comments on DX Hound Reports, as published in Nov. 22d issue Radio Magazine. "Rehead phones, causing phans to lie about stations heard." My answer to this is, you should be very sure your schedule information is correct, before you assert reports from phans are not correct.

I will give you two incidents that occurred this week, that will show your schedules not correct, viz., Wednesday, Nov. 21 WTAM, Cleveland, Ohio. I picked up at 7:58 p. m. and listened in until 8:01 at which time it announced WTAM would remain silent for about one-half hour to allow WJAX, Cleveland, to broadcast a talk by Secretary Davis from Washington, D. C.

This talk lasted until 9:16, after which WTAM came on again at 9:17 and completed its evening program, signing off at 9:35 p. m.

Now, in this case, your schedule showed WJAX silent.

Again, last Thursday night at about 9 p. m. I was trying to tune in KFI, Los Angeles, which, according to schedule, as published by another Chicago paper, was to be on at 8:45. I set my dials to 469 meters and picked up some swell music, and was greatly surprised when the station was announced, to find I had WRC, Washington, D. C. They are on 469 meters also, but what surprised me was your schedule gave WRC as silent last night.

These are only two cases, I know of others, but just now do not recall the exact facts of the case, so will not mention them.

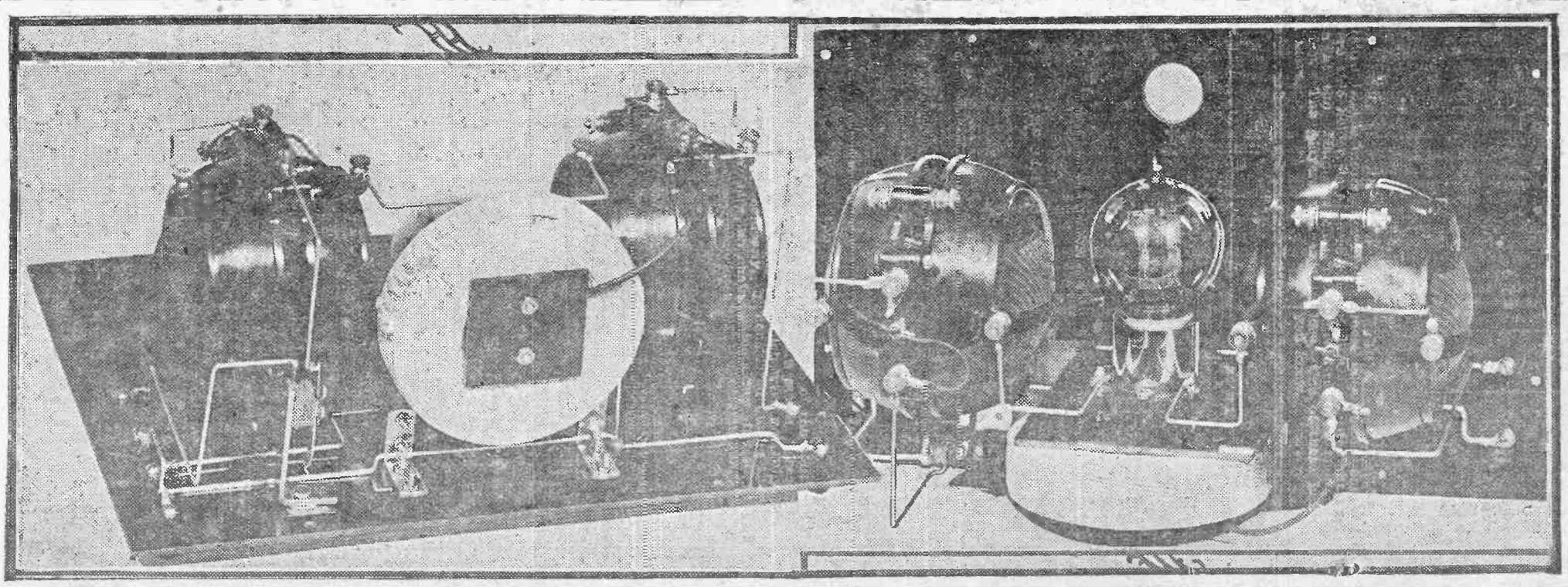
A few words about my set and what it will do. I am only a novice at the game as yet, but hope to improve as time goes by. I have a neutrodyne special, five-tube set, which was built for me in a victrola cabinet, using a Morrison loud speaker attached to the tone arm, with the following results, viz.: Installation was made on Friday, Nov. 9, about 5 p. m. when I started to try to tune in some station. I have now had the set just two weeks, during which time I have picked up a total of fifty-three stations, and am able to go right thru Chicago stations to long-distance stations in any case where the meter wave is twelve to fifteen over or under the Chicago wave.

In all cases I tune in direct with loud speaker, and do not use the head phones, as it is not necessary for what I have picked up so far. My set has six graduated dials and one knob on "A" battery.

The beauty of it is, when I get a new station, I make a correct chart of the dial reading, after which I am able to get this station again at will, whenever they are on the air.

Inasmuch as I cannot be blamed for lying, due to the pressure of head phones, I am going to take a chance on sending you the list of stations I have heard on a copy of a chart as I make them up. You will notice this chart is indexed, both as per meter wave and alphabetically as per station call, so I make it easy to determine the possibility of whether or not you will be able to get a station desired, as the chart shows quickly that fifteen meters

Continued on Page 8.



View of autoplex looking at bottom of receiver. This and the opposite photo show the wiring details quite clearly.

Interior view of the autoplex described in these articles. Note the arrangement of the inductance coil.

Letter Box

Continued from Page 7.

away on each side will not interfere with tuning in any station desired. The following is a log of stations recently picked up, also the date of same up to Wednesday, Nov. 21, and Thursday night, Nov. 22. Too many in my home to make up a log.

Friday, Nov. 16 — WMAQ, KYW, WDAP, WPAD, WJAZ, WGY, WDAF, WOAW, WWJ, WBAP, WFAA, KFI, KDKA, WJZ, WSB, KSD, KHJ, WDAR, WLW, WMC and WNAD.

Saturday, Nov. 17—KDKA, WDAF, WDAP, WCAE, KYW, WMAQ, WSB, WGY, WOC, WFAA, WTAM, PWX, WJAZ, WTAS, KHJ and WSAI.

Sunday, Nov. 18—KYW, WOC, WPAD, WCBD, WHAS, WBAP, KDKA, WPAH, WFAA, WEAF, WJAZ, WSY, WBL, WDAP, WOAW, KHJ and KPO.

Monday, Nov. 19—KDKA, WDAP, KYW, WCX, WRC, WCAE, WGY, WBAP, WOC, WMC, WFAA, WOO, WCBD, WTAS, WOAW, WHAZ, KSD, WGR, WLAG, WSB, KFI, WBAY, HXD, CFCN and WDAF.

Tuesday, Nov. 20 — WSB, WMAQ, KDKA, WDAP, WJAX, WJZ WWJ, WBAP, WSB, WFAA, WSAI, KSD, WHB, KYW, WDAF, KHJ and KFI.

Wednesday, Nov. 21—WJZ, WMAQ, WWJ, KSD, WTAM, WDAP, WBAP, WDAF, WOR, WJAX, WOS, WJAZ, WLAG, KHJ, WOC and 9XN.

I trust I have made my position clear in this case, and I hope you will continue to keep up the good work on radio.—Leslie W. Otto, 7231 South Park Avenue.

ALL ON LOUD SPEAKER.

Radio Editor: Caught the following stations using Grebe C R 12, every one being distinguishable on the Magnavox:

KDKA, Pittsburg; WCAE, Pittsburg; KDPM, Cleveland; WOS, Jefferson City, Mo.; KFI, Los Angeles; CFTC, Toronto, Canada; WAAD, Cincinnati; WBAP, Fort Worth; WOAW, Omaha; WGY, Schenectady; WHAG, Cincinnati; WHAS, Louisville; WHAZ, Troy, N. Y.; WHB, Kansas City; WDAF, Kansas City; WFAA, Dallas, Texas; WJZ, New York; WLW, Cincinnati; WMAJ, Kansas City; WMC, Memphis; WOC, Davenport; WPAT, El Paso, Texas; WSAI, Cincinnati. Since then until 9 p. m. this evening, the 22d, I have caught WSY, Birmingham; WTAM, Cleveland; WTAS, Elgin; WJJ, Detroit; WTAL, Toledo, Ohio; WWL, New Orleans; WWZ, New York; WLAL, Tulsa, Okla.; WMAB, Oklahoma City; WEAF, WEB, St. Louis; KFGC, Baton Rouge, La., and CVJDC, Toronto, Canada. While Chicago stations have been going "full blast," I have read in your magazine how one fellow can't tune out WDAP. My advice to that fellow is by all means to buy a Grebe CR 12. I want to compliment you on your radio magazine. It sure is the berries.—Henry Kratochvil, 2315 South Kedzie avenue, Chicago.

HAS 117 STATIONS LOGGED.

Radio Editor: The following is a list of stations which I have heard on my one-tube Reinartz set (117 up to date) and still going strong:

KDKA, East Pittsburg, Pa.; WDAP, Drake hotel, Chicago; WBV, Chicago, Ill.; WAAF, Chicago, Ill.; WJZ, Newark, N. J.; KYW, Chicago, Ill.; WMAQ, Chicago, Ill.; WOC, Davenport, Iowa; GKP, Chicago, Ill.; WLW, Cincinnati, Ohio; WDAJ, Atlanta, Ga.; WSB, Atlanta, Ga.; WWJ, Detroit, Mich.; WBAT, Tulsa, Okla.; KSD, St. Louis, Mo.; WBAP, Fort Worth, Texas; WPAD, Chicago, Ill.; WJAZ, Chicago, Ill.; WHAS, Louisville, Ky.; WEAA, Flint, Mich.; KFAF, Denver, Colo.; WLK, Indianapolis, Ind.; WHAZ, Troy, N. Y.; QXL, Schenectady, N. Y.; WIAO, Milwaukee, Wis.; WGY, Schenectady, N. Y.; WSY, Birmingham, Ala.; WDAA, Nashville, Tenn.; WGM, Atlanta, Ga.; WDAF, Kansas City, Mo.; WFAP, Peoria, Ill.; KWH, Los Angeles, Cal.; WFAA, Dallas, Texas; WMAF, Dartmouth, Mass.; GXU; WNAJ, Chicago, Ill.; WHB, Kansas City Mo.; WRAM—Galesburg, Ill.; WCX, Detroit, Mich.; WLAC, Minneapolis, Minn.; WIAR, Paducah, Ky.; WEAS, Washington, D. C.; WOR, Newark, N. J.; WEAF, New York, N. Y.; WRM, Champaign, Ill.; KQV, Pittsburg, Pa.; WPO, Memphis, Tenn.; WHA, Madison, Wis.; WGAF, Tulsa, Okla.; WOS, Jefferson City, Mo.; WCM, Austin, Texas; GAWJ, Elgin, Ill.; GKWJ; GUU; WAAU, Philadelphia, Pa.; WEAD, Atwood, Kan.; WTAS, Elgin, Ill.; WLAP, Louisville, Ky.; WPA, Fort Worth, Texas; WMC, Memphis, Tenn.; WEAX, Little Rock, Ark.; WAAP, Wichita, Kan.; WOO, Philadelphia, Pa.; WKAN, Montgomery, Ala.; WWAY, Chicago, Ill.; KHJ, Los Angeles, Cal.; WCAE, Pittsburg, Pa.; WBZ, Springfield, Mass.; WCAC, Fort Smith, Ark.; WHAF, Pittsburg, Pa.; WGR, Buffalo, N. Y.; NUG, Keewena Point, Mich.; GAKU, Rockford, Ill.; GAJU, Freeport, Ill.; PWX, Havana, Cuba; WLB, Minneapolis, Minn.; IAP; WHAA, Iowa City, Iowa; GYO; WNJ, Albany, N. Y.; WOAW, Omaha, Neb.; GAPM; KFI, Los Angeles, Cal.; WSAH, Chicago, Ill.; KOP, Detroit, Mich.; WEAB, Des Moines, Iowa; GPDK; GBM; GYL; GLY; WBL, Kansas City, Kan.; GBJK; GBVG; WAAX, Crafton, Pa.; WSAI, Cincinnati, Ohio; WCBD, Zion City, Ill.; WDAR, Philadelphia, Pa.; WFAT, Sioux Falls, S. D.; WOI, Ames, Iowa; WLAC, Raleigh, N. C.; WBAU, Columbus, Ohio; WNAC, Boston, Mass.; WJX, Cleveland, Ohio; WOAI, San Antonio, Texas; WAAK, Milwaukee, Wis.; WJAD, Waco, Texas; WTAM, Cleveland, Ohio; WRC, Washington, D. C.; WBAK, Harrisburg, Pa.; WOAH, Charleston, S. C.; WMAY, St. Louis, Mo.; WSAX, Chicago, Ill.; WJZ, New York City; WAAW, Omaha, Neb.; WBAX, Wilkesbarre, Pa.; GAUI.

The one hundred and seventeenth station was in Watertown, N. Y., but I could not catch the call letters. I don't like to appear boastful, but the Reinartz surely plows thru local interference.

I enjoy your radio paper very much. Got some good tips on tuning a reflex from it.—G. L. Weinberger, 5329 Calumet Avenue, Chicago.

"IT'S THE TUBE'S HOWL."

Radio Editor: Kindly reserve for me a copy of the binder you advertise in your new "radio supplement" this week.

"It," the new supplement, sure is the "tube's howl," and I guess all Chicago phans who read it will agree with me. Kindly advise me when the binder is ready for distribution. Address care of R. H. Benns, 219 West Adams street, city. Yours in the big scoop.—R. H. Krogstad.

DEFENDS CUBAN LISTENERS.

Radio Editor: We see by your Radio Magazine that you doubt the DX-ers, who have written you regarding receiving Havana, Cuba. We feel that it is up to you as a radio editor to find out whether PWX was on the air or not. We, too, were tuned in on PWX and listened to a concert given by a sextet from the orchestra from a Spanish transatlantic ocean liner and heard the ticks of the clock, which, according to the announcer, identifies PWX. Did we or did we not hear PWX, Havana, Cuba?

Among other stations I had WOO, WWJ, WGY, WOC, WOAM, WMC, WLW, WBAP, WBAH, WDAF, WTAS, WCBD and WOS. We are using Atwater Kent varicoupler, two variometers and two stages audio-frequency.—E. T. Hurry, 3007 5th avenue, Chicago.

HERE'S A SCORCHER.

Radio Editor: If you wish an affidavit by several responsible business men, same will be furnished you that PWX, Havana, Cuba, was distinctly heard Monday night, Nov. 19, and we think that your radio editor is rather careless in calling the radiophans of Chicago liars when they report to you they heard Havana, Cuba, Monday night, Nov. 19.

I had this station on the air Monday evening, and others were listening in on my set. You have come out with a radio magazine issued every Thursday, and you are soliciting the radiophans of Chicago, hoping they will become interested in your magazine. You certainly are not commencing very well by allowing anyone writing for your paper to use the word liar, as he did in last night's issue.

We are inclosing copy of letter we are writing PWX today, and on reply to this letter, we are positive we are going to prove to you PWX was on the air Monday night, Nov. 19.—H. W. R. Sassmann, 126 North Franklin Street, Chicago.

HE HAS HIS WITNESSES.

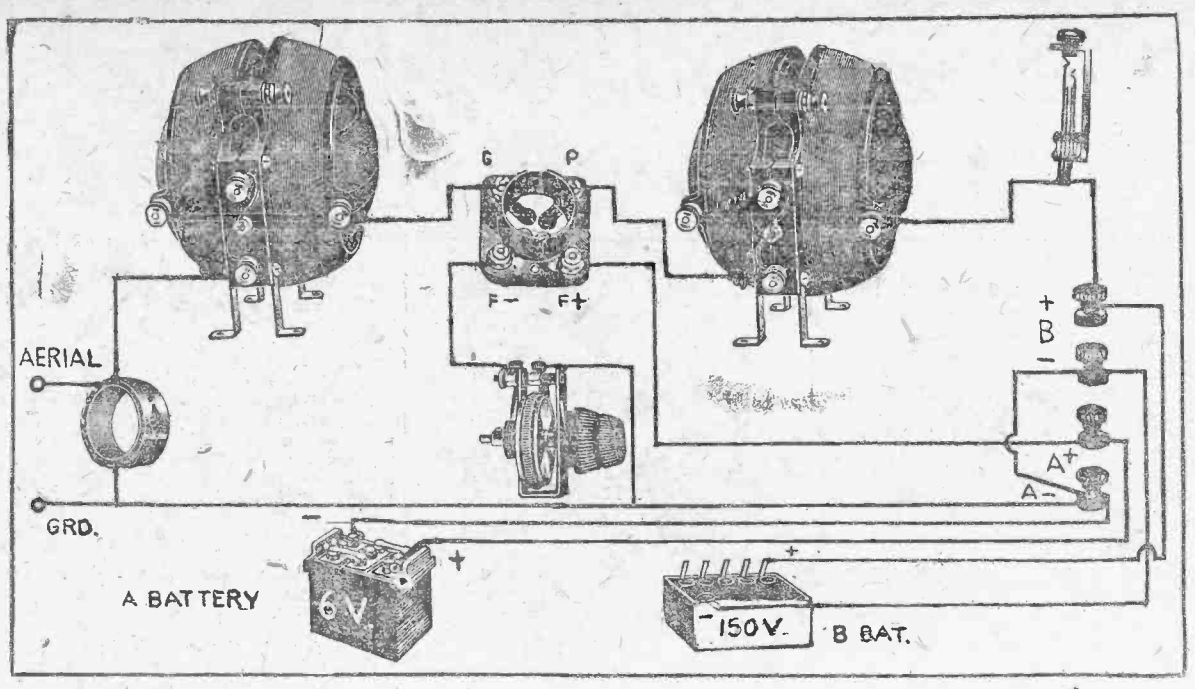
Radio Editor: I've read your article in Radio Magazine of Nov. 22 by the Night Prowler, ridiculing DX-ers regarding reception of PWX, Havana, Cuba, Monday, Nov. 19. Beg to advise that that station was plainly heard by myself and two others and signed off at 11:31½, eastern standard time, on that date.—Leonard Mayer, 1544 West 13th Street, Chicago.

USES ZENITH TUNER.

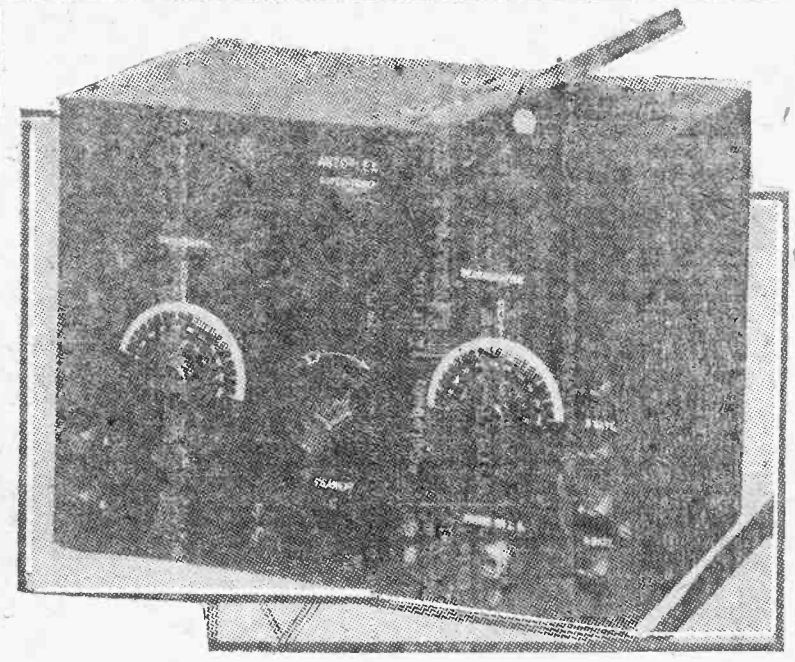
Radio Editor: Here is a list of the stations heard on one night only, Nov. 21, using a zenith tuner and detector; antenna, single wire, 15 feet high, 50 feet long; ground water pipe:

5PR, 8RV, 8CK, 8DA, 8PH, 2CCI, 8PL, 9BHL, 9AON, 9AEM, 9IT, 9BRV, 9CER, 9EER, 9DIL, 9RC, 9DHK, 9BQ, 9BMO, 9CIX, 9AAV 9AAW, 9EZY, 9AVW, 9EJY, 9BQY, 8BBI, 8CEO, 9BA, 9BZ, 9AIM and 4K(?).

Let's have more amateur articles.—Beverly B. DUDLEY, 9BR.



Pictorial diagram of the autoplex circuit.



Exterior view of cabinet and panel markings of autoplex super.

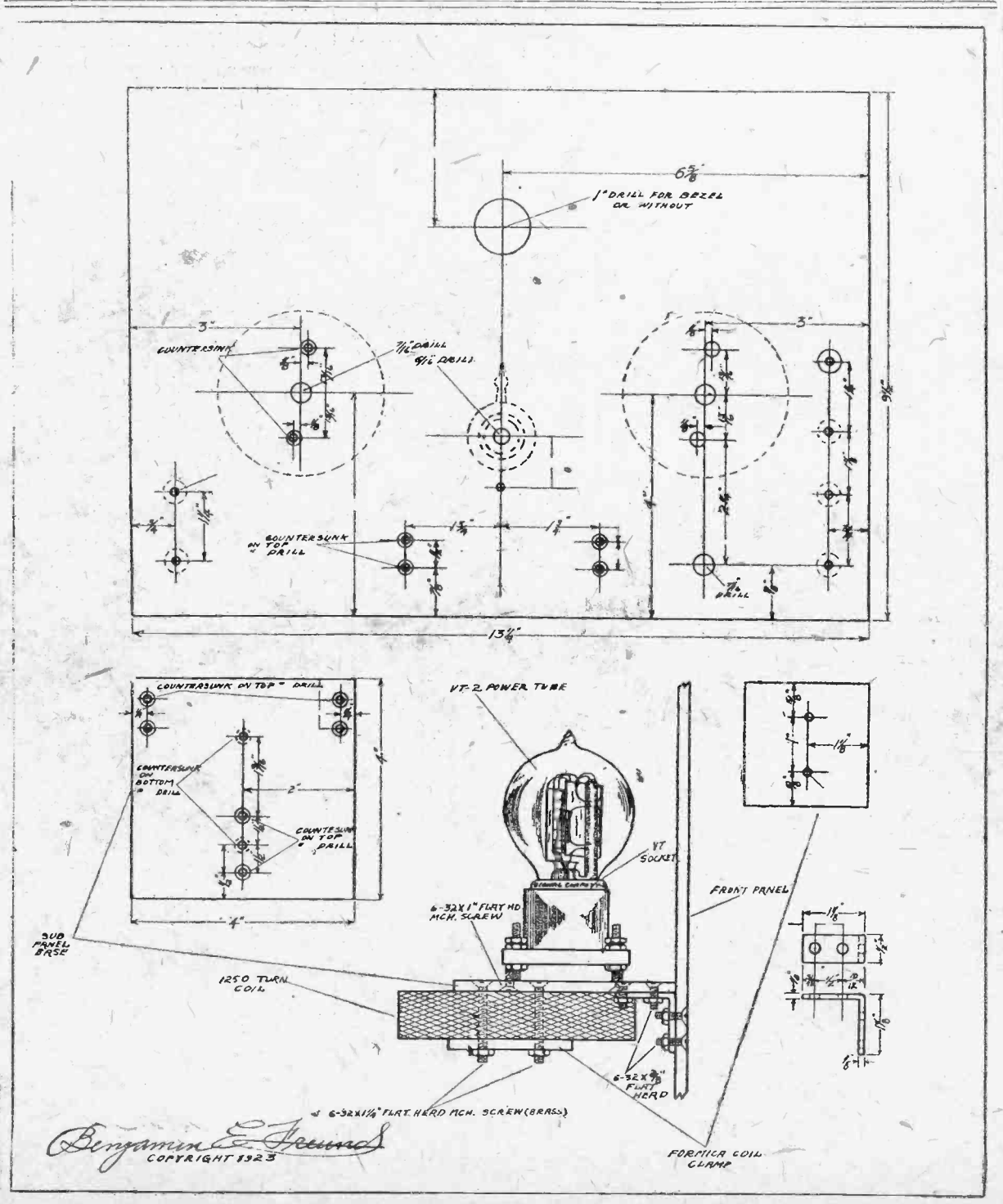
Construction of Autoplex Set

Continued from Page 7.

most efficiently as a substitute for the ones shown in the photos, as their distributed capacity is very low and their inductance high.

However, if these are used there should be a reduction in the plate circuit voltage. It is because of this characteristic I have not used this type of variometers. The tube requires a much higher voltage on the plate than these variometers will work with efficently, under the present arrangement of the circuit.

I am conducting some experiments with these variometers because I realize that their smallness would prove ideal for a portable set—a type of receiver that proved very popular this last summer and which will be in even greater favor next year.



Panel layout of the autoplex super. Reproduced from drawings especially made for The Chicago Evening Post Radio Magazine Section by Benjamin Freund, constructing and designing engineer for the Chicago Salvage company. This drawing is protected by copyright by The Chicago Evening Post.

This Crystal Set Is a Long-Distance Receiver and Runs Loud Speaker Locally

HERE is the hook-up and constuction details of a long-distance crystal set. This set was designed and constructed by Mr. Hagerman especially for The Post Radio Magazine section. The photos, diagram and descriptive text are protected by copyright and reproduction prohibited.—The Editor.

BY LEWIS B. HAGERMAN.
Radio Construction Engineer.

NOWADAYS it seems to be the fashion to belittle the plebeian crystal. It does receive some begrudged credit for the part it plays in reflex circuits, but as a detector, in a circuit of its own, it appears to have been relegated to a back shelf, especially by the serious-minded experimenter.

The vacuum tube, with its powerful amplifying capacity and its sensitiveness, has dimmed the brightness of the achievements of the faithful little crystal of former days. The unthinking have drifted into the habit of consigning it to the youthful home-builder's circuit where popular prejudice limits it to a range of a few miles.

Is this fair to a servant that served the radio world so efficiently when vacuum tubes and the ponderous eqipment of today were unknown?

Distance Getter in Early Days.

I have come up with the new generation. Tubes were the popular detector when I began to walk in the swaddling clothes of the amateur. Crystals had been discarded.

However, I recall that once the radio world depended solely on the little crystal for its voice and music transmission. And, also, I recall that some pretty long distance records were piled up to the credit of the despised crystal and that ships at sea depended solely on this rectifier of frequency currents.

If the crystal was so effective in those early days, I argued, why is it not today? Then I picked up a few galenas, a coil or so and began to experiment.

The result of these experiments have endeared me to the tiny crystal. I feel so kindly to it I want to present myself as a champion of its many excellent qualities.

The trouble with the crystal of today is that experimenters have ceased to experiment with it. The crystal circuit, which the small boy toys with, is the same embryonic circuit of the early days. No one seems to be interested in it.

Perfect Reproducer of Sound.

There is one good point about the crystal that all admit is superior to the best vacuum tubes. That is its clear, perfect reproduction of sound. As a rectifier of radio-frequency, also, it has a good reputation, even in these days of the audion.

It is in its apparent inability to develop sufficient enegy to reach across vast stretches of land and water and pick up weak signals and bring them into the receiver with sufficient strength to permit them to be converted into audible sound.

The average radiophan will tell you that a crystal is "good for ten or fifteen miles" ordinarily, and, under exceptional conditions, might give you "a fifty-mile reception," if you have an extra good set of head phones and will strain your ears a little.

Occasionally you will hear some ardent crystal owner proclaim that he has brought in broadcast signals a thousand or even more miles, but generally he is not believed, and, should one admit his sincerity or accept his proof, the achievement is laid to the door of some near-by regenerative set and "re-radiation."

Within the last few months I have learned to accept these reports of long-distance work as sincere records. I say this because I have hooked up a crystal set and have brought in stations that would do credit to many a tube set.

Stations Logged on Set.

Here is a sample logging on a recent Monday, or silent night, for the little crystal set which illustrates this article:

WSB, Atlanta, Ga.
WGY, Schenectady, N Y.
WOC, Davenport, Iowa.
WCBD, Zion, Ill.
WHB, Kansas City.

And the following night I logged these local stations:

KYW, Chicago.
WDAP, Chicago.
WJAZ, Chicago.
WPAD, Chicago.
WMAQ, Chicago.

That is a pretty fair logging, is it not? It almost reads like a tube set log, doesn't it? Well, it is a truthful list of just what I picked up, and I have witnesses, including the editor of The Post Radio Magazine, who will vouch for its accuracy.

But this is not all. The Zion, Ill., station—forty or more miles away, and the five Chicago stations came in on the LOUD SPEAKER. Get that? And this loud speaker was not a tube-battery hook-up, either, but just a Baldwin unit attached to a horn.

Now, when I say these stations came in on a loud speaker, I do not wish to convey the idea that they thundered in so loud they could be heard "across the street." I do mean to say, however, that anyone in the room could hear every sound clearly and comfortably. And neither do I wish to create the impression that this receiver is any more selective than the average one-circuit audion tube set. It is not. You'll have local interference just the same.

If some of you readers care to do a little experimenting take a peep at the schematic diagram published elsewhere and then give heed to the few words of wisdom with which I propose to unburden myself.

No Claim for Originality.

You will note, for one thing, if you are familiar with circuits, there is little or nothing new about this circuit of mine. It is just the regulation variometer-condenser circuit. However, there IS a difference somewhere, and therein lies the secret of this wonderful little long-distance getter.

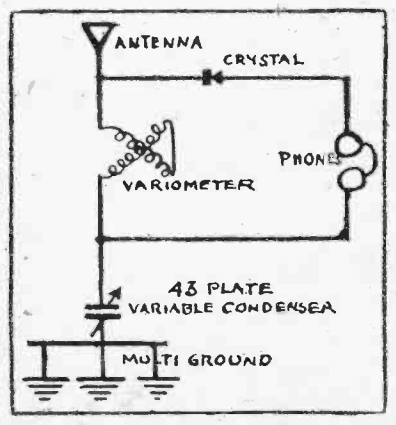
In the first place I have used good parts thruout. In the next place, I have used great care in the hook-up. Every precaution has been taken to prevent loss of energy. Every effort has been made to conserve energy.

But those things are not the important factors. The real reason for the set's efficiency lies in the aerial and ground.

It is just here that most failures with crystals come. The average crystal owner knows little or nothing about antennas. A few feet of wire for an aerial and a bell cord wire to a steam radiator, in his estimation, apparently constitutes an antenna system.

Secret Is Good Ground.

The aerial I used on this long-distance crystal is the very best I knew how to erect. It is a two or more stranded No. 14 copper wire of the "L" type, 100 feet long, exclusive of lead-in. The wires are spaced three feet apart and are at least ten feet above all obstacles. This sort of an aerial helps me bring in long distance.

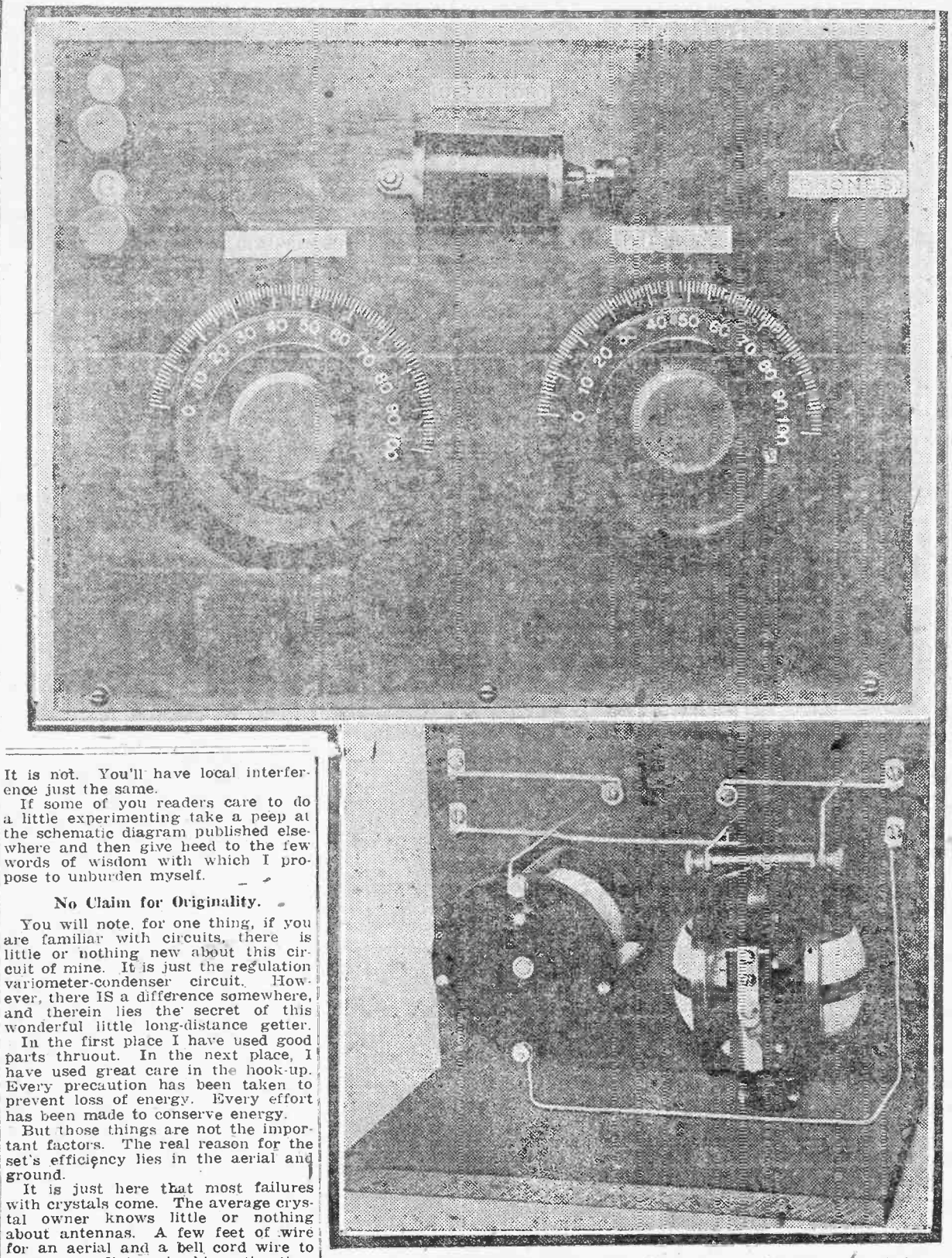


The ground, however, is where the real kick comes in. I am not content with just any sort of an old ground. I insist on the very best obtainable. And to make sure that I am getting it, I use a multi ground. Then I am pretty certain to have at least one good ground.

I have one ground on the steam radiator. I have another on the water pipe, and I have another that goes direct to Old Mother Earth. I don't know which one of these is the good ground—it may be all three of them are. But there is one of them, at least, because the ground connection proves itself in the set.

Before I go into the construction details of this receiver, I am going to offer rules I have compiled as the result of my experiences.

1. Use as few instruments as possible and wire as simply as possible.
2. Tapped or slider tuning coils tune broadly.
3. Loose couplers have great dead end losses.
4. Fixed crystals generally are unsatisfactory.
5. Crystal used should be silicon or tested galena.
6. Phones should be of best construction with double magnets, the ohmage being of little importance.
7. The aerial should be of the type already suggested.



LONG-DISTANCE CRYSTAL—Here you see Mr. Hagerman's long-distance crystal receiver in all its glory. The upper photo shows the front panel, with the variometer dial at the left and the variable condenser on the right. The variable crystal is at the top, just between the two dials. The aerial and ground posts are in the upper left corner. The output or phone posts are in the upper right corner. Below is a rear view of the interior, showing in detail the wiring scheme and location of the parts.

8. Instruments should be mounted on a bakelite panel.
9. Lead-in and ground should be of No. 14, or even No. 12 wire, rubber covered.
10. Inside aerials, light socket plugs, loops, bedsprings, coils, etc., are from 1 to 25 per cent efficient.
11. Ground should be multi type as already described.
12. All connections on the aerial, the set and ground wire should be soldered with soft solder and noncorrosive flux such as Johnson's soldering fluid.

Parts Needed for Receiver.

So much for that. Let us now take up the construction of the set. The parts needed are:

One panel 7 by 9 by 3-16 inches.
One variometer (700 meters).
One 43-plate variable condenser.
One crystal detector (not fixed).
Four binding posts.
Four feet of square tinned wire.
One baseboard.
ACCESSORIES—Wire for ground, aerial and lead-in, insulators, screws, nuts and bolts.

Drill the panel for the parts purchased. Mount instruments, screw in the binding posts and attach the base board. Study the diagram and photos carefully and follow the suggestions I made earlier. Build the aerial as already described and install the multi-ground.

To operate connect the aerial and ground to the receiver. Set variable condenser so plates are completely out. Place rotor of variometer at right angles to stator. Find the sensitive spot on the crystal by placing the catwhiskers on different spots on the galena. Tune roughy with variometer and clear up with the variable condenser.

Should trouble develop try out different crystals. Look over your grounds, and if you cannot find anything wrong take no chances and install another ground. Check over the wiring and test phones.

I have gotten the long-distance stations referred to with this hook-up. Others can do the same thing if they will just put as much care into the circuit and its construction and operation.

Amplifying Crystal Sets

Contrary to popular opinion any crystal set that delivers sufficient output may be connected to an audion-tube amplifying circuit and be operated on a loud speaker.

Suit Reveals Tube Secrets

During the period from July 1, 1920, to Dec. 31, 1922, approximately 1,817,715 vacuum tubes were manufactured for the Radio Corporation of America. In the same period approximately 73,607 radio sets were sold by the same corporation. For the initial operation of these sets 156,274 vacuum tubes were required.

These facts, together with other interesting information regarding the operation of the Radio Corporation of America, are included in the answers to the interrogatory submitted by counsel for A. H. Grebe & Co. in the action brought against that concern by the Radio Corporation of America for alleged infringement of patent.

The Grebe company is one of the licensees under the Armstrong patent, the license having been issued before the patents were taken over by the Westinghouse Electric and Manufacturing company.

Radio Corporation Gets Royalties.

The replies which were filed in the federal court also show that, in an agreement dated June 30, 1921, between the Radio Corporation of America, the General Electric company and the Westinghouse Electric and Manufacturing company, all royalties collected by the latter under the Armstrong patents are turned over to the Radio corporation. Under this agreement, therefore, the Radio corporation is receiving royalties from the Grebe company.

One of the interesting features in the answers submitted to the court is the proportion of stock owned by the principal electric companies which are responsible for the formation of the Radio Corporation of America.

General Electric's Holdings.

In the action involving the De Forest patents on the three-electrode vacuum tube, three questions were asked, as follows: "What proportion or number of shares, if any, of the capital stock, both common and preferred, of the plaintiff Radio Corporation of America does the plaintiff General Electric company directly or indirectly own or control?"

The answer given to this question shows that the General Electric company owns 1,728,627 shares of common stock and 620,800 shares of preferred stock in the Radio Corporation of America.

Question No. 6 similarly refers to the holdings of the Westinghouse Electric and Manufacturing company. The answer in this case was given as follows: "Common stock, 986,000 shares; preferred stock, 1,000,000 shares."

The answer also discloses the fact that the American Telephone and Telegraph company, which was made the defendant in this particular action, does not own a single share of stock in the Radio Corporation of America, altho it was one of the corporations interested in the formation of that organization. This statement in the court paper verifies the announcement made about a year ago, to the effect that the A. T. and T. was relinquishing its holdings in the Radio corporation.

Dates of Patents.

One of the actions against the Grebe company, which was brought by the Radio Corporation of America, involves the alleged infringement of three subsidiary patents held by the Radio corporation.

The answers to the interrogatories given by the Radio corporation on these points show that the dates of these patents are much later than was expected.

For instance, the patent of Irving Langmuir, involving the use of a grid leak, was invented between May 18, 1913, and June 20, 1913, and disclosure of the patent was made, according to the answer between these dates.

The invention of Fritz Lowenstein was made between Oct. 23, 1911, and Nov. 29 of the same year. The date of the Robert C. Mathes invention is given as Feb. 2, 1916.

The interesting feature with regard to the manufacture of vacuum tubes is the fact that the Radio corporation actually sold, according to its statement, more than five times as many tubes as were necessary to the initial operation of their own equipment, plus one set of spare tubes for each set.

Includes Transmitters.

The reply to this particular interrogatory qualifies by stating that transmitting tubes are included in the total number given, but since the number of sets sold also includes transmitting sets, the two items balance against each other.

There is a further qualification also to this extent:

"These numbers are only approximate and include transmitting sets as well as any sets that may have been subsequently returned by customers. They do not include parts sold for use with three-electrode vacuum tubes, such as sockets, rheostats, transformers," etc.

Allowing for a reasonable proportion of these accessories, the answer shows that sufficient tubes were released on general sale to meet the requirements of other sets than those of the Radio Corporation of America.

Device Sounds S O S Call Automatically on Ships

The automatic S O S alarm apparatus described in a recent issue of Radioelectricite consists of three main portions—an amplifier, a wireless receiving relay and the S O S selector.

The amplifier takes the place of the crystal in the ship's ordinary wireless receiver and magnifier of the received signals, rendering them suitable for operating the receiving relay.

The S O S selector itself, which is controlled by the receiving relay, operates on the chain relay system. There are two relays arranged to discriminate between a dot and a dash, then a series of nine relays corresponding to the dots and dashes of the S O S signal.

A canceling relay is incorporated, which restores the selector to its ready condition if the correct sequence of dots and dashes is not received, while the intervals between the dots and dashes are checked by a further delay action relay.

Tip jacks as a substitute for phone aerial and battery binding posts, not only make a much more convenient arrangement but a neater job.

Tuning Sets to Get Best Out of Them

Continued from Page 6.

ported spirals of flat copper ribbon. Were it not for the costs, such inductances would be very good for receiver tuning when built in smaller units.

As to Varicoupler Faults.

In the next photograph (Figure 5) you see the familiar coil and variocoupler which are of the conventional type used in many economically built receivers. The unit shown is not a bad tuning unit at all. It has the usual tapped primary, and the secondary (rotor) has the shunted variable condenser for tuning.

The greatest drawback here will be due to making a contact to the rotor leads thru the shaft bearing. Pig tailing would be desirable, as the friction frame on the rotor shaft always will not establish a good contact.

A photograph (Figure 6) also shows an oscillator used to measure the relative resistance of condensers. The two coils are in a magnetic coupling so that the oscillator energy will be measurable in the tuned circuit on the cover (in which the resistance of the variable condenser is the unknown factor).

The galvanometer deflection indicates the amount of current at resonance. Such a device has a limited accuracy, but will indicate how good a condenser is by the sharpness of the resonant peak. If losses occur because of poor design, these will make the rounded-resonant peak instead of a sharp peak and the condenser, therefore, is going to act the same way when it is used to pick up broadcast signals in a receiver.

As an example of the possible refinement of a receiver, note the back view of the loop receiver (Fig. 7). Here the loop is supported on the swinging door. The "loop" has a primary, secondary and a feedback wound together, and these are tuned by the two condensers seen inside the set. As the batteries are contained in the cabinet, this set is truly portable and will pick up local stations on the three tubes with good head phone strength.

Notes on Inductance.

From the foregoing practical examples it will be noted that for ideally sharp tuning the inductance element should be designed only to cover one range of wave lengths within the capacity tuning of the condenser. Honeycomb inductances are good coil units to use and permit ample flexibility over many wave lengths.

Spider inductances also are good, and a variety of coils are on the market which have ample merit for dependable results.

Let me point out one very much overlooked factor in the matter of resonant circuits. You will note that the resonant frequency depends upon inductance and capacity. If we used, say, twenty-five units inductance and two units of capacity, we can call the frequency a function of the product, which is fifty. But we can get the same factor, fifty, by using ten units of inductance and five units of capacity. In short, the frequency has any ratio we may wish to select as long as the product is the same.

However, when we tame a circuit and impress the signal picked up on the grid of a tube, we have to remember that the tube operates on voltage effects and not on current effects.

An inductance builds up voltage, which a condenser does not. A coil has the effect of stepping-up voltages, and upon this principle transformers are made to increase potentials. A small buzzer (which contains proper inductances) and a battery can set up voltage enough to send signals across a continent, but a condenser will only increase voltage in a resonant circuit in conjunction with proper inductance.

Recommends Cockaday Tuner.

The idea, therefore, is to use as much inductance in proportion to capacity as you can to secure a given resonant frequency. This means that your coil will give better signals with the condenser out than when full in.

To cover the range of wave lengths you wish to hear, a coil is selected which, with the condenser plates out, picks up the lowest wave length, say 200, and with the condenser all in, will just reach the highest wave length.

Therefore, I would recommend the Cockaday tuning inductance, which is so designed that with a condenser of properly low minimum capacity (such as 10 MMF) you will be able to cover the entire broadcast frequencies using only a seventeen-plate condenser. The banked winding has lower distributed capacity than most coils and is very compact. It provides some six or eight taps, and when a "dead end" switch is used, it is as satisfactory a unit as might be found.

Reinartz tuner efficiency for long distance is well known, due to the inductance step-up effect of an autotransformer as well as its spider type and the regenerative circuit. Very little condenser-tuning is used and the end taps are used only to tap off a few variations of the coil.

An interesting variation of tuning devices is the "neutroformer," or tightly coupled air core "transformer," in which a ratio of one turn of primary to four turns of secondary is used.

The secondary is tuned, which forces the same frequency in the primary, and this is practical for interstage or tuned radio-frequency amplification, but it has serious losses in aerial tuning.

The aerial circuit does not necessarily follow the tuning of the condenser across the secondary as closely as it will in a tube circuit particularly where, as in a neutrodyne receiver, there is a regenerative effect between stages, if the stages are not exactly balanced, and it not always is possible to secure a balance.

Single Coil Best.

Hence, neutrodyne reception can be made more efficient by using a single coil with shunt condensers rather than a neutroformer in the first stage, as the selectivity is assured by the interstage tuned radio-frequency.

The single circuit thus used generally requires taps, which thus complicates the panel and mean supplementary controls. As each stage is calibrated, the neutroformer tuner eliminates the taps but sacrifices some efficiency.

To summarize the ideas I have tried to give on tuning, let us remember:

1. Sharpness of tuning depends upon low losses of all units in the tuning circuit as well as resonance.

2. Losses are caused by distributed capacity of coils, dead end turns, magnetic leakage of coils, etc.

3. Losses of condensers may be due to solid dielectric in the condenser, poor insulation, poor contacts, etc.

4. Too much capacity reduces the tube efficiency, and a high ratio of inductance to capacity is desirable.

5. Series of coupling are dependent upon the possibility of quick tuning and absolute resonance. Few amateurs need more than a double circuit, and if the first tube is not going to oscillate under any conditions, a single circuit will be most sensitive but will not assure selectivity unless tuned stages follow in the circuit.

To these let me add a few practical pointers:

1. Use coils which are insulated by air as much as possible.

2. Where rotating secondaries are used, use pig-tailed connections to the rotor windings.

3. Avoid taps to a coil if possible, but where essential so select the constants that the taps will be only on a few turns at one end.

4. Avoid varnished coils.

5. Keep stray capacity down by locating the connecting leads to the inductances, condensers, etc., as far away from each other as possible.

6. Keep coils away from masses of metal.

7. Keep your grid lead away from the plate wire or the filament wires, particularly on the first tube.

8. Use good tube sockets (especially on the first tube.)

9. Use a good panel.

10. Solder all connections.

Note—"Sketching the Layout" is to follow in next week's Radio Magazine section as the fourth of Mr. Cardwell's series.

Distance and Sharp Tuning

Lower wave-length stations tune in sharper. This sharpness is emphasized in long-distance reception. This is why it is difficult to tune in some stations.

Loops Poor Collectors

Loop aerials as collecting agents are classed by many experts as about 25 per cent efficient, when compared with an outside aerial of one wire.

THE programs of WMAQ (Chicago), always noted for the superb quality of its musical numbers, are being further improved by the addition of a station orchestra. It is composed of five artists under the direction of Miss Rhea Dorothy Lynch, the talented young violin soloist of Oak Park.

QUESTIONS AND ANSWERS

QUESTIONS asked on any subject pertaining to radio will be answered in this department in either the daily edition or The Radio Magazine section published each Thursday. No charges are made for this service. If personal reply is desired by return mail, enclose self-addressed and stamped envelope. Write on only one side of the sheet, and where a check is desired on a faulty circuit be sure to send legible diagram as used in the hook-up.

NEUTRODYNE HOOK-UP.

201-Chicago—I notice on page 8 of the Radio Magazine, issued on Nov. 22, a picture of a neutrodyne set in a compact form. If possible I would like to get the plans of this set, but for five tubes instead of four, and am willing to pay for same. If you have these plans will you send them to me or give me such information you may have as to where I can get them?

Plans requested are published elsewhere in this issue of the Radio Magazine.

WANTS NEUTRODYNE HOOK-UP.

101, Chicago—I have been a reader of your good paper for a number of years and frankly admit that I could not get along without it. I am not surprised by your announcement that you are now devoting a large part of your paper to radio; and I believe it will be the best in town, because The Post leads in most everything.

I am very much interested in a five-tube neutrodyne radio set, and would like to see a set that is now working by one of our readers, so I may build one also. All sets are long distance until it is completed and then one is lucky to get all Chicago stations. Probably you will explain this set so the layman will understand it thoroly. I believe the much-talked-of Cockaday circuit is also worthy of mention. Trust your radio department will be a success—Walter A. George, 1629 Clybourn avenue, Chicago.

There was an article in the Nov. 22 issue on the neutrodyne receiver. Another is in this issue, with hook-up and construction details.

AERIAL IS TOO SMALL.

260—CHICAGO: I have built a small radio set to use a Diode tube (a small two-element tube, operating on two dry cells), and although I have tried three of these tubes, I have so far failed to get any results from the set. My wiring diagram is submitted. The twenty-three-plate condenser is placed inside the coil. The coil has fifty-nine turns of No. 22 S-C-C wire on it, tapped every ten turns for fifty turns and every one turn for nine turns. With this same hook-up I can get unusually good results with a crystal detector. My aerial consists of three porch screens 6x10 feet, all connected and soldered. The ground is on the steam radiator, also soldered. I am on the third floor of an apartment building. If you can see anything wrong with my hook-up, I shall appreciate it, if you will tell me.

Your aerial is not sufficient. A Diode tube is not very sensitive and requires a large aerial, at least one wire 100 feet long. Your hook-up is O. K.

103—CHICAGO: In Mr. Wolf's statement about his experiences with the Autoplex circuit in Radio Magazine section of Nov. 15, reference is made to loading up the variometer at "the point marked X". Evidently the diagram Mr. Wolf referred to was omitted. Can you tell me just where this coil is to be inserted? On page 7 in the article which Mr. Wells prepared on the same circuit a diagram is given but this does not refer to the loading coil either.

A more clearly drawn schematic diagram of the Autoplex circuit was published Nov. 22.

You ask if this set can be bought already made. It is too new to be on the market as a manufactured product. We understand that since publication of the circuit in The Post Radio Magazine several of the local radio stores are featuring the circuit by getting up a list of the assembly parts and making it a feature.

Our suggestion is that you buy the parts and take the published diagram and hook up the set yourself. If you are unaccustomed to this work it would be better to have some expert constructor to do the work for you.

We would suggest, however, that you buy the very best parts. This is true in every radio circuit but particularly so in the Autoplex circuit, especially as to the variometers.

The Autoplex, constructed from the best parts, everything complete, tubes and batteries and the phones, would cost, construction work and everything, about $50. It could be hooked up from cheaper parts at a cost of about $35 to $40.

You understand this circuit still is in the experimental stage. The parts used, however, are few and are standard, so if it fails you the parts may be used on any standard hook-up.

THE AUTOPLEX CIRCUIT.

202—CHICAGO: I have read much about the Autoplex circuit in past and found that only certain makes of variometer can be used for it. I will be very much much obliged to you if you could, at your earliest convenience, forward to me the name of the manufacturers of variometers best adapted for the Autoplex circuit.

Go to any reputable dealer and tell him you want a variometer that has a high ratio of inductance and a low distributed capacity. Also see that he gives you one with the stator windings inside and that has pig-tail connections.

RAISING WAVE LENGTH.

204—CHICAGO: I have a home-made set. The parts are on a wood panel and placed around on a drawing board, but some of the stations I get are WHAZ 380, WGR 319, WCBO 345, WTAS 275, KOKA 326, WSA 309, WLW 309, WEAN 273, WSOA 261, KFKX 286, WMAK 360, KOD 286, KFKB 286. As you will notice they are all 300-meter stations. I get them loud enough to keep out KYW, WMAQ, WDAP or WJAZ, but why is it I can't get 900-meter stations? I think it is my variocoupler which has 5 at 10 and 8 at 1, which is not very much and it is a 180-degree coupling. What could I do to make this coupler get higher wave lengths? This is my hook-up and I think it is pretty good for one tube to get Rhode Island, New York, Pennsylvania and Nebraska. My stator on the coupler is too small to put any more turns on it except over the other ones.

Your results have been very good. To raise wave lengths of set, put 75-turn honeycomb coil in antenna circuit. A 43-plate condenser in series with ground also would help.

ERLA SET TUBES.

207—CHICAGO: Will you advise the best tube to use with an Erla reflex receiving st, and whether dry cells can be used? Would the WD-11 tubes give good results, and could a Westinghouse WD-12 tube, two-stage amplifying set be used in connection with a one-tube reflex set?

The best tube to use would be UV201A or C-301A. Dry cells can be used on one tube. WD-11 and WD-12 tubes give fair results. A two-stage amplifier can be used.

NOT ENOUGH PLATE VOLTAGE.

218—CHICAGO: Referring to Autoplex circuit, described in Nov. 18 Radio Magazine, I built this receiver from specifications given in the Radio News, using the following parts: Two Manhattan variometers, 600-meter range. One 1,500-turn honeycomb coil, one standard socket. I use a Silvertone, De Forest tube, and have tried all the various plate and filament voltage, but to date the only station I can tune in is KDKA, East Pittsburg. I cannot receive even the local stations, but Pittsburgh comes in exceptionally loud and clear, but when they are not on the air the only thing I can get is a few station whistles and now and then a faint voice reception. I have tried all kinds of energy collectors, including good single wire, outdoor aerial, a few feet of lamp cord, ground alone, and Ducon plug, but the results are the same. This station comes in when only a few turns of the rotors are outside of the variometer moulding. I also tried a 1,250-turn H. C. coil, but this made no difference. What is your idea of the proposition as outlined? Frankly, it has me guessing. I enclose stamped envelope for reply.

From your information we gather that your set works efficiently at a certain point of regeneration. When this point is reached your apparatus is set so as to receive on a narrow band of wave-lengths that take in KDKA. As you will notice, there is no other station in reasonable distance on or near 326 meters, therefore our conjecture. We would suggest that you use a harder tube, such as 216A or VT-2 that will not oscillate as freely. Be sure to vary the "B" battery voltage, and use up to 200 volts on this tube. Apparatus mentioned should be o. k. except for tube. Chief trouble with Autoplex is not enough plate voltage is used.

VARICOUPLER HOOK-UP.

216—CHICAGO: Please give diagram of a good hook-up with variocoupler, forty-three-plate variable condenser, two steps audio-amplification. Please give range and selectivety.

Requested hook-up was mailed you. Range is 1,000 to 1,500 miles. Selectivity fair.

HONEY-COMB COIL HOOK-UP.

217—CHICAGO: If it would not be too much trouble to you, or your department, I should like to have you print at your earliest opportunity a picture showing how to make a three-tube set, with three honeycomb coils. Also suggestions as what use in the line of tubes, etc.

An article such as you request will appear in our columns in the near future. We are mailing for your immediate needs a wiring diagram of the set. Use UV-200 for detector—UV-201A's as amplifiers. A 400-ohm potentiometer should be used.

SEEKS CIRCUIT IDENTITY.

208—CHICAGO: The writer recently ran across a circuit composed of the following: One (sixteen taps), one variable condenser, twenty-three-plate, one variable condenser, twenty-three plate (vernier), one rheostat vernier, one grid leak and condenser combined, one socket and WD-12 tube. Could not obtain hook-up so would appreciate any information or diagram you can give. Can four dry cells and one 45-volt "B" battery be used on WD-11 tube, and would same increase volume?

Hook-up was mailed. This is a single circuit regenerative set.

No Outside Stations.

214—CHICAGO—I have a three-coil honeycomb set just wired up. Get local stations clear and loud, but outside stations nil, except Zion and Elgin very faint. Use WD-11 as detector tube and am trying to use UV-199 as amplifier, but cannot get them to work. Have them hooked up as a separate amplifying unit. If I use WD-11 in the amplifying unit, the set seems to work O. K., but with UV-199 can get no results. Is the UV-199 connected up differently? If so, connect up submitted diagram to illustrate. Why can't I get outside stations on this set?

Amplifying units hook-up mailed you should give good results with UV-199 tubes. Be sure to use 40-ohm rheostats. To bring in distance, would suggest trying 45 volts on plate of WD-11 as detector. A variable grid leak is essential. Aerial should be of the "L" type, single wire, 100 feet long, six to ten feet above all obstacles.

215—CHICAGO—Will you please send me a diagram how to use two variometers and one variable condenser and a WD-11 tube? What is the distance on the set drawn by your diagram? Have you a better diagram which I would get better distance and use my WD-11 tube? Inclosed please find an addressed envelope to send these things to me.

Use hook-up shown in sketch mailed you. Range is about 1,000 to 1,500 miles with good aerial and ground.

This Autoplex Fails.

213—CHICAGO—Noting what you had to say about the Autoplex circuit in The Post Radio Magazine, I wish to ask you a few questions concerning the one I made up: (1) I cannot get any out-of-town stations under any conditions. (2) I get a very loud regeneration at almost all times. (3) I cannot get a loud enough volume on one tube to use a speaker even for city stations. I am using B. P. M. variometers and a DeForest 1,500-turn coil mounted. The set has one stage of amplification and as I could not secure a cabinet for seven inches

(Continued on Page 12.)

How to Build Five-Tube Neutrodyne Receiver, Including Panel Layout

IN response to numerous requests, construction details on the Hazeltine five-tube neutrodyne set are given in the accompanying article. The set illustrated was designed and constructed by George Flint of The Chicago Evening Post.—The Editor.

NEUTRODYNE receivers cannot be just thrown together in any old way. They must be scientifically constructed if good results are to be achieved. While this is true of most any circuit—even with the simple crystal set—it particularly is true with the Hazeltine circuit.

In laying out the panel and baseboard the parts must be placed in the radio-frequency circuit in such a manner that they will not have any inductance relation, yet, at the same time the leads must be kept reasonably short to minimize stray capacity.

More failures in constructing neutrodyne receivers come from improper location and installation of the neutroformers than from any other one factor. These are the tuned secondary radio-frequency transformers consisting of one coil within another and shunted by a variable condenser.

It is very essential that the neutroformers be mounted so that they will be at an angle of 54.7 degrees from the horizontal. Variations from this will cause an improperly balanced circuit and since perfect balance in all the circuits is one of the important features of Prof. Hazeltine's circuit, the importance of this precaution can be seen.

Must Have Proper Windings.

Also it is very essential that the neutroformers be properly wound and that the correct capacities of condensers used to tune the transformers shall be observed.

There are neutroformer units, made under the license of the inventor, which may be procured at any of the dealers, several concerns making them. These special transformers are mounted to the condensers and the proper windings for the particular condenser used are on these. It will not do to purchase these transformers and condensers separately unless you know that their values are correct.

The transformers may be made by any one who is familiar with winding coils, as they are of very simple construction. Directions for these home-built transformers will appear in a subsequent issue of The Post Radio Magazine section. It is best for the novice to purchase the parts ready made.

Make it a point to obtain the very best parts thruout. Skimping is disastrous. Better pay a fair price for your materials and insure against trouble later.

The set illustrated in this article is composed of Fada parts and while the list of parts indicates that their cost total $63.19, the writer, by shopping around a little, actually bought the parts for $46. A considerable saving also may be made in purchasing the extras, such as tubes, batteries, etc. The cost list shows these to total $74, but the writer obtained the same at a cost of $45, making the actual cost of all parts and extras $90.

List of Parts.

1	cabinet, 26x7x7 in.	$ 4.75
1	panel, bakelite or formica, 26x-7x3-16 in.	3.64
1	baseboard, 26x6x¾ in.	.50
5	sockets	3.75
3	neutroformers	22.50
2	neutrodons	2.50
3	audio-transformers (5-3 and 3-1 ratios)	9.00
1	battery switch	.75
3	dials	2.25
1	power rheostat (two ohms)	1.50
1	detector-tube rheostat (six ohms) vernier	1.85
7	Union phone jack tips	1.00
1	radio jack, closed circuit	.75
1	radio jack, three-spring, automatic	1.00
27	feet insulated tubing (Spaghetta)	2.25
27	feet No. 14 busbar wire	.25
2	fixed condensers (.006)	1.50
1	grid leak (variable)	1.85
1	grid leak condenser (.00025)	.40
	Screws, nuts, bolts, solder, slugs, washers, etc.	.20
	Total	$63.19

Costs of Extras.

4	C-301A vacuum tubes	$26.00
1	C-300 detector tube	5.00
1	storage battery	22.00
2	45-volt "B" batteries	10.00
1	22½-volt "B" battery	3.00
	Head phones	6.00
	Antenna	2.00
	Total	$74.00

It will be noted that telephone tip jacks are specified in the list of parts instead of the customary binding posts. These not only make a neater job, but are a much more convenient way of making connections for the antenna, phones and batteries. If preferred, however, the binding posts may be substituted.

In drilling your panel be very careful in getting the holes in the exact spot indicated. This is especially true for the neutroformers. All the holes not marked with their dimensions are to clear 6-32 machine screws, a No. 25 drill being used for this purpose.

It would be better if you redrew the panel dimensions full size on a sheet of stiff writing paper and use this as a template. If this is done, paste the template on the face of the panel and use it as a guide for the drilling.

Locating the Parts.

The panel layout calls for the neutroformers to be located on the right end of the panel, viewing it from the rear. The shaft hole for the condensers are five and three-quarters inches apart, which give the proper spacing between the neutroformers. The two sockets for the radio-frequency tubes are located on the first and second and the second and third neutroformers. The two neutrodons, or neutralizing condensers, are mounted on the baseboard just to the rear of the tube sockets and should be kept to the rear of the board.

These neutralizing condensers are the backbone of the circuit. It is thru them that the capacity of the tubes are neutralized, which neutralization is the chief purpose or goal of the Hazeltine circuit.

The two condensers are of very small capacity—much smaller than any of the condensers heretofore on the market. They are very simple contrivances.

They consist of two insulated wires of about three inches in length each. These two wires are incased in a small brass tube which slides freely over them. One end of each wire is attached to a small piece of bakelite with binding posts or screw bolts. One of these posts is connected to the grid post of the tube to be neutralized. The sliding sleeve is connected with the secondary of the neutroformer.

Neutralizing of the tubes is accomplished by sliding the sleeve or brass jacket back or forward as was described in last week's issue of the Post Radio Magazine section.

The sockets for the detector tube and the two audio-frequency amplification tubes are located at the left of the baseboard, viewing it from the rear. The two audio-transformers are just to the rear of these. The two rheostats—one for the detector tube and the other for the two amplifying tubes—are located as shown in photo displaying the rear view of the set.

Follow Polarity Scheme.

In wiring up the set observe these precautions: Have the polarity of the neutroformer windings, audio-transformers, the neutrodons and jacks just as they are indicated in the schematic diagram of the circuit. Keep the plate and grid leads as far apart as you can and make sure that none of the wiring anywhere in the set runs parallel. Where a lead does approach another, cross it at right angles. If wires must run parallel, even for the shortest distance, be sure that they are at least one-half an inch apart. A wider distance would be better.

The first step in mounting and wiring should be with the neutroformers. Attach these to the panel in their proper places. Next attach the two rheostats. Then, before screwing the baseboard to the panel, mount the sockets, the audio-transformers and the neutrodons to the board. Wire as much of the panel as possible before attaching the base.

Begin with a connection from the negative tube sockets to the ground tip jacks or binding post. Take the filament positive connections next and complete the wiring for the detector tube socket, the rheostats, battery switch and battery tips or binding posts.

The neutroformers come next. Run a lead from the taps of the second and third instruments to the second and third neutrodons or neutralizing condensers on the rear of the base board. There is no such connection from the first neutroformer.

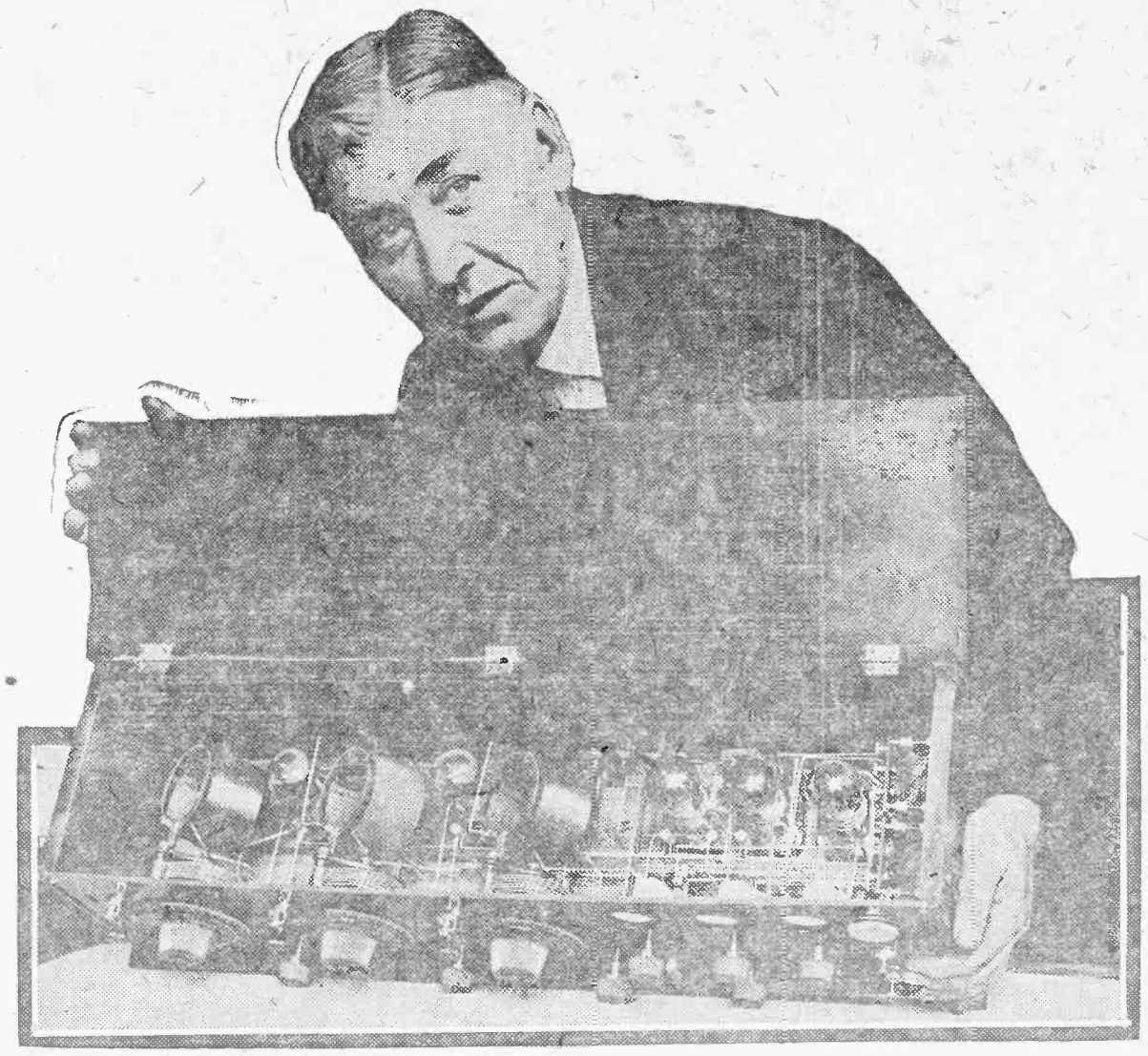
The fixed condensers indicated in the diagram may be attached wherever you desire—either on the panel or the base board.

Solder All Connections.

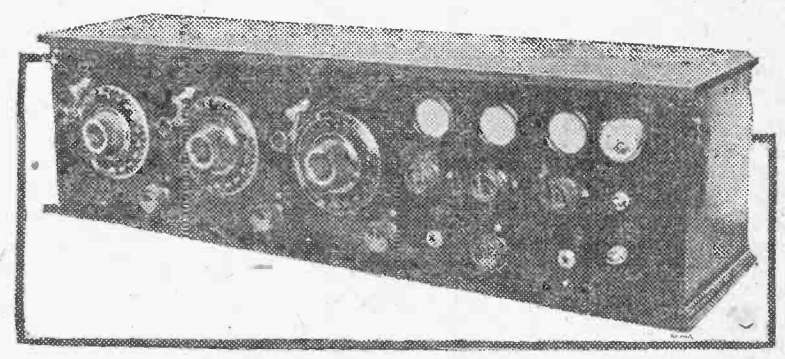
It should not be necessary to repeat the oft-given suggestion to solder all wire connections, but so many home builders seem to think this advice is not important and omit it.

Where two ends of wire are to be joined, instead of lapping the ends, place them point to point and solder them in this fashion. This insures a safer joint. After soldering strike the wires a sharp blow with your screw driver. If the solder is imperfect, the wires will separate. If not, they will hold. It is better to discover these imperfections at the start than to have them develop later, when the set is all wired and it is difficult to locate trouble of this nature.

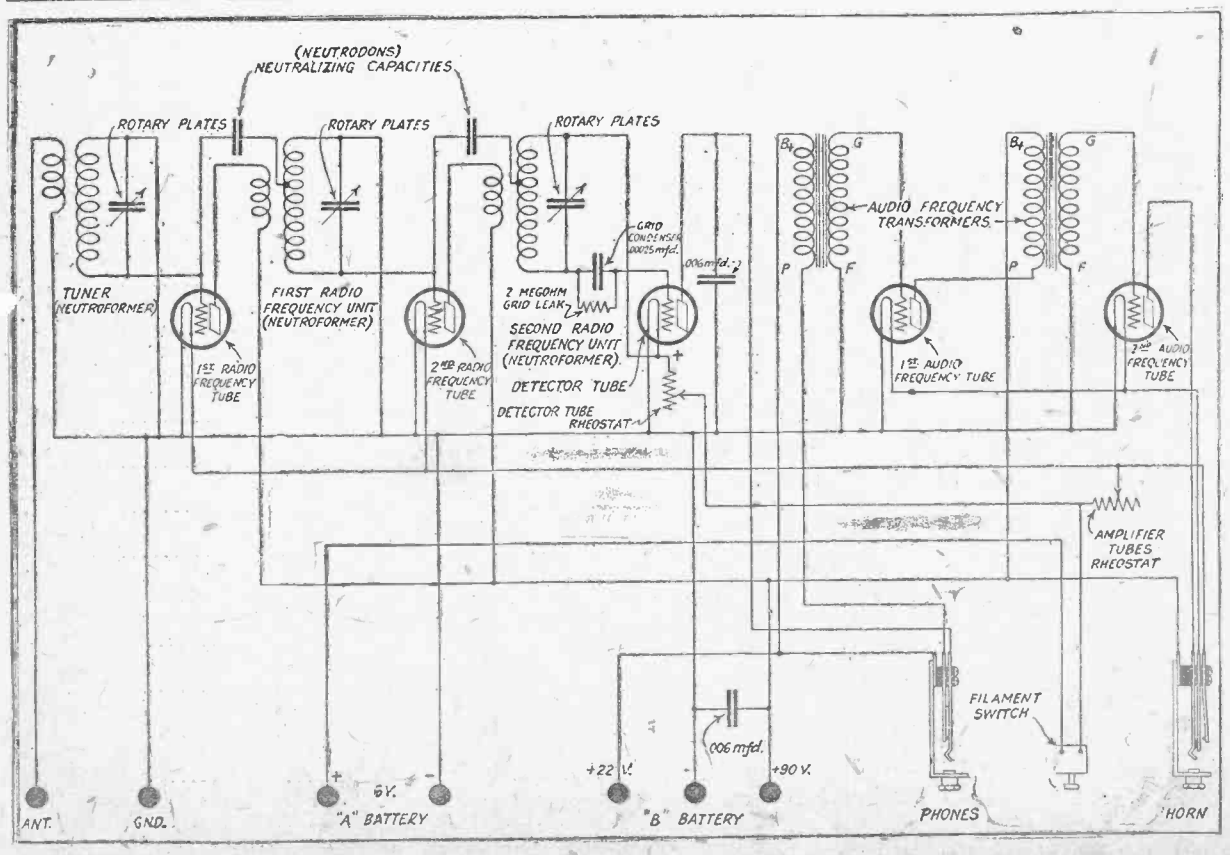
In the next issue of the Post Radio Magazine section some notes on tuning a neutrodyne will be given.



GEORGE FLINT and his five-tube neutrodyne. Note the neat wiring and the orderly arrangement of parts. The three neutro-formers are set at the proper angle on the left end of the cabinet. The two tubes between them are the radio-frequency tubes. In the battery of three at the right, the first, or left hand one, is the detector, and the other two are amplifiers. Fada parts were used in this hook-up.



NEUTRODYNE RECEIVER—Front view of five-tube set designed and constructed by George Flint of The Post staff. Note the vernier attachments on each of the three neutro-former dials. To the right of the three bezels is an ammeter.



Hazeltine five-tube neutrodyne circuit.

Courtesy F. A. Andrea Company.

Amateur Fakers Forge McMillan's Arctic Voice

Since MacMillan, the well-known arctic explorer, went north on his present expedition there have been three instances of radio forgery where some amateur with a radio telephone transmitter has gone on the air and impersonated MacMillan.

For instance, the Philadelphia Public Ledger recently published an account to the effect that one of the officers of a Philadelphia trust company had, at his summer home in the Pocono mountains, distinctly heard MacMillan broadcast a message by voice. In truth and in fact, MacMillan has no voice transmitter and uses nothing but code in sending back his messages.

MacMillan has been coming thru right along with the radio telegraph transmitter used for this present expedition. The American Radio Relay league members are straining every effort to keep in touch with MacMillan, despite the great distances involved.

Alloy Vapor Tubes Prove Very Efficient Detectors

Three-electrode vacuum tubes containing vapor of alloys of alkali metals, having low ionizing potentials and the characteristics of a photo-electric cell, give remarkable results as detectors with ten volts on the anode, according to the Proceedings of the Institute of Radio Engineers.

These tubes are at least three times as sensitive as the usual gas content tube and in addition are quite sensitive amplifiers.

The photo-electric properties cause this tube to function quite well with zero plate voltage. In this case the source of energy is probably the luminous and nonluminous radiation from the filament.

Radio Drama at WGY

"Shavings," a dramatization of Joseph Lincoln's story, will be broadcast by the players at WGY (Schenectady) Friday evening, Nov. 30.

Use of "C" Batteries

A bias, or "C" battery, will smooth out distortion in amplifying circuits quite often.

Programs Today and Thursday

Continued from Page 3.

de Perth" (Bizet), by R. E. Boltenstern: (a) "For You Alone" (Goehl), (b) "Kashmiri Song" (Finden), (c) "Indian Summer" (Saar), by Madeline Snyder; (a) "Humoresque" (Rachmaninoff), (b) "The Lark" (Balifereff), by Esther Felick; (a) "Consecration" (Manney), (b) "Uncle Rome" (Homer), by R. E. Boltenstern; (a) "In a Gondola" (Saar), (b) "Etude Badinage" (Saar), by Evelyn Stahler; two vocal selections by Olga Gates; (a) "Improvisation" (MacDowell), (b) "Witches' Dance" (MacDowell), by Evelyn Stahler.

Thursday.

Evening—6:30 p. m., news, financial and final market and sport summary; financial summary furnished by the Union Trust company; 6:50 p. m., children's bedtime story; 8 to 8:20 p. m., twenty minutes of good reading by Rev. C. J. Pernin, S. J., Head of department of English, Loyola university, Chicago; 8:20 p. m., musical program: Herbie Mintz, pianist; Wendell W. Hall, music maker; "Sen" Kaney, specialty act; other artists will be announced by radiophone; 8:58 p. m., naval observatory time signals; 9 p. m., news and weather report; 9:05 p. m., traffic talks, furnished by the Chicago Motor club.

WAAF—Located at Union Stock yards; 286 meters.

Wednesday.

Day—Live stock reports at 8:40, 10:30, 10:45 a. m., 12:30, 12:45, 3, 4:30 p. m.

WMAQ—Located on Hotel LaSalle; 447.5 meters. Miss Judith C. Waller, program director.

Day—1 p. m., speeches broadcast from Chicago Association of Commerce luncheon; 4:30 p. m., pupils of Cosmopolitan School of Music and Dramatic Art.

Evening—7 p. m., Miss Georgene Faulkner, the story lady, stories for children; 7:30 p. m., weekly lecture from Northwestern university; 9 p. m., Hotel LaSalle trio; 9:15 p. m., musical program by Mme. Sturkow-Ryder.

Thursday.

No program.

WDAP—Located on Drake hotel; 360 meters. Jack Nelson, program director.

Wednesday.

Day—1:40 p. m., Drake concert ensemble, market reports direct from Chicago board of trade on every half hour, beginning at 9:30 a. m., and continuing until 1:30 p. m.

Evening—7 p. m., Drake concert ensemble (direction, Henry Selinger), Blackstone String quintet (direction Irving Margrath); 10 p. m., Frederick W. Agard, tenor; Bob Cougle, accompanist; Jack Chapman's orchestra.

Thursday.

Evening—7 p. m., Drake concert ensemble (direction, Henry Selinger), Blackstone String quintet (direction, Irving Margrath); 10 p. m., Mme. Joan Young, soprano; David Nixon, violinist; Leo F. Ives, tenor; Jack Chapman's orchestra.

WJAZ—Located on Edgewater Beach hotel; 447.7 meters: E. Warren Howe, program director.

Wednesday.

Day—This station has no regular day schedule.

Evening—10 p. m. to 2 a. m., artists: Mollie Wiggins, soprano; Olga Gates, soprano; Phyllis Brunton, violinist; Starra Feigen, cellist; Alice Vergina Johnson, pianist accompanist; Jack Crampton, barytone; Oriole orchestra; selections to be announced.

Thursday.

Evening—10 p. m. to 2 a. m., A special Thanksgiving program will be given by the Rogers Park quartet; the Cambridge Sisters; Oriole orchestra; selections to be announced.

WPAD—Located on W. A. Wiebold & Co., School street and Ashland avenue.

Notice—This station has closed and is being moved to Armour institute where it will be operated by the radio department of that institution.

WSAH—Located at 4801 Woodlawn avenue; 248 meters.

WSAX—Located on Chicago Radio laboratory; 268 meters.

SUBURBAN STATIONS

(Central Time Is Shown.)

WCBD—Zion, Ill., 345 meters; J. H. Depew, station manager.

Note—This station broadcasts only on Monday and Friday evenings, Wednesday afternoons and on Sundays.

Wednesday.

Day — 2:30 to 3:45 p. m., sacred solos, duets and an address by Wilbur Glenn Voliva, general overseer of the Christian Catholic Apostolic Church of Zion.

Friday—2:30 to 3:45 p. m., sacred solos and duet; address by Overseer Voliva.

Sunday—9 to 9:30 a. m., Sunday school; 2:30 to 5:30 p. m., Sunday service with special music by Zion band or organ, and by Zion White Robe choir; also an address by Wilbur Glenn Voliva.

WCAY—Milwaukee, Wis.; 261 meters:

Wednesday.

Day—1 p. m. to 4:30 p. m., special concert; novelty and test programs as announced.

Evening—7:30 p. m., regular concert program.

Thursday.

Evening—7:30 p. m., concert program.

WIAB—Rockford, Ill.; 252 meters: 8 to 9 p. m., concert.

WRM—Urbana, Ill., University of Illinois; 360 meters: 8:50 to 9:30 p. m., lectures and news.

WTAS—Elgin, Ill.; 275 meters:

Wednesday.

Evening—7:30 p. m., musical program.

Thursday.

Evening—7:30 p. m., musical program.

OUT-OF-TOWN STATIONS

Eastern Programs.

(Central Time Is Shown.)

KDKA—East Pittsburg; 326 meters:

Wednesday.

Day—10 a. m., music, markets; 10:55 p. m., noon-time signals; 11:30 a. m., music, weather; 11:50 a. m., United States bureau market.

Evening—5:15 p. m., dinner concert by the Grand Symphony orchestra from the Million Dollar Grand theater, Pittsburg, Pa.; 6:30 p. m., literary program; 7:15 p. m., address; 7:30 p. m., concert by the KDKA Little Symphony orchestra under the direction of Victor Saudek and Ruth Elta Ross, colorature soprano; Clyde Dunn, tenor; Mrs. Pearl Van Orsdale, accompanist. Program: Orchestra numbers, overture, "Marriage of Figaro" (Mozart); (a) "Largo" (Handel); (b) "Moment Musical" (Schubert); Aragonaise, "Le Cid" (Massenet); "Romanze" (Rubinstein); fantasy, "Rigoletto" (Verdi); "Invitation to the Dance" (Weber); soprano solos, Aria, "Caro Nome" (with orchestra accompaniment), (Rigoletto), (Verdi); Aria, "Pearl of Brazil" (with flute obbligato), (David); "Sing, Smile, Slumber" (flute obbligato), (Gounod); tenor solos, "O Cool Is the Valley" (Koemenick); "Because of You" (Woodman); "When Shadows Fall" (Kiethley).

Thursday.

Day—9:45 a. m., Thanksgiving day service at Point Breeze Presbyterian church, sermon by Dr. Percival H. Barker, minister; 10:55 a. m., Arlington time signals; 1:30 p. m., Pitt-State football game from Forbes field, Pittsburgh, Pa.

Evening—6:30 p. m., dinner concert by the Pittsburgh Athletic Association orchestra, Gregorio Scalzo, conductor; 7 p. m., Thanksgiving day program; 10:30 p. m., special late concert.

WBZ—Springfield, Mass.; 337 meters:

Wednesday.

Day—10:55 a. m., noon (eastern) time signals, weather and Boston and Springfield markets.

Evening—5 p. m., dinner concert by the WBZ quintet; 6 p. m., "Amplification of speech and music, ninth lecture in the Radio course by Edward H. Goodrich; humorous program; 6:30 p. m., farmers' period, "The Farmer's Job, Feeding New England"; "The Road from Orchard to Market," by Samuel C. Hood, market specialist of the Hampden County Improvement league; story for grownups by Orison S. Marden; 10 p. m., program of chamber music by the WBZ quintet and William L. Spittal, tenor; Mrs. Dorothy Birchard Mulroney, accompanist.

Thursday.

Day—9 a. m., church services direct from the Springfield auditorium; 10:55 a. m., Arlington time signals; weather reports; Boston and Springfield market reports.

Evening—6 p. m., "Jim and Me," an outing story from Field and Stream, prepared by William G. Wood; 6:30 p. m., twilight tales for the kiddies; letter from the New England Homestead; 7 p. m., concert by Fred Gardner, tenor; Marion Tryon, pianist; 8 p. m., bedtime story for grownups, by Orison S. Marden; 8:55 p. m., Arlington time signals.

WEAF—New York city; 495 meters: 5:30 to 8 p. m., concerts.

WGI—Medford Hillside, Mass.; 360 meters:

Wednesday.

Evening 5:10 p. m., code practice, lesson No. 174; 5:35 p. m., Boston police reports, Boston police headquarters; 5:40 p. m., late news flashes; sports news; Boston American; 5:50 p. m., message to Camp Fire Girls, by Charles W. Casson, "Big Smoke"; 6:15 p. m., "This Week's Judge," furnished by the Judge Publication company; 6:20 p. m., "Science Up to Date," by the Scientific American; 6:30 p. m., evening program (1) essay, "Self-Cultivation in Reading," by David McGregor Cheney; (2) musical program by the concert players.

Thursday.

Evening—5:10 p. m., late news flashes; sports news; Boston American; 5:30 p. m., Boston police reports, Boston police headquarters; 5:40 p. m., code practice, lesson No. 175; 6 p. m., evening program (1) "Bits of Wisdom," by George Brinton Beal, prominent newspaper man; (2) musical program to be announced; 6:30 p. m., (3) bedtime stories for parents, prepared by the Children's Aid association, number (3) Paper, read by Alfred F. Whitman, executive secretary; (4) continuation of musical program.

WHAZ—Troy, N. Y.; 330 meters: This station broadcasts only on Monday evenings.

Evening—Musical program.

WGY—Schenectady, N. Y., 280 meters:

Wednesday.

5:30 p. m., "Adventure story" (courtesy of The Youth's Companion). Silent night.

Thursday.

Day—9:30 a. m., Thanksgiving day service. St. George's church, Schenectady, N. Y.; organ selection, "Festival Prelude" (Maxson), Helen Stephens; processional, "Come, Ye Thankful People, Come" (Elvey); Thanksgiving anthem, "O Praise the Lord," Anglican Chant; Psalm 136, "For His Mercy Endureth Forever" (Troutbeck); first lesson, Deutteronomy 8; "Te Deum in D" (Buck); second lesson, from First Thessalonians 5; Jubilate, Angelican Chant; hymn, "We Plough the Fields" (Schulz); hymn before sermon, "O Beautiful for Spacious Skies" (Bates); a short Thanksgiving sermon, by Rev. B. W. R. Taylor, D. D., D. C. L.; offertory anthem, "Praise the Lord, O Jerusalem" (Maunder); presentation, "God Bless Our Native Land, America"; recessional, "Battle Hymn of the Republic" (Howe); organ postlude, "March in A" (Roeckel), Helen Stephens.

Evening—6:45 p. m., musical program: A few moments with new books, William F. Jacob, librarian of General Electric company; selection, "The First Thanksgiving" (Brown), WGY orchestra; contralto solo, "The Lord Is My Light" (Allitsen), Rose Mountain; selection, "At Sunrise" (Grunn), orchestra; address, "The Significance of Thanksgiving"; selection, "The Waving Grain" (Grunn), orchestra; contralto solo, "A Song of Thanksgiving" (Allitsen), Rose Mountain; selection, "The Indian Dance" (Grunn), orchestra; contralto solo, "By the Waters of Minnetonka" (Lieurance), Rose Mountain; selection, "The Mayflower March" (Smith), orchestra.

WGR—Schenectady, N. Y.; 280 meters:

Wednesday.

Day—9:45 a. m., weather forecast for Lakes Erie and Ontario; special report from Buffalo and Oswego, N. Y., for marine and aviation interests; weather forecast for western New York; 11 a. m., weather, produce and livestock market reports; 11:30 a. m., organ, dining-room, Hotel Statler; program: George Albert Bouchard: "Light Cavalry Overture" (Van Suppe), "Caress" (Frederic Groton), "Moment Musical" (Schubert), "Mississippi Ripples", "When It's Night Time in Italy It's Wednesday Over Here"; 11:30 a. m., closing prices of Chicago board of trade; 2:30 p. m., closing prices of New York stock exchange; 3 p. m., teatime music, Palm room, Hotel Statler, Miss Martha Gomph, harpist; Miss Elise de Grood, violinist; 4 p. m., second broadcasting of all daily reports; 5:30 p. m., dinner music, Vincent Lopez Hotel Statler dance orchestra.

Evening—6:30 p. m., digest of the day's news; 8:30 p. m., ball-room; Troop I Post, American Legion dance; Erlenbach's Century orchestra; broadcasting from 10 to 10:30 p. m., especially for English reception; 9:45 p. m., weather forecast for Lakes Erie and Ontario; special report from Buffalo and Oswego, N. Y. for marine and aviation interests; 11 p. m., supper music, Vincent Lopez Hotel Statler dance orchestra.

Thursday

Day—Program same as Wednesday's.

Evening—5:30 p. m., dinner music; Vincent Lopez Hotel Statler dance orchestra; 6:30 p. m., digest of the day's news; Boy Scout radiograms; industrial employment bulletin; the American Boy story; 9:45 p. m., weather forecast for Lakes Erie and Ontario; special report from Buffalo and Oswego, N. Y., for marine and aviation interests; (All American broadcasting stations, participating in the transatlantic tests, will remain silent this evening from 10 until 10:30, in order to receive the English broadcasting stations.)

WJY—New York city; 405 meters:

This station broadcasts only on Sundays at 2:30 p. m. to 6 p. m.

WJZ—New York city; 455 meters; no silent night.

Wednesday.

Evening—7:15 p. m., musical program.

Thursday.

Evening—7:15 p. m., musical program.

WOO—Philadelphia; 509 meters:

Wednesday.

Silent Sunday, Tuesday, Thursday, Friday and Saturday.

Evening—6:30 p. m. dinner music from Hotel Adelphia Concert orchestra, A. Candelori, director; 7:15 p. m., instrumental trio, Marion Erwin, piano; Lawrence W. Miller, violin; Stanley Hart Cauffmann, cello; Gladys Jackson, soprano; Edward Barnes, barytone; Harriette G. Ridley, accompanist; 8:15 p. m., grand organ recital, Mary E. Voet at the console; 9:07 p. m., organ recital, continued.

WRC—Washington, D. C.; 469 meters: silent Tuesday, Thursday and Saturday.

Wednesday.

Evening—7 p. m. to 9 p. m., vocal and instrumental music.

Thursday.

Day—2 to 5 p. m., trade and financial reports; travel and fashion talks; vocal and instrumental music.

Midwest Programs.

WCX—Detroit, Mich; 517 meters: Silent Saturdays.

Wednesday.

Day—1 p. m., news bulletins; 1:15 p. m., stock quotations; 1:50 p. m., government weather forecast; 3:15 p. m., music; 5 p. m., dinner concert; Pete Bontseman's orchestra, broadcast from Hotel Tuller.

Evening 7:30 p. m., musical program.

Thursday.

Day—2:20 p. m., Rev. Gains Glenn Atkins, D.D., speaker; a twenty minute exposition of the International Sunday school lesson.

Evening—5:15 p. m., dinner concert, Pete Bontsema's orchestra, broadcast from Hotel Tuller; 6 p. m., musical program.

WJAX—Cleveland; 390 meters; Silent every night except Tuesday and Thursday.

Day—11 a. m. to noon, special studio program.

Evening—5 to 5:30 p. m., WHK special program; 5:30 to 9 p. m., community fund meetings; 7 p. m., WHK special program.

WLAG—Minneapolis, Minn.; 417 meters. No silent nights.

Wednesday.

Day—9.30, 10 and 10:30 a. m., markets, news bulletins; 10:45 a. m., household hints; 11:30 a. m., markets; noon, lecture; 12:30 p. m., musical; 4. p. m., lecture; 4:30 p. m., markets; 5 p. m., address; 5:30 to 6 p. m., children's program.

Evening—6 to 7:30 p. m., lectures; 8:30 p. m., musical program; 10 p. m., address; 10:30 p. m., till 1 a. m., musical program. (This station broadcasts a late concert on Wednesdays and Saturdays only.)

Thursday.

Evening—10:30 p. m., musical program.

WLW—Cincinnati—309 meters; silent Friday, Saturday and Sunday.

Wednesday.

Day—10:30 a. m., markets; 1:30 p. m., business reports; 3 p. m., grain and stock quotations; 3 p. m., concert by the Wurlitzer Concert company for the Shut-Ins.

Evening—7 p. m., concert by the 10th United States Infantry band; band leader, Warrant Officer Ernest G. Fischer; vocal soloists: Louise Koetter, contralto; Edwin Weidinger, barytone: (1) selections by the 10th Infantry band: (a) March, "The New Colonial" (Hall); (b) Overture; (c) Waltzes, "Daughter of Love" (King); (2) songs by Edwin Weidinger; Clara Yorston Woodside, accompanist; (a) "It Is Enough," from "Elijah"; (b) "Jean" (Burleigh); (3) selections by the 10th Infantry band: (a) Habanera, "Mexican Kisses" (Roberts); (b) 'La Paloma" (Yradeir); (c) Medley, "Southern Plantation Songs" (Haves); (4) The Crosley prize radario for the month of October, "Kitchin Kotin," written by Miss Mary Bonham of Nebo, Va., presented by the Crosley Radarians of the Schuster-Martin Dramatic school; in the cast: Arabell Spice (colored cook), Olive Vail; Jasper Johnson (her suitor), Paul Bacheller; banjo played by George Webb; (5) Contralto solo by Louise Koetter, "Lullaby" (Fred Smith), C. H. Devine; (6) Songs by Edwin Weidinger, composer, at the piano; (a) "For You Alone" (D'Hardelot); (b) "In a Garden" (Hawley); (7) Song for cornet, with band accompaniment; (8) Bill Phelon, sporting editor of the Cincinnati Times-Star, presents a football game, with Glen Lewis, cheer leader, and his squad of cheering cheerers, University of Cincinnati; (9) 10th Infantry band: "Finale" march, "Italian Riflemen" (Eilenberg), Walter Aiken, superintendent of music, public schools, Cincinnati; special features to be announced. (Baldwin piano.)

Thursday.

Day—3 p. m., piano solos by Miss Adelaide Apfel; speaker from the Cincinnati League of Women Voters.

Evening—9 p. m., American Indian program: Musical arrangements by the Cincinnati Conservatory of Music; an Indian radario given by the Crosley Radarians, directed by Helen Schuster-Martin, of the Schuster-Martin Dramatic school; 1. Miss Pearl Besuner, soprano, "From the Land of the Sky Blue Water" (Cadman); 2. Heiman Weinstein, violinist, "Indian Lament" (Dvorak); 3. "Little Scar Face," a one-act radario developed from a Micmac Indian legend, by Amelia H. Walker; in the cast: Little Scar Face, Helen McCoy; Blackbird, Mary Higgins; Young Fawn, Margaret Gerdes; Little Lame Boy, Tyrone Power Jr.; The White Maiden, Emma Helen Haswell; Vincenso Joseph Schreck; Descriptionist, Patia Power; 4. Heiman Weinstein, violinist, "Snake Dance" (Burleigh); 5. Pearl Besuner, soprano, with Miss R. Besuner at the piano, "Ghost Pipes" (Lieurance); 6. piano solos by Marjory Garrigus, followed by classical program given by Miss Besuner and Mr. Weinstein; 10 p. m., St. Xavier orchestra: violins, Misses Mary Sullivan, Patricia Conway, Mildred Costello, Marie Keller, Eugene Perazzo; viola, Miss Jeannette Nurre: cellos, Miss Esther Spaeth, Thomas Byrne; flute, Vincent Feltman; piano, Miss Marjie Bland; 1. the St. Xavier orchestra program, (a) march, "National Emblem" (Bagley); (b) overture, "Morning Noon and Night" (Suppe); 2. violin solo by Miss Mary Sullivan; 3. St. Xavier orchestra, (a) "Scarf Dance" (Chaminade); (b) "Minuet" (Beethoven); (c) "Moment Musical" (Schubert); 4. piano solo, "Hungarian Rhapsodie," No. 2, Eugene Perazzo; 5. trio, "Alita" (Losey); violin, Patricia Conway; flute, Vincent Feltman; piano, Marjory Bland; 6. piano solo by Margie Bland; 7. concluding numbers by the St. Xavier orchestra, and march, "Spirit of America."

WOC—Davenport, Iowa; 481 meters: silent Tuesdays.

Wednesday.

Day—10 a. m., markets; 11 a. m., weather and river forecast; 11:05 a. m., markets; noon, chimes concert; 2 p. m., markets; 3:30 p. m., educational program (musical numbers to be announced); lecture by Clyde G. Kern; subject, "Some Facts About Insulin."

Evening—7 p. m., educational lecture, under the auspices of the Scott County Farm bureau, subject, "The Farmers' Thanksgiving," by F. D. Steen, chairman of committee on taxation, Iowa Farm Bureau federation; 8 p. m., organ recital, Mrs. Frank W. Elliott at the console; Mrs. F. C. Huntoon, soprano; Virginia Smith, pianist; 9 p. m., two-hour concert; special Thanksgiving program by the Schmidt Music company concert orchestra, assisted by the following soloists: Amalia Schmidt Gobble, soprano; Maud Marshall Bond, reader; Mrs. E. H. Hipple, saxophone and piano; Earl Hipple, xylophone and trombone; Henry Sonntag, violin; Carl C. Schmidt, violin; Herman Schmidt Jr., mellophone and piano, and Edwards Congregational male quartet.

Thursday.

Evening—7 p. m., Thanksgiving service, conducted by Rev. J. L. Vance, pastor Oak Grove Second Presbyterian church, Rock Island, Ill.; (musical numbers to be announced); 8 p. m., musical program (one hour), P. S. C. orchestra, Gerald M. Barrow, director. (In keeping with the Thanksgiving spirit, oldtime numbers and classics will be substituted for the usual popular program.) V. B. Rochte, barytone soloist.

WTAM—Cleveland; 390 meters: broadcasts only Wednesday and Saturday evenings at 7 to 8 p. m.

WWJ—Detroit, Mich.; 517 meters: Silent Saturday.

Wednesday.

Evening—8:30 p. m., musical program.

Thursday.

Evening—8:30 p. m., musical program.

Southern Programs.

KSD—St. Louis; 546 meters: Silent Friday.

Wednesday.

Evening—7 p. m., program by Abergh's concert ensemble, Arne Arneson, violinist, broadcast direct from Hotel Statler; 11 p. m., broadcasting direct from Hotel Statler, dance music played by Rodemich's orchestra.

Thursday.

Evening—8 p. m., broadcasting direct from the Odeon concert given by St. Louis symphony orchestra, Francis MacMillen, violinist, soloist.

WBAP—Fort Worth, Texas; 476 meters:

Wednesday.

Day—10 a. m. to 4 p. m., markets and financial review.

Evening—7:30 to 8:30 p. m., concert by the Broadway Presbyterian Men's Bible class, (E. L. O. announcing.) 9:30 to 10:45 p. m., concert by George Freeman's Sooner Serenaders Texas Hotel orchestra. (The Hired Hand announcing.)

Thursday.

Day—3 to 5:30 p. m., special play-by-play broadcast of the Texas University-Texas A. and M. college football game at College Station, Texas, by direct wire from the football field at College Station to WBAP.

Evening—7:30 to 8:30 p. m., concert from the Rialto theater, Forth Worth. (E. L. O. announcing.) 9:30 to 10:45 p. m., concert by the Hilo Five Hawaiian Serenaders orchestra, Fred Wagner, director. (The Hired Hand announcing.)

WDAF—Kansas City, Mo.; 411 meters:

Wednesday.

Day—3:30 to 4:30 p. m., musical matinee, Tom Beckman's Novelty orchestra.

Evening—6 to 7 p. m., school of the air; tuning-in piano number on the Duo-Art; marketgram, weather forecast and road report; address, representative of the Health Conservation Association of Kansas City; the children's story and information period; music, Fritz Hanlein's Trianon ensemble, Hotel Muehlebach; 8 to 9:15 p. m., classical concert; 11:45 p. m. to 1 a. m., nighthawk frolic; the "Merry Old Chief" and the Coon-Sanders Novelty-Singing orchestra, Plantation grill, Hotel Muehlebach.

Thursday.

Day—3:30 to 4:30 p. m., musical matinee, the D. Ambert Haley Dance and Concert orchestra.

Evening—6 to 7 p. m., tuning-in piano number on the Duo-Art, marketgram, weather forecast and road report; address, speaker from the William Jewell college, Liberty, Mo.; the children's story and information period; music, Fritz Hanlin's Trianon ensemble, Hotel Muehlebach; 11:45 p. m. to 1 a. m., the "Merry Old Chief" and the Coon-Sanders Novelty-Singing orchestra, Plantation grill, Hotel Muehlebach.

WFAA—Dallas, Texas; 476 meters: Silent Wednesday.

Thursday.

Day—12:30 to 1 p. m., address, Dr. Thomas H. Harper, pastor Central Congregational church, on "Our Thankfulness."

Evening—8:30 to 9:30 p. m., Gussie Montgomery's Harmony Six, an orchestra.

WGM—Atlanta, Ga; 429 meters:

Evening—6 to 7 p. m., concert; 9:30 to 10:30 p. m., concert.

WGV—New Orleans; 359 meters:

Evening—7 to 8 p. m., concert.

WHAS—Louisville; 400 meters: silent Mondays:

Special program.

Wednesday.

Day—4 to 5 p. m., selections by the Walnut Theater orchestra, L. V. Davidson, director; selections played on the Alamo theater organ; four-minute talk on household economics.

Evening—7:30 to 9 p. m., soprano solos: Miss Catherine Emmitt Goodman, accompanied by Reginald W. Billin; selections by Gus Edward's orchestra, playing at the Seelbach hotel; selections by Barney Rapp's orchestra, playing at the Brown hotel; soprano solos: Miss Frances Batt Wallace of Connersville, Ind.; selections by the Walnut Theater orchestra, L. V. Davidson, director; selections by the Strand Theater orchestra, Harry S. Currie, director; late important news bulletins; official central standard time announced at 9 o'clock.

Thursday.

Day—4 to 5 p. m., selections by the Walnut Theater orchestra, L. V. Davidson, director; selections played on the Alamo theater organ; four-minute talk on household economics.

Evening—7:30 to 9 p. m., reading: Miss Frances Martha Brandley; two piano concerto: Miss Helen Eichenberger and Theodore Reichburg; selections from Barney Rapp's orchestra, playing at the Brown hotel; contralto solos: Miss Ellen Bachus, accompanied by Mme. Cara Sapin; reading, Miss Lucile Stillwell of Anniston, Ala.; selections from Gus Edward's orchestra, playing at the Seelbach Hotel; reading, Miss Floyd Crutchfield, member of the Louisville Conversatory of Music Faculty; selections from L. V. Davidson's orchestra, playing at the Walnut theater; late important news bulletins; official central standard time announced at 9 o'clock.

WHB—Kansas City, Mo.; 411 meters: silent Monday Wednesday, Friday and Saturday.

Evening—7 p. m., concert.

WMC—Memphis; 500 meters: silent Wednesdays.

Day—9 a. m. to 4 p. m., markets, financial and news.

Evening—8:30 p. m., the St. Andrews Colored sextet, under the direction of L. White McCoe, will furnish the program; 11 p. m., the regular Tuesday night midnight frolic will be announced later.

WOAI—San Antonio, Texas; 385 meters: silent night, Mondays, Wednesdays and Thursdays.

WOS—Jefferson City, Mo.; 441 meters: silent Tuesdays, Thursdays and Saturdays.

Evening—8 p. m., address, "How to Start and Develop a Dairy Herd," by Prof. E. M. Harmon of the dairy department, Missouri College of Agriculture, Columbia, Mo.; musical program, details to be announced by radiophone.

WSB—Atlanta, Ga.; 428 meters.

Wednesday.

Day—12 to 1 p. m., musical program for industrial workers; 2:30 p. m., weather forecast; 4 p. m., Howard relay concert; 5 to 5:30 p. m., markets, news and sports; 5:30 p. m., Burgess' bedtime story.

(Wednesday is silent night in Atlanta.)

Thursday.

Day—12 m. to 1 p. m.; musical program for industrial workers; 2:30 p. m., weather forecast; 4 p. m., Howard relay concert; 5 to 5:30 p. m., markets, news and sports.

Evening—5:30 p. m., Burgess' bedtime story; 8 to 9, popular concert; 10:45 p. m., Transcontinental Radiowl concert.

Pacific Coast Concert.

KDZE—Seattle, Wash.; 455 meters: silent nights Tuesdays, Thursdays and Sundays.

KFDB—San Francisco; 509 meters:

Evening—musical program from midnight to 1:30 a. m.

KGW—Portland, Ore.; 492 meters:

Evening—Midnight to 1 a. m., vocal; 2 a. m., hoot owl frolic.

KHJ—Los Angeles, 395 meters:

Evening—10:45, 11:30 p. m., 1 a. m.

KPO—San Francisco; 423 meters:

Evening—concert, midnight to 1 a. m.

Questions and Answers

Continued from Page 10.

so had to use a 6x14 cabinet, which necessitated placing the coil in back of the first variometer in an upright position. Will you please tell me what may cause my trouble and if I have the proper variometers, also if it makes any difference which side of coil is connected to the antenna binding post? I am inclosing a stamped, addressed envelope and any information which you can give me about this circuit will certainly be appreciated, as I made same for my mother to use and it is not giving satisfaction.

Questions 1, 2 and 3—Probably caused by the same reason. Suggest changing tube (216-A is best), trying different aerials and ground and reversing variometer leads. If 216-A tube is used, 150-volts "B" battery should be used. (4) These variometers should be O. K. (5) Leads to coil have no effect on circuit. If this does not remedy your trouble, write again, giving more details as to aerial, ground, tube, rheostat, phones and amplification used.

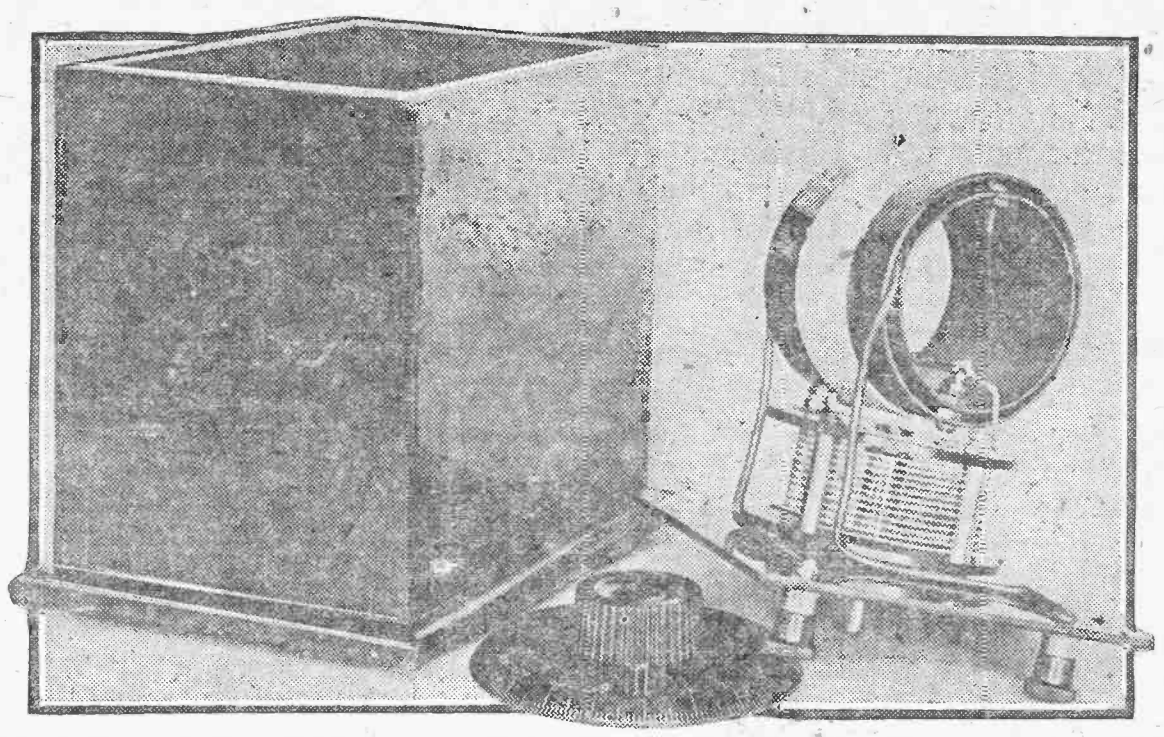
AMPLIFICATION FOR AUTOPLEX.

220—CHICAGO: Am interested in the Muhleman Autoplex circuit. Would you be kind enough to send me hook-up of the single tube set, also hook-up of amplification and panel layout of same set?

The schematic diagram of the Autoplex circuit was published in both of the Nov. 15 and 22 Radio Magazine sections of The Post, the latter being larger and more easily traced than the former. In today's issue construction data of this circuit, together with panel layout is given. You probably will not require amplification, but if you do use the standard hook-up.

This Wave Trap Cuts Out Local Interference and Brings In Desired Station

PROBABLY the most frequent complaint against radio broadcast reception is local interference. This is particularly true from owners of single circuit or regenerative sets. Here is described a sure-fire eliminator or rejector. It is a product of The Post experimental laboratory and actually works.—The Editor.



INTERFERENCE from local broadcasting stations can be eliminated easily. Any receiver, possessing sufficient sensitiveness, or selectivity, can tune in distant stations while near-by local stations are clamoring for attention. Their operator can tune in any one of the local stations and cut out the other—if he knows how to operate the set.

However, most radio circuits in use, unfortunately, are not of this highly selcetive type. But even the broadest of tuning receivers can be made selective.

In the accompanying illustrations is shown a wave trap, or eliminator, which will add the desired qualifications to any receiver. It was built for a reader of The Post Radio Magazine Section from designs furnished by The Post experimental laboratory.

Drowns Out Opera Programs.

This reader has his receiver—a one-circuit regenerative of the characteristice broad-tuning type, located within three or four blocks of one of the local stations. For the last year he has been trying to tune in some of the local stations while the near-by one was on the air. He was particularly anxious to get grand opera when this was being broadcast. However, just about the time voices began to come in, the near-by station would open up and drown out the opera.

The first night this wave trap was used the reader not only tuned out the interfering station and brought in other local stations at will, but while three of the locals were hammering away he pushed thru them and brought in many of the favorite outside stations without the least trouble.

The wave trap illustrated is somewhat different from others that have been printed in this magazine. It consists of two coils—a primary and a secondary, fixed and shunted by a variable forty-three-plate condenser. It is connected on the ground circuit rather than in the aerial, as most eliminators are.

Details of Construction.

Referring to the illustration, let us designate the secondary, or inside, coil of the inductance, coil A. The primary, or outside, coil is coil B.

Coil A is wound on a two-and-one-half-inch formica tube two inches wide. Thirty turns of No. 32 DCC wire are wound on this. Coil B has thirty turns of No. 22 DCC wire wound on a formica tube three inches in diameter and two inches in width. Coil A is placed inside of coil B and fastened into position as is shown in the illustration, by a screw bolt, one of the two nuts being used as separating nut. These bolts also serve as binding posts for the leads from coil A. The leads should go, one to the ground binding post of the receiver and the other direct to the ground.

In hooking up the trap hurriedly for photographing purposes an error was made and the leads from the coil B are shown connected to these positions, while the coil A leads are connected to the two posts on the condenser. In connecting up the trap be sure that these errors are corrected.

The condenser, with the trap shunted, is attached to a bakelite panel of suitalbe size and the whole placed in a small cabinet.

How to Tune the Trap.

To use this trap, connect to the receiver in the manner described, running one wire to the ground post of the receiver and the other direct to a ground. You may have to change these connections to find the proper direction of the winding of the coils. This will make a decided difference in the operation of the trap. The coils, by the way, should be mounted within each other, so that the windings are in the same direction.

Now to tune: Go to your tuning dials or controls on you receiver and bring in the interfering station as loud and clear as you can get it.

When you have accomplished this, turn to your wave trap condenser and proceed to tune it out. Turn the dial slowly, back or forward, until the station is eliminated. It may be that you will be enabled only to get it partly out, but it will be so weakened in signal strength that it will not interfere when the desired station is brought in with full volume.

What you have done here is that the interfering station is turned away from the receiver and sent into the ground, where it remains as long as you desire it to remain. This leaves your receiver clear for any other reception you care to receive.

This trap is not an experiment. It has been tested thoroly by The Post experimental laboratory under various conditions. The writer has had a receiving set located for the last eighteen months within two blocks of WDAP. Until this trap was devised this station dominated the tuning dial whenever it came on. There was no way, apparently, of getting it out of the receiver, which is a very sensitive and selective one.

Many Build the Set.

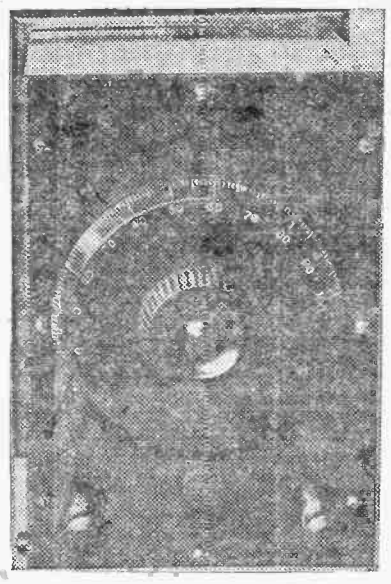
A number of Post readers have built this same trap. With but few exceptions all have had instantaneous success. Those that met with failure undoubtedly did so thru imperfect construction, improper connections and improper tuning.

The trap really makes your receiver a highly sensitive one. If your set tunes sharp originally this sharpness will be accentuated. Bear this in mind when tuning. On the writer's own receiver the WDAP station once came in almost over the entire dial. With the trap in position it tunes in sharply within two to three degrees and requires almost as much care in bringing in the signal as if it were a long-distance station.

The Post would like to hear reports on this trap from experimenters.

To Get High-Wave Station

Those receivers whose inductance is not sufficient to bring in the high-wave stations may be loaded up by placing a twenty-five to thirty-five turn coil in series with the inductance. If tuned-plate circuit is employed also load it up with a smaller coil to preserve balance.



WAVE TRAP FOR RECEIVERS—This eliminator of undesired signals makes broadcast reception enjoyable. Upper photo shows hook-up of internal parts. The lower photo is the front panel of the set.

RadiophansDeny Edison's Charge

The statement recently attributed to Thomas A. Edison at the New York Electrical show that radio will die out unless the frying sounds of the music are eliminated was challenged quickly by radiophans who daily are receiving radio programs without "frying" features, and by manufacturers of reliable radio apparatus who have reduced static interference to a minimum.

The statement of the electrical wizard is misleading, they declare, as tremendous progress has been made in the art in the last two years. Even if this were not true, they point out, it seems unlikely that something which, already is bringing education, entertainment and happiness to a million homes in the United States, will or could die out.

"Frying sounds" is one way to describe the peculiar noise which static causes in a receiving set. But with the advance in knowledge of the art and the tremendous amount of research done recently by engineers and manufacturers, this trouble practically has been eliminated.

Interference Is Controlled.

Who knows? Maybe radio has grown too rapidly for even the wizard to keep up with it.

Interference is another term for "frying sounds," and interference has been controlled by the development of better parts for radio sets. For instance, the public is just beginning to realize that the variable condenser which was considered a very satisfactory article a year ago would not be satisfactory today.

Manufacturers have developed what is called a low loss condenser, that is, one in which the dielectric resistance is very low. It absolutely is necessary to have such a condenser when using radio-frequency amplification, or with the latest development of the art reflex circuits.

Makes Circuit Efficient.

"Reflex" means using the amplifying tube twice, first using the vacuum tube to amplify at radio-frequencies, and then at audible frequencies.

This type of set, which is very simple to construct, as it uses no complicated tuning equipment, will bring in stations 1,000 miles away using the simplicity of this arrangement, the results are worth while.

This device depends upon low losses in the filter, particularly in the condenser. Great care should be taken to make sure the variable condenser used is a "low loss" condenser. There are several good types manufactured.

No Protection to Set.

This device will drain unwanted frequencies off the antenna, but it will not weed out unwanted frequencies from the receiving circuit itself. The receiver should be well shielded in order to prevent it from picking up any considerable amount of energy without antenna connection.

We hope that this information will be of service to you and reduce some of the confusion which now is existing in this territory. I shall be glad to hear as to what success you have with this method, as we are anxious to improve radio conditions and we feel this can best be done by furnishing information to our radio listeners whenever possible.

Note.—Elsewhere in this issue of the Radio Magazine Section is shown an efficient wave trap which operates upon the principle outlined by Mr. Horn.—The Editor.

Tells Why You Fail to Tune Out Local Stations

By C. W. HORN.

(Superintendent of Radio Operations of Westinghouse Electric and Manufacturing Company.)

THOSE of us who have sensitive radio receiving sets know how sharply a distant broadcasting station tunes in. We know from experience how carefully we must adjust our dials to get any particular station. A few divisions off on the scale and it is lost.

Now, I have been asked a great number of times: "Why cannot the local stations be tuned just as sharply?" I will attempt to explain the reason and also give detailed information, which I trust will assist the great army of listeners in overcoming a factor considered by many to be a very important one now.

When a receiving set is located near a powerful broadcasting station, you are able to hear that near-by station over a considerable range of the dial because of what is known as "forced oscillations."

This can best be described by referring to that analogy so often used of a pond of water after a pebble has been thrown into it. Waves radiate from the center of disturbance. At some little distance from this center the waves are regular and travel smoothly, but right near where the stone struck the water, and particularly if it was a large one, you will notice a large number of irregular splashes.

Radio Waves Similar.

Any device designed to be affected by the regular waves would also be troubled by these irregular splashes or waves as you may call them. It is the same thing in radio and the problem is to so arrange matters that these irregular splashes can be deflected or so handled as not to interfere.

In your radio set you desire to pick up the tune or, as before named, the regular wave and weed out the irregular or forced oscillations. This may be done in several ways by devices called traps or filters. I will describe here a very simple one—something you easily can construct for yourself in a few minutes with simple apparatus usually used in radio.

This filter that I am about to describe is so arranged and connected that it tends to offer a very low resistance path to the wave that is not wanted, while the tuner dial is set to offer an easy path for the desired wave which, therefore, passes thru your receiver and is registered. Therefore, this circuit must be connected in such a manner that it can be tuned to the undesired wave and also so that the energy so picked up biases the receiving apparatus.

Take pencil and paper and jot down the figures and diagram I am about to give you.

How Circuit Is Designed.

The circuit consists of an inductance and capacity either of which may be variable. It probably is simpler to use a variable capacity or condenser as it is usually called. This variable condenser may be of the twenty-three-plate type and can be purchased for a nominal sum in any store handling radio equipment if you should not happen to have one.

Next, obtain a small inductance of about twenty-five or thirty turns of small wire, any size in the neighborhood of 24 or 26 B and S gauge, or if you have a so-called honeycomb or spiderweb coil, so much the better.

This inductance, however, easily can be made by winding about twenty-five or thirty turns of wire on a cardboard tube two or three inches in diameter. Caution! Do not wind on a metal tube.

Connect this inductance in series with the variable condenser and connect this combination across your receiving set between the antenna binding post and the ground binding post.

This is so that energy from the antenna also can flow thru the filter circuit, or, as we have described "inductance and capacity in series," thru to the ground—as well as enter the receiving set. Make sure that there is no coupling between these two circuits and in order to prevent this keep the filter circuit several feet away from the receiving apparatus.

Operating the Wave Trap.

After having done all this, we are now ready to try it out. Wait until a local station begins operating and then try and tune in another station. That means you have set your dial at the point where the desired station can be heard, but it is being interfered with by the local station.

Now adjust the variable condenser of the filter circuit until the interference has been reduced to a minimum, at the same time readjusting your receiving set so that the desired station comes in as strong as it is possible to make same. A little practice will soon enable you to obtain sharp tuning.

This filter circuit is not a hundred per cent perfect, but it is believed that for the amount of money invested and a loop as an antenna or using a few turns of wire around the molding of a room (the so-called inside antenna.)

One manufacturer has had its engineering and research department working on such circuits for nearly two years, and has perfected circuits which eliminate interference or the so-called "frying sounds."

Radio die out? Not much! And "frying" will soon be ancient history in the art of radio.

FRANCIS W. DUNMORE, an engineer in the bureau of standards, Washington, D. C., and his radio receiver which insures the private receipt of air signals, as well as transcribing them upon paper similar to the news tickets already in operation in newspaper offices. A recent demonstration before a gathering of radio engineers established the practicability of the apparatus. Its principle is to take the very faint signals received thru the air and amplify them into sufficient power to operate the ticker. Co-ordination insures privacy.

Radio Introduces Song

"Husheen, Lo!" a cradle song, was introduced for the first time to the musical public last evening from station WJAZ, the Zenith Edgewater Beach Hotel radio station, by Tony Corcoran, tenor soloist. This composition is from the pen of Miss Margaret M. Garrity, a well-known Chicago pianist.

Body Capacity in Set

Tubes that oscillate too easily are responsible quite often to "body capacity" in a set. When this is true reduction of "B" battery voltage on the plate may help.

Broadcasting Stations and Schedules

Central, or Chicago time, is shown on all stations. If necessary to ascertain local time on any station deduct two hours from time shown for Pacific coast stations, one hour from time shown for the Rocky mountain stations and add one hour to those stations using eastern time. Hawaiian island time is four hours and a half slower than Chicago time. In the list the call number of the station is first given, followed by the location, the owner's name, wave length used and broadcasting schedule in order named. THE POST is making a thoro canvass of all stations in order that this directory may be complete and accurate. Changes are so frequent in stations and schedules that no list can be satisfactory which is not corrected frequently. Corrections and additions to this list will be made from week to week. Stations are urged to co-operate by sending information of changes in schedule to Radio Editor, The Chicago Evening Post.

KDKA—East Pittsburg, Westinghouse Electric and Manufacturing company, 326 meters.
KDPM—Cleveland, Ohio, Westinghouse Electric and Manufacturing company, 270 meters.
KDPT—San Diego, Calif., Southern Electrical company, 244 meters.
KDYL—Salt Lake City, Utah, Telegram Publishing company, 360 meters.
KDYM—San Diego, Calif., Savoy theater, 252 meters.
KDYQ—Portland, Ore., Oregon Institute of Technology, 360 meters.
KDYS—Great Falls, Mont., The Tribune, 360 meters.
KDYW—Phoenix, Ariz., Smith Hughes & Co., 360 meters.
KDYX—Honolulu, Hawaii, Star Bulletin, 360 meters.
KDZB—Bakersfield, Calif., 1402 20th street, Frank E. Siefert, 240 meters.
KDZE—Seattle, Wash., The Rhodes company, 455 meters.
KDZF—Los Angeles, Calif., Automobile Club of Southern California, 278 meters.
KDZI—Wenatchee, Wash., Electric Supply company, 360 meters.
KDZK—Reno, Nev., Nevada Machinery and Electric company, 360 meters.
KDZQ—Denver, Colo., Nichols Academy of Music, 360 meters.
KDZR—Bellingham, Wash., Bellingham Publishing company, 261 meters.
KDZT—Seattle, Wash., Seattle Radio association, 360 meters.
KFAD—Phoenix, Ariz., McArthur Bros. Mercantile company, 360 meters.
KFAE—Pullman, Wash., State College of Washington, 360 meters.
KFAF—Denver, Colo., Western Radio corporation, 360 meters.
KFAJ—Boulder, Colo., University of Colorado, 360 meters.
KFAN—Moscow, Idaho, The Electric shop, 360 meters.
KFAP—Butte, Mont., Standard Publishing company, 360 meters.
KFAR—Hollywood, Calif., Studio Lighting Service company (O. K. Olsen), 280 meters.
KFAU—Boise, Idaho, Independent School District of Boise City, Boise High school, 270 meters.
KFAV—Venice, Calif., Abbot Kinney company, 224 meters.
KFAW—Santa Ana, Calif., The Radio Den (W. B. Ashford and H. T. White), 280 meters.
KFAY—Medford, Ore., Virgin's Radio service, 283 meters.
KFBB—Havre, Mont., F. A. Buttrey & Co., 360 meters.
KFBC—San Diego, Calif., W. K. Azbill, 278 meters.
KFBE—San Luis Obispo, Calif., Reuben H. Horn, 360 meters.
KFBG—Tacoma, Wash., First Presbyterian church, 360 meters.
KFBK—Sacramento, Calif., Kimball-Upson company, 283 meters.
KFBL—Everett, Wash., Leese Bros., 224 meters.
KFBS—Trinidad, Colo., Trinidad Gas and Electric Supply company and the Chronicle News, 360 meters.
KFBU—Laramie, Wyo., The Cathedral (Bishop N. S. Thomas), 283 meters.
KFCB—Phoenix, Ariz., Nielsen Radio Supply company, 238 meters.
KFCD—Salem, Ore., Salem Electric company, 360 meters.
KFCF—Walla Walla, Wash., 707 Baker building, Frank A. Moore, 360 meters.
KFCH—Billings, Mont., Electric Service station (Inc.), 360 meters.
KFCK—Colorado Springs, Colo., Colorado Springs Radio company, 258 meters.
KFCL—San Antonio, Calif., Los Angeles Union Stock yards, 360 meters.
KFCM—Richmond, Calif., Richmond Radio shop (Frank T. Doeing), 360 meters.
KFCP—Ogden, Utah, 2421 Jefferson avenue, Ralph W. Flygare, 360 meters.
KFCV—Houston, Texas, Fred Mahaffey, Jr., 360 meters.
KFCY—Le Mars, Iowa, Western Union college, 252 meters.
KFCZ—Omaha, Neb., Omaha Central High school, 258 meters.
KFDA—Baker, Ore., Adler's Music store, 360 meters.
KFDD—Boise, Idaho, St. Michael's cathedral, 252 meters.
KFDH—Tucson, Ariz., University of Arizona, 360 meters.
KFDJ—Corvallis, Ore., Oregon Agricultural college, 360 meters.
KFDL—Denver, Colo., Knight-Campbell Music company, 360 meters.
KFDO—Bozeman, Mont., 420 West Koch street, H. Everett Cutting, 248 meters.
KFDP—Des Moines, Iowa, Hawkeye Radio and Supply Co., 278 meters.
KFDR—York, Neb., Bullock's Hardware and Sporting Goods (Robert G. Bullock), 360 meters.
KFDU—Lincoln, Neb., Nebraska Radio Electric company, 240 meters.
KFDV—Fayetteville, Ark., Gilbrech & Stinson, 360 meters.
KFDX—Shreveport, La., First Baptist church, 360 meters.
KFDY—Brookings, S. D., South Dakota State College of Agriculture and Mechanic Arts, 360 meters.
KFDZ—Minneapolis, Minn., 2510 South Thomas avenue, Harry O. Iverson, 360 meters.
KFEC—Portland, Ore., Meier & Frank company, 360 meters.
KFEJ—Tacoma, Wash., 1724 South Jay street, Guy Greason, 360 meters.
KFEL—Denver, Colo., Winner Radio corporation, 360 meters.
KFEP—Denver, Colo., Radio Equipment company (Joseph L. Turre), 240 meters.
KFEQ—Oak, Neb., J. L. Scroggin, 360 meters.
KFER—Fort Dodge, Iowa, Auto Electric Service company, 231 meters.
KFEV—Douglas, Wyo., Radio Electric Shop, 263 meters.
KFEX—Minneapolis, Minn., Augsburg Seminary, 261 meters.
KFEY—Kellogg, Idaho, Bunker Hill and Sullivan Mining and Concentrating company, 360 meters.
KFEZ—St. Louis, Mo., American Society of Mechanical Engineers (F. H. Schubert), 360 meters.
KFFA—San Diego, Cal., 3443 5th street, Dr. R. O. Shelton, 242 meters.
KFFB—Boise, Idaho, Jenkins Furniture company, 240 meters.
KFFE—Pendleton, Ore., Eastern Oregon Radio company, 360 meters.
KFFO—Hillsboro, Ore., Dr. E. H. Smith, 229 meters.
KFFP—Moberly, Mo., First Baptist church, 275 meters.
KFFQ—Colorado Springs, Colo., Marksheffel Motor company, 360 meters.
KFFR—Sparks, Nev., Nevada State Journal (Jim Kirk), 226 meters.
KFFV—Lamoni, Iowa, Graceland college, 360 meters.
KFFX—Omaha, Neb., McGraw company, 278 meters.
KFFY—Alexandria, La., Pincus & Murphy, 275 meters.
KFFZ—Dallas, Tex. (portable), Al. G. Barnes Amusement company, 226 meters.
KFGG—Baton Rouge, La., Louisiana State university, 254 meters.
KFGD—Chickasha, Okla., Chickasha Radio and Electric company, 248 meters.
KFGH—Stanford University, Cal., Leland Stanford university, 360 meters.
KFGJ—St. Louis, Mo., Missouri National guard, 138th infantry, 266 meters.
KFGL—Arlington, Ore., Arlington garage, 234 meters.
KFGP—Cheney, Kan., Cheney Radio company, 229 meters.
KFGQ—Boone, Iowa, Crary Hardware company, 226 meters.
KFGV—Utica, Neb., Heidbreder Radio Supply company, 224 meters.
KFGX—Orange, Texas, First Presbyterian church, 250 meters.
KFGZ—Berrien Springs, Mich., Emmanuel Missionary college, 268 meters.
KFHA—Gunnison, Colo., Colorado State Normal school, 252 meters.
KFHB—Hood River, Ore., Rialto theater (P. L. Beardwell), 280 meters.
KFHD—St. Joseph, Mo., Utz Electric Shop company, 226 meters.
KFHF—Shreveport, La., Central Christian church, 266 meters.
KFHH—Neah Bay, Wis., Ambrose A. McCue, 283 meters.
KFHJ—Santa Barbara, Cal., Fallon & Co., 360 meters.
KFHQ—Los Gatos, Cal., Curtis Brothers Hardware store, 242 meters.
KFHR—Seattle, Wash., Star Electric and Radio company, 270 meters.
KFHS—Lihue, Hawaii, Clifford J. Dow, 275 meters.
KFHU—Mayville, N. D., M. G. Sateren, 261 meters.
KFHX—Hutchinson, Kan., 407 East 1st street, Robert W. Nelson, 229 meters.
KFI—Los Angeles, Cal., Earle C. Anthony (Inc.), 469 meters.
KFIB—St. Louis, Mo., 5666 Vernon avenue, Franklin W. Jenkins, 244 meters.
KFID—Iola, Kan., Ross Arbuckle's garage, 246 meters.
KFIF—Portland, Ore., Benson Polytechnic institute, 360 meters.
KFIK—Gldabrook, Iowa, Gladbrook Electric company, 234 meters.
KFIL—Louisburg, Kan., Windisch Electric Farm Equipment company, 234 meters.
KFIO—Spokane, Wash., North Central high school, 252 meters.
KFKX—Hastings, Neb., Westinghouse Electric and Manufacturing company, 286 meters.
KFKZ—Colorado Springs, Colo., Nassour Bros. Radio company, 234 meters.
KFLA—Butte, Mont., Abner R. Wilson, 283 meters.
KFLB—Menominee, Mich., Signal Electric Manufacturing company, 248 meters.
KFLD—Franklinton, La., Paul E. Greenlaw, 234 meters.
KFLE—Denver, Colo., National Educational Service, 268 meters.
KFLH—Salt Lake City, Utah, Erickson Radio company, 261 meters.
KFLP—Cedar Rapids, Ohio, Everette M. Foster, 240 meters.
KFLQ—Little Rock, Ark., Bizzell Radio shop, 261 meters.
KFLR—Albuquerque, N. M., University of New Mexico, 254 meters.
KGB—Tacoma, Wash., Wm. A. Mullins Electric company, 360 meters.
KGG—Portland, Ore., Hallock & Watson Radio service, 360 meters.
KGN—Portland, Ore., Northwestern Radio Manufacturing company, 360 meters.
KGU—Honolulu, Hawaii, Waikiki Beach, Marion A. Mulrony, 660 meters.
KGW—Portland Ore., Portland Morning Oregonian, 492 meters.
KGY—Lacy, Wash., St. Martins college (Rev. Sebastian Ruth), 258 meters.
KHJ—Los Angeles, Cal., Times-Mirror company, 395 meters.
KHQ—Seattle, Wash, 419 13th avenue, Louis Wasmer, 360 meters.
KJQ—Stockton, Cal., 615 East Main street, C. O. Gould, 360 meters.
KJR—Seattle, Wash., Northwest Radio Service company, 270 meters.
KJS—Los Angeles, Cal., Bible Institute of Los Angeles, 360 meters.
KLN—Monterey, Cal., Monterey Electric Shop, 360 meters.
KLS—Oakland, Cal., 2301 Telegraph avenue, Warner Brothers, 360 meters.
KLX—Oakland, Cal., Tribune Publishing company, 360 meters.
KLZ—Denver, Colo., Reynolds Radio company, 360 meters.
KMJ—Fresno, Cal., San Joaquin Light and Power corporation, 360 meters.
KMO—Tacoma, Wash., Love Electric company, 360 meters.
KNJ—Roswell, New Mexico, Roswell Public Service company, 250 meters.
KNT—Aberdeen, Wash., Grays Harbor Radio company (Walter Hemrich), 263 meters.
KNV—Los Angeles, Cal., Radio Supply company, 360 meters.
KNX—Los Angeles, Cal., Electric Lighting Supply company, 360 meters.
KOB—State College, New Mexico, New Mexico College of Agriculture and Mechanic Arts, 360 meters.
KOP—Detroit, Mich, Detroit Police department, 286 meters.
KPO—San Francisco, Cal., Hale Brothers, 423 meters.
KQI—Berkeley, Cal., University of California, 360 meters.
KQP—Hood River, Ore., Apple City Radio club, 360 meters.
KQV—Pittsburg, Pa., Doubleday-Hill Electric company, 360 meters.
KQW—San Jose, Cal., 467 1st street, Charles D. Herrold, 360 meters.
KRE—Berkeley, Cal., Berkeley Daily Gazette, 278 meters.
KSD—St. Louis, Mo., Post Dispatch (Pulitzer Publishing company), 546 meters.
KSS—Long Beach, Cal., Prest & Dean Radio company and Radio Research Society of Long Beach, Cal., 360 meters.
KTW—Seattle, Wash., First Presbyterian church, 360 meters.
KUO—San Francisco, Cal., Examiner Printing company, 360 meters.
KUS—Los Angeles, Cal., City Dye Works and Laundry company, 360 meters.
KUY—El Monte, Cal., Coast Radio company, 360 meters.
KWG—Stockton, Cal., Portable Wireless Telephone company, 360 meters.
KWH—Los Angeles, Cal., Los Angeles Examiner, 360 meters.
KXD—Modesto, Cal., Modesto Herald Publishing company, 360 meters.
KYQ—Honolulu, Hawaii, Electric Shop, 360 meters.
KYW—Chicago, Ill., Westinghouse Electric and Manufacturing company, 345 meters.
KZM—Oakland, Cal., 13th and Harrison streets, Preston D. Allen, 360 meters.
KZN—Salt Lake City, Utah, The Deseret News, 360 meters.
KZV—Wenatchee, Wash, Wenatchee Battery and Motor company, 360 meters.
WAAB—New Orleans, La., 137 South St. Patrick street, Valdemar Jepsen, 268 meters.
WAAC—New Orleans, La., Tulane university, 360 meters.
WAAD—Cincinnati, Ohio, Ohio Mechanics institute, 360 meters.
WAAF—Chicago, Ill., Chicago Daily Drovers Journal, 360 meters.
WAAH—St. Paul, Min., Commonwealth Electric company, 360 meters.
WAAK—Milwaukee, Wis., Gimbel Brothers, 280 meters.
WAAM—Newark, N. J., I. R. Nelson company, 263 meters.
WAAN—Columbia, Mo., University of Missouri, 254 meters.
WAAW—Omaha, Neb., Omaha Grain Exchange, 360 meters.
WAAZ—Emporia, Kans., Hollister-Miller Motor company, 360 meters.
WABB—Harrisburg, Pa., Dr. John B. Lawrence, 266 meters.
WABC—Anderson, Ind., Fulwider-Grimes Battery company, 229 meters.
WABD—Dayton, Ohio, Parker high school, 283 meters.
WABE—Washington, D. C., Young Men's Christian association, 283 meters.
WABF—Mount Vernon, Ill., Mount Vernon Register-News company, 234 meters.
WABG—Jacksonville, Fla., Arnold Edwards Piano company, 248 meters.
WABH—Sandusky, Ohio, Lake Shore Tire company, 240 meters.
WABI—Bangor, Me., Bangor Railway and Electric company, 240 meters.
WABA—Lake Forest, Ill., Lake Forest college, 266 meters.
WABJ—South Bend, Ind., The Radio Laboratories, 240 meters.
WABK—Worcester, Mass., First Baptist church, 252 meters.
WABL—Storrs, Conn., Connecticut Agricultural college, 283 meters.
WABM—Saginaw, Mich., F. E. Doherty Automotive and Radio Supply company, 254 meters.
WABN—La Crosse, Wis., Waldo C. Grover, 234 meters.
WABO—Rochester, N. Y., Lake Avenue Baptist church, 252 meters.
WBAA—West Lafayette, Ind., Purdue university, 360 meters.
WBAD—Minneapolis, Minn., Sterling Electric company, 360 meters.
WBAH—Minneapolis, Minn., The Dayton company, 360 meters.
WBAN—Paterson, N. J., Wireless Phone corporation, 244 meters.
WBAO—Decatur, Ill., James Millikin university, 360 meters.
WBAP—Fort Worth, Texas, Wortham-Carter Publishing company (Star-Telegram), 476 meters.
WBAV—Columbus, Ohio, Erner & Hopkins company, 390 meters.
WBAW—Marietta, Ohio, Marietta college, 246 meters.
WBAX—Wilkesbarre, Pa., 66 Gildersleeve street, John H. Stenger Jr., 360 meters.
WBAY—New York, N. Y., Western Electric company, 492 meters.
WBBA—Newark, Ohio, Newark Radio Laboratories, 240 meters.
WBBC—Sterling, Ill., Sterling Radio Equipment company, 229 meters.
WBBD—Reading, Pa., Barbey Battery Service, 234 meters.
WBL—Anthony, Kan., T & H Radio company, 261 meters.
WBS—Newark, N. J., D. W. May, Inc., 360 meters.
WBT—Charlotte, N. C.—Southern Radio corporation, 360 meters.
WBU—Chicago, Ill., City of Chicago, 286 meters.
WBZ—Springfield, Mass., Westinghouse Electric and Manufacturing company, 337 meters.
WCAD—Canton, N. Y., St. Lawrence university, 280 meters.
WCAE—Pittsburg, Pa., Kaufmann & Baer company, 462 meters.
WCAG—New Orleans, La., 2813 Calhoun street, Clyde R. Randall, 268 meters.
WCAH—Columbus, Ohio, Entrekin Electric company, 286 meters.
WCAJ—University Place, Neb., Nebraska Wesleyan university, 360 meters.
WCAK—Houston, Texas, 2504 Bagby street, Alfred P. Daniel, 360 meters.
WCAL—Northfield, Minn., St. Olaf college, 360 meters.
WCAM—Villanova, Pa., Villanova college, 360 meters.
WCAO—Baltimore, Md., Sanders & Stayman company, 360 meters.
WCAP—Washington, D. C., Chesapeake & Potomac Telephone company, 469 meters.
WCAR—San Antonio, Texas, Alamo Radio Electric company, 360 meters.
WCAS—Minneapolis, Minn., William Hood Dunwoody Industrial institute, 360 meters.
WCAT—Rapid City, S. D., South Dakota State School of Mines, 240 meters.
WCAU—Philadelphia, Pa., Durham &. Co., 286 meters.
WCAV—Little Rock, Ark., J. C. Dice Electric company, 360 meters.
WCAX—Burlington, Vt., University of Belmont, 360 meters.
WCAY—Milwaukee, Wis., Kesselman O'Driscoll company, 261 meters.
WCAZ—Carthage, Ill., Carthage college, 246 meters.
WCBA—Allentown, Pa., 1015 Allen street, Charles W. Heimbach, 280 meters.
WCBB—Greenville, Ohio, K. & K. Radio Supply company (Charles H. Katzenberger), 240 meters.
WCBD—Zion, Ill., Wilbur G. Voliva, 345 meters.
WCE—Minneapolis, Minn., Findley Electric company, 360 meters.
WCK—St. Louis, Mo., Stix, Baer & Fuller Dry Goods company, 360 meters.
WCM—Austin, Texas, University of Texas, 360 meters.
WCX—Detroit, Mich., Detroit Free Press, 517 meters.
WDAD—Lindsborg, Kans., Central Kansas Radio Supply company (Wm. L. Harrison), 360 meters.
WDAE—Tampa, Fla., Tampa Daily Times, 360 meters.
WDAF—Kansas City, Mo., Kansas City Star, 411 meters.
WDAG—Amarillo, Texas, J. Laurance Martin, 360 meters.
WDAH—El Paso, Texas, Trinity Methodist church (South), 360 meters.
WDAI—Syracuse, N. Y., Hughes Radio corporation, 246 meters.
WDAK—Hartford, Conn., The Courant, 261 meters.
WDAL—Jacksonville, Fla., Florida Times-Union, 360 meters.
WDAO—Dallas, Texas, Automotive Electric company, 360 meters.
WDAP—Chicago, Ill., Board of Trade, 360 meters.
WDAR—Philadelphia, Pa., Lit Brothers, 395 meters.
WDAS—Worcester, Mass., 692a Main street, Samuel A. Waite, 360 meters.
WDAU—New Bedford, Mass., Slocum Kilburn, 360 meters.
WDAX—Centerville, Iowa, First National bank, 360 meters.
WDAY—Fargo, N. D., Fargo Radio Service company, 244 meters.
WDBC—Lancaster, Pa., Kirk, Johnson & company, 258 meters.
WDBF—Youngstown, Ohio, 254 West Federal street, Robert G. Phillips, 261 meters.
WDM—Washington, D. C., Church of the Covenant, 360 meters.
WDT—Stapleton, N. Y., Ship Owners Radio Service, 405 meters.
WDZ—Tuscola, Ill., Star Store building, James L. Bush, 278 meters.
WEAA—Flint, Mich., Fallain & Lathrop, 280 meters.
WEAB—Fort Dodge, Iowa, Standard Radio Equipment company, 360 meters.
WEAF—New York, N. Y., American Telephone and Telegraph company, 492 meters.
WEAG—Edgewood, R. I., Nichols-Hineline-Bassett Laboratory, 231 meters.
WEAH—Wichita, Kans, Witchita Board of Trade, 244 meters.
WEAI—Ithaca, N. Y., Cornell university, 286 meters.
WEAJ—Vermilion, S. D., University of South Dakota, 360 meters.
WEAM—North Plainfield, N. J., Borough of North Plainfield (W. Gibson Buttfield), 250 meters.
WEAN—Providence, R. I., Shepard company, 273 meters.
WEAO—Columbus, Ohio, Ohio State University, 360 meters.
WEAP—Mobile, Ala., Mobile Radio company, 360 meters.
WEAR—Baltimore, Md., Baltimore American and News Publishing company, 360 meters.
WEAS—Washington, D. C., Hecht company, 360 meters.
WEAU—Sioux City, Iowa, Davidson Brothers company, 360 meters.
WEAY—Houston, Texas, Iris theater (Will Horowitz Jr.), 360 meters.
WEB—St. Louis, Mo., Benwood company, 360 meters.
WEV—Houston, Texas, Hurlburt-Still Electrical company, 360 meters.
KFIQ—Yakima, Wash., Yakima Valley Radio Broadcasting association, 224 meters.
KFIU—Juneau, Alaska, Alaska Electric Light and Power company, 226 meters.
KFIV—Pittsburg, Kan., 706 East 10th street, V. H. Broyles, 240 meters.
KFIX—Independence, Mo., Reorganized Church of Jesus Christ of Latter Day Saints, 240 meters.
KFIY—Seattle, Wash., Brott laboratories, 236 meters.
KFIZ—Fond du Lac, Wis., Daily Commonwealth, 237 meters.
KFJA—Grand Island, Neb., Central Power company, 244 meters.
KFJB—Marshalltown, Iowa, Marshalltown Electrical company, 248 meters.
KFJC—Seattle, Wash., Post Intelligencer, 233 meters.
KFJD—Greeley, Colo., Weld County Printing and Publishing company, 236 meters.
KFJF—Oklahoma City, Okla., National Radio Manufacturing company, 252 meters.
KFJH—Selma, Cal., The Sugar Bowl (H. R. Shaw), 273 meters.
KFJI—Astoria, Oreg., Liberty theater (E. E. Marsh), 252 meters.
KFJJ—Carrollton, Mo., Carrollton Radio shop, 236 meters.
KFJK—Bristow, Okla., Delano Radion and Electric company, 233 meters.
KFJL—Ottumwa, Iowa, Hardsacg Manufacturing company, 242 meters.
KFJM—Grand Forks, N. D., University of North Dakota, 229 meters.
KFJQ—Grand Forks, N. D., Electric Construction company (portable), 252 meters.
KFJR—Stevensville, Mont., Ashley C. Dixon and Son, 258 meters.
KFJV—Dexter, Iowa, Thomas H. Warren, 224 meters.
KFJW—Towanda, Kan., Le Grand Radio company, 226 meters.
KFJX—Cedar Falls, Iowa, State Teachers' college, 229 meters.
KFJY—Fort Dodge, Iowa, Tunwall Radio company, 246 meters.
KFJZ—Fort Worth, Texas, Texas National Guard, 112th Cavalry, 254 meters.
KFKA—Greeley, Colo., Colorado State Teachers' college, 248 meters.
KFKB—Milford, Kas., Brinkley-Jones Hospital association, 286 meters.
KFKH—Lakeside, Colo., Denver Park and Amusement company, 248 meters.
KFKQ—Conway, Ark., Conway Radio laboratories, 224 meters.
KFKV—Butte, Mont., F. E. Gray, 283 meters.

THE CHICAGO EVENING POST TABLOID RADIO SCHEDULES

These stations are those most commonly tuned in evenings by the Chicago broadcast listeners. The time given is central standard. Pacific coast time is two hours earlier than that shown here. Mountain time is one hour earlier, and eastern time one hour later. Evening program schedules only are given. This list was compiled by The Chicago Evening Post Radio Department and is protected by copyright.

STATION	Miles	Met	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Chicago—									
KYW, Comm. Edison Bldg		536		6:30- 9:30	6:30-12:00	6:30- 9:30	6:30- 9:30	6:30-12 m.	6:30- 9:30
WAAF, Union Stock Yards		286	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00		
WMAQ, Hotel La Salle		448		7:00- 9:55	7:00- 9:55	7:00- 9:55	7:00- 9:55	8:00-10:00	
WDAP, Drake Hotel		360		7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	9:15-10:30
WJAZ, Edgewater Beach Hotel		448		10:00-12:30	10:00-12:30	10:00-12:30	10:00-12:30	10:00- 2:00	6:00- 9:00
Suburban—									
WCBD, Zion, Ill	39	345	8:00- 9:00				8:00- 9:00		
WIAB, Rockford, Ill	77	252			8:00- 9:00				
WRM, Urbana, Ill	120	360			8:50- 9:30				
WTAS, Elgin, Ill	37	275			7:30-10:00				
Eastern—									
KDKA, East Pittsburg	430	326	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WBZ, Springfield, Mass	802	337	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	
WEAF, New York City	733	495	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10.00
WGI, Medford Hillside, Mass	875	360	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	7:30- 9:00
WHAZ, Troy, N. Y	748	380	8:00- 9:30						
WGY, Schnectady, N. Y	698	280	6:45-11:30	6:45- 9:00	6:45- 9:00	6:45- 9:00	6:45-11:30	6:45- 9:00	
WGR, Buffalo	472	319	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	
WJY, New York City	733	405							2:30- 6:00
WJZ, New York City	733	455	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	
WOO, Philadelphia	677	509	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	
WRC, Washington, D. C	612	469	8:00-10:00		8:00-10:00		8:00-10:00		
Midwest—									
WCX, Detroit	245	517	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00		
WJAX, Cleveland	323	390		7:30- 9:30		8:00-10:30			
WLAG, Minneapolis	358	417	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	
WLW, Cincinnati	262	309	8:00-10:00	10:00-12:00	8:00-10:00	10:00-12:00			
WOC, Davenport	105	481	7:00-11:00		7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WTAM, Cleveland	323	300	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30
WWJ, Detroit	245	517	8:30-10:00	8:30-10:00	8:30-10:00	8:30-12 m.	8:30-10:00		
Southern—									
KSD, St. Louis	370	546	8:00-11:00	8:00-11:00	8:00-11:00		8:00-11:00	8:00-11:00	
WBAP, Fort Worth, Texas	855	476	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00		
WDAF, Kansas City, Mo	430	411	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	
WFAA, Dallas, Texas	853	476	6:45- 9:30	6:45- 9:30	6:45- 9:30	6:45- 7:30	6:45- 9:30	6:45- 9:30	9:30-11:00
WGV, New Orleans	858	350	7:00- 8:00		7:00- 8:00			7:00- 8:00	
WHAS, Louisville	271	400			7:30- 9:00				4:00- 5:00
WHB, Kansas City, Mo	430	411		7:00- 9:00		7:00- 9:00	7:00- 9:00		8:00-10:00
WMC, Memphis	480	500		11:00-12:00			11:00-12:00	8:00-10:00	8:00-10:00
WOAI, San Antonio, Texas	1,080	385		9:30-10:30				9:30-10:30	
WOS, Jefferson City, Mo	337	441	8:00- 9:30		8:00- 9:30		8:00- 9:30		
WSB, Atlanta, Ga	605	428	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	7:30- 9:00
Pacific Coast—									
KFDB, San Francisco	1,910	509	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30
KGW, Portland, Ore	1,895	492	1:00-2 a.m.	10:00-11:00	10:00-11:00	10:00 11:00	1:00-2 a.m.	10:00-11:00	9:00-10:00
KHJ, Los Angeles	1,795	395	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	10:00-12:00
KPO, San Francisco	1,910	423	6:30-12 m.	6:30-12 m.		6:30-12 m.		6:30-12 m.	10:30-12 m.

Continued on Page 15.

Broadcasting Stations and Schedule of Programs

Continued from Page 14.

WEW—St. Louis, Mo., St. Louis University, 261 meters.
WFAA—Dallas, Texas, Dallas News and Dallas Journal, 476 meters.
WFAB—Syracuse, N. Y., 802 McBride street, Carl F. Woese, 234 meters.
WFAF—Poughkeepsie, N. Y., H. C. Spratley Radio company, 360 meters.
WFAH—Port Arthur, Texas, Electric Supply company, 360 meters.
WFAJ—Asheville, N. C., Hi-Grade Wireless Instrument company, 360 meters.
WFAM—St. Cloud, Minn., Times Publishing company, 360 meters.
WFAN—Hutchinson, Minn., Hutchinson Electric Service company, 360 meters.
WFAQ—Cameron, Mo., Missouri Wesleyan college, 360 meters.
WFAT—Sioux Falls, S. D., Daily Argus-Leader, 360 meters.
WFAV—Lincoln, Neb., University of Nebraska, department of electrical engineering, 360 meters.
WFI—Philadelphia, Pa., Strawbridge & Clothier, 395 meters.
WGAI—Lancaster, Pa., Lancaster Electric Supply and Construction company, 248 meters.
WGAN—Pensacola, Fla., 216 West Romana street, Cecil E. Lloyd, 360 meters.
WGAQ—Shreveport, La., Glenwood Radio corporation (W. G. Patterson), 360 meters.
WGAR—Fort Smith, Ark., Southwest American, 360 meters.
WGAU—Wooster, Ohio, Radio Manufacturing and Service company (Marcus G. Limb), 226 meters.
WGAW—Altoona, Pa., 1918 West Chestnut street, Ernest C. Albright, 261 meters.
WGAY—Madison, Wis., Northwestern Radio company, 360 meters.
WGAZ—South Bend, Ind., South Bend Tribune, 360 meters.
WGI—Medford Hillside, Mass., American Radio and Research corporation, 360 meters.
WGL—Philadelphia, Pa., 2303 North Broad street, Thomas F. J. Howlett, 360 meters.
WGR—Buffalo, N. Y., Federal Telephone and Telegraph company, 319 meters.
WGV—New Orleans, La., Interstate Electric company, 360 meters.
WGY—Schenectady, N. Y., General Electric company, 380 meters.
WHA—Madison, Wis., University of Wisconsin, 360 meters.
WHAA—Iowa City, Iowa, State University of Iowa, 283 meters.
WHAB—Galveston, Texas, Clark W. Thompson, 360 meters.
WHAC—Waterloo, Iowa, Cole Brothers Electric company, 360 meters.
WHAD—Milwaukee, Wis., Marquette university, 280 meters.
WHAG—Cincinnati, Ohio, University of Cincinnati, 222 meters.
WHAH—Joplin, Mo., Hafer Supply company, 360 meters.
WHAI—Davenport, Iowa, Radio Equipment and Manufacturing company, 360 meters.
WHAK—Clarksburg W. Va., Roberts Hardware company, 360 meters.
WHAL—Lansing, Mich., Lansing Capital News, 248 meters.
WHAM—Rochester, N. Y., University of Rochester (Eastman School of Music), 360 meters.
WHAP—Decatur, Ill., Otta & Kuhn, 360 meters.
WHAQ—Washington, D. C., Semmes Motor company, 360 meters.
WHAR—Atlantic City, N. J., Paramount Radio and Electric company (W. H. A. Paulus), 231 meters.
WHAS—Louisville, Ky., Courier-Journal and Louisville Times, 400 meters.
WHAV—Wilmington, Dela., Wilmington Electrical Special company, 360 meters.
WHAZ—Troy, N. Y., Rensselaer Polytechnic Institute, 380 meters.
WHB—Kansas City, Mo., Sweeney School company, 411 meters.
WHD—Morgantown, W. Va., West Virginia University, 360 meters.
WHK—Cleveland, Ohio, Radiovox company (Warren R. Cox), 360 meters.
WHN—Ridgewood, N. Y., George Schubel, 360 meters.
WIAB—Rockford, Ill., Joslyn Automobile company, 252 meters.
WIAC—Galveston, Texas, Galveston Tribune, 360 meters.
WIAD—Ocean City, N. J., Ocean City Yacht club (Howard R. Miller), 254 meters.
WIAF—New Orleans, La., 139 North Alexander street, Gustav A. DeCortin, 234 meters.
WIAH—Newton, Iowa, Continental Radio and Manufacturing company, 258 meters.
WIAI—Springfield, Mo., Heer Stores company, 360 meters.
WIAJ—Neenah, Wis., Fox River Valley Radio Supply company (Quinn Brothers), 224 meters.
WIAK—Omaha, Neb., Journal-Stockman company, 278 meters.
WIAO—Milwaukee, Wis., School of Engineering of Milwaukee, 360 meters.
WIAQ—Marion, Ind., Chronicle Publishing company, 226 meters.
WIAR—Paducah, Ky., Paducah Evening Sun, 360 meters.
WIAS—Burlington, Iowa, Home Electric company, 360 meters.
WIAT—Tarkio, Mo., Leon T. Noel, 360 meters.
WIAU—Le Mars, Iowa, American Trust and Savings bank, 360 meters.
WIK—McKeesport, Pa., K. & L. Electric company (Herbert F. Kelso and Hunter J. Lohman), 360 meters.
WIL—Washington, D. C., Continental Electric Supply company, 360 meters.
WIP—Philadelphia, Pa., Gimbel Brothers, 509 meters.
WJAB—Lincoln, Neb., American Electric company, 360 meters.
WJAD—Waco, Texas, Jackson's Radio Engineering laboratories, 360 meters.
WJAF—Muncie, Ind., Press Publishing company, 360 meters.
WJAG—Norfolk, Neb., Norfolk Daily News (Huse Publishing company), 360 meters.
WJAK—Greentown, Ind., Clifford L. White, 254 meters.
WJAM—Cedar Rapids, Iowa, 302 3d avenue, West, D. M. Perham, 268 meters.
WJAN—Peoria, Ill., Peoria Star, 280 meters.
WJAQ—Topeka, Kan, Capper Publications, 360 meters.
WJAR—Providence, R. I., The Outlet company (J. Samuels and Brother), 360 meters.
WJAS—Pittsburg, Pa., Pittsburg Radio Supply house, 360 meters.
WJAT—Marshall, Mo., Kelly-Vawter Jewelry company, 360 meters.
WJAX—Cleveland, Ohio, Union Trust company, 390 meters.
WJAZ—Chicago, Ill., Chicago Radio laboratory, 448 meters.
WJD—Granville, Ohio, Richahrd H. Howe, 229 meters.
WJH—Washington, D. C., White & Boyer company, 273 meters.
WJX—New York, N. Y., Deforest Radio Telephone and Telegraph company, 360 meters.
WJY—New York, N. Y., R. C. A. 405 meters.
WJZ—New 2York, N. Y., R. C. A., 455 meters.
WKAA—Cedar Rapids, Iowa, 1444 2d avenue, East, H. F. Paar, 268 meters.
WKAD—East Providence, R. I., Charles Loof (Cresent park), 240 meters.
WKAF—Wichita Falls, Texas, W. S. Radio Supply company, 360 meters.
WKAN—Montgomery, Ala., United Battery Service company, 226 meters.
WKAO—Cranston, R. I., Dutee W. Flint, 360 meters.
WKAQ—San Juan, P. R., Radio Corporation of Porto Rico, 360 meters.
WKAR—East Lansing, Mich., Michigan Agriculture college, 280 meters.
WKAS—Springfield, Mo., L. E. Lines Music company, 360 meters.
WKAV—Laconia, N. H., Laconia Radio club, 254 meters.
WKAW—Beloit, Wis., Turner Cycle company, 242 meters.
WKAX—Bridgeport, Conn., 1789 Park avenue, William A. MacFarlane, 231 meters.
WKAY—Gainesville, Ga., Brenau college, 280 meters.
WKC—Baltimore, Md., Joseph M. Zamoiski company, 360 meters.
WKY—Oklahoma, Okla., WKY Radio Shop, 360 meters.
WLAC—Raleigh, N. C., North Carolina State college, 360 meters.
WLAG—Minneapolis, Minn., Cutting and Washington Radio corporation, 417 meters.
WLAH—Syracuse, N. Y., 425 Brownell street, Samuel Woodworth, 234 meters.
WLAJ—Waco, Texas, Waco Electrical Supply company, 360 meters.
WLAK—Bellows Falls, Vt., Vermont Farm Machine corporation, 360 meters.
WLAL—Tulsa, Okla., Naylor Electric company, 360 meters.
WLAN—Houlton, Maine, Putnam Hardware company, 283 meters.
WLAP—Louisville, Ky., 306 West Breckenridge street, W. V. Jordon, 360 meters.
WLAQ—Kalamazoo, Mich., 108 Elm street, Arthur E. Schilling, 360 meters.
WLAT—Burlington, Iowa., Radio and Specialty company, 360 meters.
WLAV—Pensacola, Fla., Electric Shop, 254 meters.
WLAW—New York, N. Y., police department, City of New York, 360 meters.
WLAX—Greencastle, Ind., Putnam Electric company (Greencastle Community Broadcasting station), 231 meters.
WLB—Minneapolis, Minn., University of Minneosta, 360 meters.
WLW—Cincinnati, Ohio, Crosley Manufacturing company, 309 meters.
WMAB—Oklahoma, Okla., Radio Supply company, 360 meters.
WMAC—Cazenovia, N. Y., Fernwood street, J. Edw. Page (Olive B. Meredith), 261 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WMAH—Lincoln, Neb., General Supply company, 254 meters.
WMAJ—Kansas City, Mo., Drovers Telegram company, 275 meters.
WMAK—Lockport, N. Y., Norton Laboratories, 360 meters.
WMAL—Trenton, N. J., Trenton Hardware company, 256 meters.
WMAM—Beaumont, Texas, Beaumont Radio Equipment company, 360 meters.
WMAP—Easton, Pa., Utility Battery service, 246 meters.
WMAQ—Chicago, Ill., Chicago Daily News, 448 meters.
WMAV—Auburn, Ala., Alabama Polytechnic institute, 250 meters.
WMAY—St. Louis, Mo., Kingshighway Presbyterian church, 280 meters.
WMAZ—Macon, Ga., Mercer university, 268 meters.
WMC—Memphis, Tenn., "Commercial Appeal" (Commercial Publishing company), 500 meters.
WMH—Cincinnati, Ohio, Precision Equipment company, 248 meters.
WMU—Washington, D. C., Doubleday-Hill Electric company, 261 meters.
WNAC—Boston, Mass., Shepard stores, 278 meters.
WNAD—Norman, Okla, University of Oklahoma, 360 meters.
WNAL—Omaha, Neb., 5019 Capitol avenue, R. J. Rockwell, 242 meters.
WNAM—Evansville, Ind., Ideal Apparatus company, 360 meters.
WNAN—Syracuse, N. Y., Syracuse Radio Telephone company, 286 meters.
WNAP—Springfield, Ohio, Wittenberg college, 231 meters.
WNAQ—Charleston, S. C., Charleston Radio Electric company, 360 meters.
WNAR—Butler, Mo., C. C. Rhodes, 231 meters.
WNAS—Austin, Texas, Texas Radio Corporation and Austin Statesman, 360 meters.
WNAT—Philadelphia, Pa., Lemmig Brothers company (Frederick Lemmig), 360 meters.
WNAV—Knoxville, Tenn., Peoples Telephone and Telegraph company, 236 meters.
WNAW—Fort Monroe, Va., Peninsular Radio club (Henry Kunzmann), 360 meters.
WNAX—Yankton, S. D., Dakota Radio Apparatus company, 244 meters.
WNJ—Albany, N. Y., Shotton Radio Manufacturing company, 360 meters.
WOAA—Ardmore, Okla., Dr. Walter Hardy, 360 meters.
WOAC—Lima, Ohio, Maus Radio company, 266 meters.
WOAD—Sigourney, Iowa, Friday Battery and Electric corporation, 360 meters.
WOAE—Fremont, Neb., Midland college, 360 meters.
WOAF—Tyler, Texas, Tyler Commercial college, 360 meters.
WOAG—Belvidere, Ill., Apollo theater (Belvidere Amusement company), 224 meters.
WOAH—Charleston, S. C., Palmetto Radio corporation, 360 meters.
WOAI—San Antonio, Texas, Southern Equipment company, 385 meters.
WOAJ—Parsons, Kan., Ervins Electrical company, 258 meters.
WOAK—Frankfort, Ky., Collins Hardware company, 240 meters.
WOAL—Webster Groves, Mo., 4 Jefferson road, William E. Woods, 229 meters.
WOAN—Lawrenceburg, Tenn., Vaughn Conservatory of Music (James D. Vaughn), 360 meters.
WOAO—Mishawka, Ind., Lyradion Manufacturing company, 360 meters.
WOAP—Kalamazoo, Mich., Kalamazoo college, 240 meters.
WOAQ—Portsmouth, Va., Portsmouth Kiwanis club, 360 meters.
WOAT—Wilmington, Del., 215 Market street, Boyd M. Hamp, 360 meters.
WOAV—Erie, Pa., Pennsylvania National Guard, 2d Battalion, 112th Infantry, 242 meters.
WOAW—Omaha, Neb., Woodmen of the World, 526 meters.
WOAX—Trenton, N. J., 600 Ingham avenue, Franklyn K. Wolff, 240 meters.
WOAZ—Stamford, Texas, Penick Hughes company, 360 meters.
WOC—Davenport, Iowa, Palmer School of Chiropractic, 484 meters.
WOI—Ames, Iowa, Iowa State college, 360 meters.
WOK—Pine Bluff, Ark., Pine Bluff company, 360 meters.
WOO—Philadelphia, Pa., 13th and Market streets, John Wanamaker, 509 meters.
WOQ—Kansas City, Mo., Western Radio company, 360 meters.
WOR—Newark, N. J., L. Bamberger & Co., 405 meters.
WOS—Jefferson City, Mo., Missouri State Marketing bureau, 441 meters.
WPAB—State College, Pa., Pennsylvania State college, 360 meters.
WPAC—Okmulgee, Okla., Donaldson Radio company, 360 meters.
WPAD—Chicago, Ill., W. A. Wieboldt & Co., 360 meters.
WPAH—Waupaca, Wis., Wisconsin department of markets, 360 meters.
WPAJ—New Haven, Conn., Doolittle Radio corporation, 268 meters.
WPAK—Agricultural College, N. D., North Dakota Agricultural college, 360 meters.
WPAL—Columbus, Ohio, Superior Radio and Telegraph Equipment company, 286 meters.
WPAM—Topeka, Kan., Auerbach & Guettel, 360 meters.
WPAP—Winchester, Ky., 222 Lexington avenue, Theodore D. Phillips, 360 meters.
WPAQ—Frostburg, Md., General Sales and Engineering company, 360 meters.
WPAR—Beloit, Kan., Ward Battery and Radio company, 360 meters.
WPAT—El Paso, Texas, St. Patrick's cathedral, 360 meters.
WPAU—Moorhead, Minn., Concordia college, 360 meters.
WPAZ—Charleston, W. Va., Dr. John R. Koch, 273 meters.
WPG—New Lebannon, Ohio, Nushawg Poultry farm, 234 meters.
WQAA—Parkersburg, Pa., Horace A. Beale, Jr., 360 meters.
WQAB—Springfield, Mo., Southwest Missouri State Teachers' college, 236 meters.
WQAC—Amarillo, Texas, 108 East 8th street, E. B. Gish, 360 meters.
WQAD—Waterbury, Conn., Whitall Electric company, 242 meters.
WQAE—Springfield, Vt., Moore Radio News station (Edmund B. Moore), 275 meters.
WQAF—Sandusky, Ohio, Sandusky Register, 240 meters.
WQAH—Lexington, Ky., Brock-Anderson Electrical Engineering company, 254 meters.
WQAI—Mattoon, Ill., Coles County Telephone and Telegraph company, 258 meters.
WQAM—Miami, Fla., Electrical Equipment company, 360 meters.
WQAN—Scranton, Pa., Scranton Times, 280 meters.
WQAO—New York, N. Y., Calvary Baptist church, 360 meters.
WQAQ—Abilene, Texas, West Texas Radio company, 360 meters.
WQAS—Lowell, Mass., Prince-Walter company, 266 meters.
WQAV—Greenville, S. C., Huntington and Guerry (Inc.), 258 meters.
WQAW—Washington, D. C., Catholic university, 236 meters.
WQAX—Peoria, Ill., Radio Euipment company, 360 meters.
WQAZ—Greensboro, N. C., Greensboro Daily News, 360 meters.
WRAA—Houston, Texas, Rice institute, 360 meters.
WRAD—Marion, Kan., Taylor Radio shop (G. L. Taylor), 360 meters.
WRAF—Laporte, Ind., The Radio club (Inc.), 224 meters.
WRAH—Providence, R. I., Stanley N. Read, 231 meters.
WRAL—St. Croix Falls, Wis., Northern States Power company, 248 meters.
WRAN—Waterloo, Iowa, Black Hawk Electrical company, 236 meters.
WRAO—St. Louis, Mo., Radio Service company, 360 meters.
WRAP—Winter Park, Fla., Winter Park Electrical Construction company, 360 meters.
WRAU—Amarillo, Texas, Amarillo Daily News, 360 meters.
WRAV—Yellow Springs, Ohio, Antioch college, 360 meters.
WRAW—Reading, Pa., Avenue Radio shop (Horace D. Good), 238 meters.
WRAX—Gloucester City, N. J., Flaxon's garage, 268 meters.
WRAY—Scranton, Pa., Radio Sales corporation, 280 meters.
WRAZ—Newark, N. J., Radio Shop of Newark (Herman Lubinsky), 233 meters.
WRC—Washington, D. C., Radio Corporation of America.
WRK—Hamilton, Ohio, Doron Bros. Electric company, 360 meters.
WRL—Schenectady, N. Y., Union college, 360 meters.
WRM—Urbana, Ill., University of Illinois, 360 meters.
WRR—Dallas, Texas, City of Dallas (police and fire signal department), 360 meters.
WRW—Tarrytown, N. Y., Tarrytown Radio Research laboratory, 273 meters.
WSAB—Cape Girardeau, Mo., Southeast Missouri State Teachers' college, 360 meters.
WSAC—Clemson College, S. C., Clemson Agricultural college, 360 meters.
WSAD—Providence, R. I., J. A. Foster company, 261 meters.
WSAG—St. Petersburg, Fla., City of St. Petersburg (Loren V. Davis), 244 meters.
WSAH—Chicago, Ill., 4801 Woodlawn avenue, A. J. Leonard, Jr., 248 meters.
WSAI—Cincinnati, Ohio, United States Playing Cards company, 309 meters.
WSAJ—Grove City, Pa., Grove City college, 360 meters.
ESAK—Middleport, Ohio, Foster Egner (Daily News, Pomeroy, Ohio), 258 meters.
WSAL—Brookville, Ind., Franklin Electric company, 246 meters.
WSAN—Allentown, Pa., Allentown Radio club, 229 meters.
WSAP—New York, N. Y., Seventh Day Adventist church, 360 meters.
WSAR—Fall River, Mass., Doughty & Welch Electrical company, 254 meters.
WSAT—Plainview, Texas, Donohoo-Ware Hardware company, 268 meters.
WSAU—Chesham, N. H., Camp Marienfeld, 229 meters.
WSAW—Canandaigua, N. Y., Curtice and McElwee, 275 meters.
WSAX—Chicago, Ill., Chicago Radio laboratory, 268 meters.
WSAY—Port Chester, N. Y., Port Chester Chamber of Commerce, 233 meters.
WSB—Atlanta, Ga., Atlanta Journal, 429 meters.
WSL—Utica, N. Y., J. and M. Electrical company, 273 meters.
WSY—Birmingham, Ala., Alabama Power company, 360 meters.
WTAB—Fall River, Mass., Fall River Daily Herald Publishing company, 248 meters.
WTAC—Johnstown, Pa., Penn Traffic company, 360 meters.
WTAD—Carthage, Ill., First Presbyterian church, 229 meters.
WTAF—New Orleans, La., Louis J. Gallo, 242 meters.
WTAH—Belvidere, Ill., Carmen Ferro, 236 meters.
WTAG—Providence, R. I., Kern Music company, 258 meters.
WTAJ—Portland, Me., The Radio shop, 236 meters.
WTAL—Toledo, Ohio, Toledo Radio and Electric company, wave length unrecorded.
WTAM—Cleveland, Ohio, Willard Storage Battery company, 390 meters.
WTAN—Mattoon, Ill., Orndorff Radio shop, 240 meters.
WTAP—Cambridge, Ill., Cambridge Radio and Electric company, 242 meters.
WTAQ—Osseo, Wis., S. H. Van Gordon and Son, 226 meters.
WTAR—Norfolk, Va., Reliance Electric company, 226 meters.
WTAS—Elgin, Ill., (near) R. F. D. 6, Box 75, Charles E. Erbstein, 275 meters.
WTAT—Boston, Mass., Edison Electric Illuminating company, portable, 244 meters.
WTAU—Tecumseh, Neb., Ruegg Battery and Electric company, 360 meters.
WTAW—College Station, Texas, Agricultural and Mechanical college of Texas, 280 meters.
WTAX—Streator, Ill., Williams Hardware company, 231 meters.
WTAY—Oak Park, Ill., Iodar-Oak Leaves Broadcasting station, 226 meters.
WTAZ—Lambertville, N. J., Thomas J. McGuire, 283 meters.
WTG—Manhattan, Kans., Kansas State Agricultural college, 485 meters.
WWAB—Trenton, N. J., Hoenig, Swern & Co., 226 meters.
WWAC—Waco, Texas, Sanger Brothers, 360 meters.
WWAD—Philadelphia, Pa., Wright & Wright, (Inc.), 360 meters.
WWAX—Laredo, Texas, Wormser Brothers, 360 meters.
WWB—Canton, Ohio, Daily News Printing company, 268 meters.
WWI—Dearborn, Mich., Ford Motor company, 273 meters.
WWJ—Detroit, Mich., Detroit News (Evening News association), 517 meters.
WWL—New Orleans, La., Loyola university, 280 meters.
WWZ—New York, N. Y., John Wanamaker, 360 meters.
WZAZ—Pomeroy, Ohio, Chase Electric, 258 meters.

Learn Code, Tip to Radiophans

Listeners-in complain that amateurs interfere with broadcasting. They do not actually know who is interfering, but simply that some one transmitting code is interfering with their reception. Half the time it is probably ships which are sending or shore stations handling regular commercial work.

What these listeners-in should do, department of commerce officials say, is to learn to read code so they can identify the senders, getting the calls in order to report the offending stations if violations are found. Besides reporting the call letters of amateurs breaking the regulations, efforts should also be made to ascertain and report the wave length used.

Here is a real service those who own receiving sets can render simply by learning the code and reporting breaches of regulations to the district radio supervisors or the department proper. Present regulations make the air free to amateurs on 150 to 200 meter waves, except between 8 and 10:30 p. m.

Amateurs have the right to use spark or tube sets; those owning tube sets can communicate by either code or voice. Broadcasting, as such, is forbidden amateurs; that is, music and entertainment cannot be sent out, but two station owners may converse, except in the evening broadcasting period. Special amateurs have the privilege of using wave lengths as high as 220 mefers.

International Morse is the code used by amateurs, and its rudiments should be mastered within a few months. Amateurs must obtain a government license to transmit.

Distortion in Amplifier

Amplifier distortion often is due to a poorly designed coupling transformer, in either audio or radio-frequency cascade amplification. The remedy, of course, is a properly designed transformer.

Radio-Movie Wanted

Scenario writers now have their opportunity in radio—and radiophans in the movies.

Dr. Lee de Forest has offered the use of his invention, the phonofilm, or talking movie machine, for the projection of a movie by radio.

To this end, he has sent out a call for a radio comedy to be produced by the phonofilm-radio method. Every phan in the country may submit a scenario.

The writer whose scenario is chosen for this unique entertainment will not only receive nation wide fame thru broadcasting of his film, but will get material compensation in the form of a modern reflex set from the De Forest company.

Scenarios may be sent to Dr. Lee de Forest, 220 West 42d street, New York city.

Finds Potentiometer in Aerial Aids Receiver

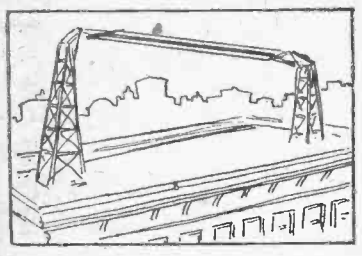
In receivers utilizing the principle of regeneration it is not always a simple matter to control the functioning of the vacuum tube closely enough to permit the greatest amplification of the signal without squealing caused by local oscillations in the tube.

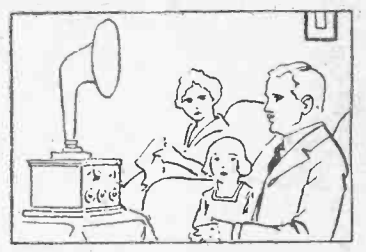
While experimenting with a set of this type an amateur has discovered that an ordinary potentiometer of 200 to 400 ohms resistance inserted in the aerial lead-in wire makes it possible to carry regeneration to a higher degree without affecting the stability of the tube.

Without some such scheme as this it is not possible to reach the maximum in regeneration before tube oscillations commence.

THE CHICAGO EVENING POST

RADIO MAGAZINE





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BROADCASTING

HOME RADIO

RADIO SETS

HOOK-UPS

AMATEUR RECEPTION

HOME-WORKSHOP

RADIO SCIENCE-

RADIO PROGRAMS

LOCAL NEWS

U.S. RADIO NEWS

HOME LABORATORY

AMATEUR TRANSMISSION

RADIO STATIONS

INVENTIONS

D.X. RECORDS

RADIO PRACTICE-

COMMERCIAL

CLAUDIA MUZIO of the Chicago Civic Opera company, shown above, sings the stellar role, Madame de Coigny, in "Andrea Chenier," this evening at the Auditorium. This opera will be broadcast from WMAQ station. It goes on the air at 8 p. m.

FOREIGN RADIO NEWS

MANUFACTURERS NEWS

NEW EQUIPMENT

DEALERS NEWS

JOBBER NEWS

IN THIS ISSUE

Announcement of a New Audion Tube That May Upset the Radio World and Revolutionize the Industry—How to Make a Home-Built Push and Pull Amplifier—Chicagoans Hear European Broadcasters—Notes on Tuning Autoplex One-Tube, Loud Speaker Receiver.

Broadcasting Stations and Schedules

Central, or Chicago time, is shown on all stations. If necessary to ascertain local time on any station deduct two hours from time shown for Pacific coast stations, one hour from time shown for the Rocky mountain stations and add one hour to those stations using eastern time. Hawaiian island time is four hours and a half slower than Chicago time. In the list the call number of the station is first given, followed by the location, the owner's name, wave length used and broadcasting schedule in order named. THE POST is making a thoro canvass of all stations in order that this directory may be complete and accurate. Changes are so frequent in stations and schedules that no list can be satisfactory which is not corrected frequently. Corrections and additions to this list will be made from week to week. Stations are urged to co-operate by sending information of changes in schedule to Radio Editor, The Chicago Evening Post.

KDKA—East Pittsburg, Westinghouse Electric and Manufacturing company, 326 meters.
KDPM—Cleveland, Ohio, Westinghouse Electric and Manufacturing company, 270 meters.
KDPT—San Diego, Calif., Southern Electrical company, 244 meters.
KDYL—Salt Lake City, Utah, Telegram Publishing company, 360 meters.
KDYM—San Diego, Calif., Savoy theater, 252 meters.
KDYQ—Portland, Ore., Oregon Institute of Technology, 360 meters.
KDYS—Great Falls, Mont., The Tribune, 360 meters.
KDYW—Phoenix, Ariz., Smith Hughes & Co., 360 meters.
KDYX—Honolulu, Hawaii, Star Bulletin, 360 meters.
KDZB—Bakersfield, Calif., 1402 20th street, Frank E. Siefert, 240 meters.
KDZE—Seattle, Wash., The Rhodes company, 455 meters.
KDZF—Los Angeles, Calif., Automobile Club of Southern California, 278 meters.
KDZI—Wenatchee, Wash., Electric Supply company, 360 meters.
KDZK—Reno, Nev., Nevada Machinery and Electric company, 360 meters.
KDZQ—Denver, Colo., Nichols Academy of Music, 360 meters.
KDZR—Bellingham, Wash., Bellingham Publishing company, 261 meters.
KDZT—Seattle, Wash., Seattle Radio association, 360 meters.
KFAD—Phoenix, Ariz., McArthur Bros. Mercantile company, 360 meters.
KFAE—Pullman, Wash., State College of Washington, 360 meters.
KFAF—Denver, Colo., Western Radio corporation, 360 meters.
KFAJ—Boulder, Colo., University of Colorado, 360 meters.
KFAN—Moscow, Idaho, The Electric shop, 360 meters.
KFAP—Butte, Mont., Standard Publishing company, 360 meters.
KFAR—Hollywood, Calif., Studio Lighting Service company (O. K. Olsen), 280 meters.
KFAU—Boise, Idaho, Independent School District of Boise City, Boise High school, 270 meters.
KFAV—Venice, Calif., Abbot Kinney company, 224 meters.
KFAW—Santa Ana, Calif., The Radio Den (W. B. Ashford and H. T. White), 280 meters.
KFAY—Medford, Ore., Virgin's Radio service, 283 meters.
KFBB—Havre, Mont., F. A. Buttrey & Co., 360 meters.
KFBC—San Diego, Calif., W. K. Azbill, 278 meters.
KFBE—San Luis Obispo, Calif., Reuben H. Horn, 360 meters.
KFBG—Tacoma, Wash., First Presbyterian church, 360 meters.
KFBK—Sacramento, Calif., Kimball-Upson company, 283 meters.
KFBL—Everett, Wash., Leese Bros., 224 meters.
KFBS—Trinidad, Colo., Trinidad Gas and Electric Supply company and the Chronicle News, 360 meters.
KFBU—Laramie, Wyo., The Cathedral (Bishop N. S. Thomas), 283 meters.
KFCB—Phoenix, Ariz., Nielsen Radio Supply company, 238 meters.
KFCD—Salem, Ore., Salem Electric company, 360 meters.
KFCF—Walla Walla, Wash., 707 Baker building, Frank A. Moore, 360 meters.
KFCH—Billings, Mont., Electric Service station (Inc.), 360 meters.
KFCK—Colorado Springs, Colo., Colorado Springs Radio company, 258 meters.
KFCL—San Antonio, Calif., Los Angeles Union Stock yards, 360 meters.
KFCM—Richmond, Calif., Richmond Radio shop (Frank T. Doeing), 360 meters.
KFCP—Ogden, Utah, 2421 Jefferson avenue, Ralph W. Flygare, 360 meters.
KFCV—Houston, Texas, Fred Mahaffey, Jr., 360 meters.
KFCY—Le Mars, Iowa, Western Union college, 252 meters.
KFCZ—Omaha, Neb., Omaha Central High school, 258 meters.
KFDA—Baker, Ore., Adler's Music store, 360 meters.
KFDD—Boise, Idaho, St. Michael's cathedral, 252 meters.
KFDH—Tucson, Ariz., University of Arizona, 360 meters.
KFDJ—Corvallis, Ore., Oregon Agricultural college, 360 meters.
KFDL—Denver, Colo., Knight-Campbell Music company, 360 meters.
KFDO—Bozeman, Mont., 420 West Koch street, H. Everett Cutting, 248 meters.
KFDP—Des Moines, Iowa, Hawkeye Radio and Supply Co., 278 meters.
KFDR—York, Neb., Bullock's Hardware and Sporting Goods (Robert G. Bullock), 360 meters.
KFDU—Lincoln, Neb., Nebraska Radio Electric company, 240 meters.
KFDV—Fayetteville, Ark., Gilbrech & Stinson, 360 meters.
KFDX—Shreveport, La., First Baptist church, 360 meters.
KFDY—Brookings, S. D., South Dakota State College of Agriculture and Mechanic Arts, 360 meters.
KFDZ—Minneapolis, Minn., 2510 South Thomas avenue, Harry O. Iverson, 360 meters.
KFEC—Portland, Ore., Meier & Frank company, 360 meters.
KFEJ—Tacoma, Wash., 1724 South Jay street, Guy Greason, 360 meters.
KFEL—Denver, Colo., Winner Radio corporation, 360 meters.
KFEP—Denver, Colo., Radio Equipment company (Joseph L. Turre), 240 meters.
KFEQ—Oak, Neb., J. L. Scroggin, 360 meters.
KFER—Fort Dodge, Iowa, Auto Electric Service company, 231 meters.
KFEV—Douglas, Wyo., Radio Electric Shop, 263 meters.
KFEX—Minneapolis, Minn., Augsburg Seminary, 261 meters.
KFEY—Kellogg, Idaho, Bunker Hill and Sullivan Mining and Concentrating company, 360 meters.
KFEZ—St. Louis, Mo., American Society of Mechanical Engineers (F. H. Schubert), 360 meters.
KFFA—San Diego, Cal., 3443 5th street, Dr. R. O. Shelton, 242 meters.
KFFB—Boise, Idaho, Jenkins Furniture company, 240 meters.
KFFE—Pendleton, Ore., Eastern Oregon Radio company, 360 meters.
KFFO—Hillsboro, Ore., Dr. E. H. Smith, 229 meters.
KFFP—Moberly, Mo., First Baptist church, 275 meters.
KFFQ—Colorado Springs, Colo., Markaheffel Motor company, 360 meters.
KFFR—Sparks, Nev., Nevada State Journal (Jim Kirk), 226 meters.
KFFV—Lamoni, Iowa, Graceland college, 360 meters.
KFFX—Omaha, Neb., McGraw company, 278 meters.
KFFY—Alexandria, La., Pincus & Murphy, 275 meters.
KFFZ—Dallas, Tex. (portable), Al. G. Barnes Amusement company, 226 meters.
KFGG—Baton Rouge, La., Louisiana State university, 254 meters.
KFGB—Chickasha, Okla., Chickasha Radio and Electric company, 240 meters.
KFGH—Stanford University, Cal., Leland Stanford university, 360 meters.
KFGJ—St. Louis, Mo., Missouri National guard, 138th infantry, 266 meters.
KFGL—Arlington, Ore., Arlington garage, 234 meters.
KFGP—Cheney, Kan., Cheney Radio company, 228 meters.
KFGQ—Boone, Iowa, Crary Hardware company, 226 meters.
KFGV—Utica, Neb., Heidbreder Radio Supply company, 224 meters.
KFGX—Orange, Texas, First Presbyterian church, 250 meters.
KFGZ—Berrien Springs, Mich., Emmanuel Missionary college, 268 meters.
KFHA—Gunnison, Colo., Colorado State Normal school, 252 meters.
KFHB—Hood River, Ore., Rialto theater (P. L. Beardwell), 280 meters.
KFHD—St. Joseph, Mo., Utz Electric Shop company, 226 meters.
KFHF—Shreveport, La., Central Christian church, 266 meters.
KFHH—Neah Bay, Wis., Ambrose A. McCue, 283 meters.
KFHJ—Santa Barbara, Cal., Fallon & Co., 360 meters.
KFHQ—Los Gatos, Cal., Curtis Brothers Hardware store, 242 meters.
KFHR—Seattle, Wash., Star Electric and Radio company, 270 meters.
KFHS—Lihue, Hawaii, Clifford J. Dow, 275 meters.
KFHU—Mayville, N. D., M. G. Sateren, 261 meters.
KFHX—Hutchinson, Kan., 407 East 1st street, Robert W. Nelson, 229 meters.
KFI—Los Angeles, Cal., Earle C. Anthony (Inc.), 469 meters.
KFIB—St. Louis, Mo., 5666 Vernon avenue, Franklin W. Jenkins, 244 meters.
KFID—Jola, Kan., Ross Arbuckle's garage, 246 meters.
KFIF—Portland, Ore., Benson Polytechnic institute, 360 meters.
KFIK—Gildabrook, Iowa, Gladbrook Electric company, 234 meters.
KFIL—Louisburg, Kan., Windisch Electric Farm Equipment company, 234 meters.
KFIO—Spokane, Wash., North Central high school, 252 meters.
KFIQ—Yakima, Wash., Yakima Valley Radio Broadcasting association, 224 meters.
KFIU—Juneau, Alaska, Alaska Electric Light and Power company, 226 meters.
KFIV—Pittsburg, Kan., 706 East 10th street, V. H. Broyles, 240 meters.
KFIX—Independence, Mo., Reorganized Church of Jesus Christ of Latter Day Saints, 240 meters.
KFIY—Seattle, Wash., Brott laboratories, 236 meters.
KFIZ—Fond du Lac, Wis., Daily Commonwealth, 237 meters.
KFJA—Grand Island, Neb., Central Power company, 244 meters.
KFJB—Marshalltown, Iowa, Marshalltown Electrical company, 248 meters.
KFJC—Seattle, Wash., Post Intelligencer, 233 meters.
KFJD—Greeley, Colo., Weld County Printing and Publishing company, 236 meters.
KFJF—Oklahoma City, Okla., National Radio Manufacturing company, 252 meters.
KFJH—Selma, Cal., The Sugar Bowl (H. R. Shaw), 273 meters.
KFJI—Astoria, Oreg., Liberty theater (E. E. Marsh), 252 meters.
KFJJ—Carrollton, Mo., Carrollton Radio shop, 236 meters.
KFJK—Bristow, Okla., Delano Radion and Electric company, 233 meters.
KFJL—Ottumwa, Iowa, Hardsacg Manufacturing company, 242 meters.
KFJM—Grand Forks, N. D., University of North Dakota, 229 meters.
KFJQ—Grand Forks, N. D., Electric Construction company (portable), 252 meters.
KFJR—Stevensville, Mont., Ashley C. Dixon and Son, 258 meters.
KFJV—Dexter, Iowa, Thomas H. Warren, 224 meters.
KFJW—Towanda, Kan., Le Grand Radio company, 226 meters.
KFJX—Cedar Falls, Iowa, State Teachers' college, 229 meters.
KFJY—Fort Dodge, Iowa, Tunwall Radio company, 246 meters.
KFJZ—Fort Worth, Texas, Texas National Guard, 112th Cavalry, 254 meters.
KFKA—Greeley, Colo., Colorado State Teachers' college, 248 meters.
KFKB—Milford, Kas., Brinkley-Jones Hospital association, 288 meters.
KFKM—Lakeside, Colo., Denver Park and Amusement company, 248 meters.
KFKQ—Conway, Ark., Conway Radio laboratories, 224 meters.
KFKV—Butte, Mont., F. F. Gray, 283 meters.
KFKX—Hastings, Neb., Westinghouse Electric and Manufacturing company, 286 meters.
KFKZ—Colorado Springs, Colo., Nassour Bros. Radio company, 234 meters.
KFLA—Butte, Mont., Abner R. Wilson, 283 meters.
KFLB—Menominee, Mich., Signal Electric Manufacturing company, 248 meters.
KFLD—Franklinton, La., Paul E. Greenlaw, 234 meters.
KFLE—Denver, Colo., National Educational Service, 268 meters.
KFLH—Salt Lake City, Utah, Erickson Radio company, 261 meters.
KFLP—Cedar Rapids, Ohio, Everette M. Foster, 240 meters.
KFLQ—Little Rock, Ark., Bizzell Radio shop, 261 meters.
KFLR—Albuquerque, N. M., University of New Mexico, 254 meters.
KGB—Tacoma, Wash., Wm. A. Mullins Electric company, 360 meters.
KGG—Portland, Ore., Hallock & Watson Radio service, 360 meters.
KGN—Portland, Ore., Northwestern Radio Manufacturing company, 360 meters.
KGU—Honolulu, Hawaii, Waikiki Beach, Marion A. Mulrony, 360 meters.
KGW—Portland Ore., Portland Morning Oregonian, 492 meters.
KGY—Lacy, Wash., St. Martins college (Rev. Sebastian Ruth), 258 meters.
KHJ—Los Angeles, Cal., Times-Mirror company, 395 meters.
KHQ—Seattle, Wash. 419 13th avenue, Louis Wasmer, 360 meters.
KJQ—Stockton, Cal., 615 East Main street, C. O. Gould, 360 meters.
KJR—Seattle, Wash. Northwest Radio Service company, 270 meters.
KJS—Los Angeles, Cal., Bible Institute of Los Angeles, 360 meters.
KLN—Monterey, Cal., Monterey Electric Shop, 360 meters.
KLS—Oakland, Cal., 2201 Telegraph avenue, Warner Brothers, 360 meters.
KLX—Oakland, Cal., Tribune Publishing company, 360 meters.
KLZ—Denver, Colo., Reynolds Radio company, 360 meters.
KMJ—Fresno, Cal., San Joaquin Light and Power corporation, 360 meters.
KMO—Tacoma, Wash., Love Electric company, 360 meters.
KNJ—Roswell, New Mexico, Roswell Public Service company, 250 meters.
KNT—Aberdeen, Wash., Grays Harbor Radio company (Walter Hemrich), 263 meters.
KNV—Los Angeles, Cal., Radio Supply company, 360 meters.
KNX—Los Angeles, Cal., Electric Lighting Supply company, 360 meters.
KOB—State College, New Mexico, New Mexico College of Agriculture and Mechanic Arts, 360 meters.
KOP—Detroit, Mich, Detroit Police department, 286 meters.
KPO—San Francisco, Cal., Hale Brothers, 428 meters.
KQI—Berkeley, Cal., University of California, 360 meters.
KQP—Hood River, Ore., Apple City Radio club, 360 meters.
KQV—Pittsburg, Pa., Doubleday-Hill Electric company, 390 meters.
KQW—San Jose, Cal., 467 1st street, Charles D. Herrold, 360 meters.
KRE—Berkeley, Cal., Berkeley Daily Gazette, 278 meters.
KSD—St. Louis, Mo., Post Dispatch (Pulitzer Publishing company), 546 meters.
KSS—Long Beach, Cal., Frost & Dean Radio company and Radio Research Society of Long Beach, Cal., 360 meters.
KTW—Seattle, Wash., First Presbyterian church, 360 meters.
KUO—San Francisco, Cal., Examiner Printing company, 360 meters.
KUS—Los Angeles, Cal., City Dye Works and Laundry company, 360 meters.
KUY—El Monte, Cal., Coast Radio company, 360 meters.
KWG—Stockton, Cal., Portable Wireless Telephone company, 360 meters.
KWH—Los Angeles, Cal., Los Angeles Examiner, 360 meters.
KXD—Modesto, Cal., Modesto Herald Publishing company, 360 meters.
KYQ—Honolulu, Hawaii, Electric Shop, 360 meters.
KYW—Chicago, Ill., Westinghouse Electric and Manufacturing company, 345 meters.
KZH—Oakland, Cal., 13th and Harrison streets, Preston D. Allen, 360 meters.
KZN—Salt Lake City, Utah, The Deseret News, 360 meters.
KZV—Wenatchee, Wash, Wenatchee Battery and Motor company, 360 meters.
WAAB—New Orleans, La., 137 South St. Patrick street, Valdemar Jensen, 268 meters.
WAAC—New Orleans, La., Tulane university, 360 meters.
WAAD—Cincinnati, Ohio, Ohio Mechanics institute, 360 meters.
WAAE—Chicago, Ill., Chicago Daily Drovers Journal, 360 meters.
WAAH—St. Paul, Min., Commonwealth Electric company, 360 meters.
WAAK—Milwaukee, Wis., Gimbel Brothers, 280 meters.
WAAM—Newark, N. J., I. R. Nelson company, 263 meters.
WAAN—Columbia, Mo., University of Missouri, 254 meters.
WAAW—Omaha, Neb., Omaha Grain Exchange, 360 meters.
WAAZ—Emporia, Kans., Hollister-Miller Motor company, 360 meters.
WABB—Harrisburg, Pa., Dr. John B. Lawrence, 266 meters.
WABC—Anderson, Ind., Fulwider-Grimes Battery company, 229 meters.
WABD—Dayton, Ohio, Parker high school, 283 meters.
WABE—Washington, D. C., Young Men's Christian association, 283 meters.
WABF—Mount Vernon, Ill., Mount Vernon Register-News company, 234 meters.
WABG—Jacksonville, Fla., Arnold Edwards Piano company, 248 meters.
WABH—Sandusky, Ohio, Lake Shore Tire company, 240 meters.
WABI—Bangor, Me., Bangor Railway and Electric company, 240 meters.
WABA—Lake Forest, Ill., Lake Forest college, 266 meters.
WABJ—South Bend, Ind., The Radio Laboratories, 240 meters.
WABK—Worcester, Mass., First Baptist church, 252 meters.
WABL—Storrs, Conn., Connecticut Agricultural college, 283 meters.
WABM—Saginaw, Mich., F. E. Doherty Automotive and Radio Supply company, 254 meters.
WABN—La Crosse, Wis., Waldo C. Grover, 234 meters.
WABO—Rochester, N. Y., Lake Avenue Baptist church, 252 meters.
WBAA—West Lafayette, Ind., Purdue university, 360 meters.
WBAD—Minneapolis, Minn., Sterling Electric company, 360 meters.
WBAH—Minneapolis, Minn., The Dayton company, 360 meters.
WBAN—Paterson, N. J., Wireless Phone corporation, 244 meters.
WBAO—Decatur, Ill., James Millikin university, 360 meters.
WBAP—Fort Worth, Texas, Wortham-Carter Publishing company (Star-Telegram), 476 meters.
WBAV—Columbus, Ohio, Erner & Hopkins company, 390 meters.
WBAW—Marietta, Ohio, Marietta college, 246 meters.
WBAX—Wilkesbarre, Pa., 66 Gildersleeve street, John H. Stenger Jr., 360 meters.
WBAY—New York, N. Y., Western Electric company, 492 meters.
WBBA—Newark, Ohio, Newark Radio Laboratories, 240 meters.
WBBC—Sterling, Ill., Sterling Radio Equipment company, 229 meters.
WBBD—Reading, Pa., Barbey Battery Service, 234 meters.
WBL—Anthony, Kan., T & H. Radio company, 261 meters.
WBS—Newark, N. J., D. W. May, Inc., 360 meters.
WBT—Charlotte, N. C., Southern Radio corporation, 360 meters.
WBU—Chicago, Ill., City of Chicago, 286 meters.
WBZ—Springfield, Mass., Westinghouse Electric and Manufacturing company, 337 meters.
WCAD—Canton, N. Y., St. Lawrence university, 280 meters.
WCAE—Pittsburg, Pa., Kaufmann & Baer company, 462 meters.
WCAG—New Orleans, La., 2813 Calhoun street, Clyde R. Randall, 268 meters.
WCAH—Columbus, Ohio, Entrekin Electric company, 286 meters.
WCAJ—University Place, Neb., Nebraska Wesleyan university, 360 meters.
WCAK—Houston, Texas, 2504 Bagby street, Alfred P. Daniel, 360 meters.
WCAL—Northfield, Minn., St. Olaf college, 360 meters.
WCAM—Villanova, Pa., Villanova college, 360 meters.
WCAO—Baltimore, Md., Sanders & Stayman company, 360 meters.
WCAP—Washington, D. C., Chesapeake & Potomac Telephone company, 469 meters.
WCAR—San Antonio, Texas, Alamo Radio Electric company, 360 meters.
WCAS—Minneapolis, Minn., William Hood Dunwoody Industrial institute, 360 meters.
WCAT—Rapid City, S. D., South Dakota State School of Mines, 240 meters.
WCAU—Philadelphia, Pa., Durham &. Co., 286 meters.
WCAV—Little Rock, Ark., J. C. Dice Electric company, 360 meters.
WCAX—Burlington, Vt., University of Belmont, 360 meters.
WCAY—Milwaukee, Wis., Kesselman O'Driscoll company, 261 meters.
WCAZ—Carthage, Ill., Carthage college, 246 meters.
WCBA—Allentown, Pa., 1015 Allen street, Charles W. Heimbach, 280 meters.
WCBB—Greenville, Ohio, K. & K. Radio Supply company (Charles H. Katzenberger), 240 meters.
WCBD—Zion, Ill., Wilbur G. Voliva, 345 meters.
WCE—Minneapolis, Minn., Findley Electric company, 360 meters.
WCK—St. Louis, Mo., Stix, Baer & Fuller Dry Goods company, 360 meters.
WCM—Austin, Texas, University of Texas, 360 meters.
WCX—Detroit, Mich., Detroit Free Press, 517 meters.
WDAD—Lindsborg, Kans., Central Kansas Radio Supply company (Wm. L. Harrison), 360 meters.
WDAE—Tampa, Fla., Tampa Daily Times, 360 meters.
WDAF—Kansas City, Mo., Kansas City Star, 411 meters.
WDAG—Amarillo, Texas, J. Laurance Martin, 360 meters.
WDAH—El Paso, Texas, Trinity Methodist church (South), 360 meters.
WDAI—Syracuse, N. Y., Hughes Radio corporation, 246 meters.
WDAK—Hartford, Conn., The Courant, 261 meters.
WDAL—Jacksonville, Fla., Florida Times-Union, 360 meters.
WDAO—Dallas, Texas, Automotive Electric company, 360 meters.
WDAP—Chicago, Ill., Board of Trade, 360 meters.
WDAR—Philadelphia, Pa., Lit Brothers, 395 meters.
WDAS—Worcester, Mass., 692a Main street, Samuel A. Waite, 360 meters.
WDAU—New Bedford, Mass., Slocum Kilburn, 360 meters.
WDAX—Centerville, Iowa, First National bank, 360 meters.
WDAY—Fargo, N. D., Fargo Radio Service company, 244 meters.
WDBC—Lancaster, Pa., Kirk, Johnson & company, 258 meters.
WDBF—Youngstown, Ohio, 254 West Federal street, Robert G. Phillips, 261 meters.
WDM—Washington, D. C., Church of the Covenant, 360 meters.
WDT—Stapleton, N. Y., Ship Owners Radio Service, 405 meters.
WDZ—Tuscola, Ill., Star Store building, James L. Bush, 278 meters.
WEAA—Flint, Mich., Fallain & Lathrop, 280 meters.
WEAB—Fort Dodge, Iowa, Standard Radio Equipment company, 360 meters.
WEAF—New York, N. Y., American Telephone and Telegraph company, 492 meters.
WEAG—Edgewood, R. I., Nichols-Hineline-Bassett Laboratory, 231 meters.
WEAH—Wichita, Kans., Witchita Board of Trade, 244 meters.
WEAI—Ithaca, N. Y., Cornell university, 286 meters.
WEAJ—Vermilion, S. D., University of South Dakota, 360 meters.
WEAM—North Plainfield, N. J., Borough of North Plainfield (W. Gibson Buttfield), 250 meters.
WEAN—Providence, R. I., Shepard company, 273 meters.
WEAO—Columbus, Ohio, Ohio State University, 300 meters.
WEAP—Mobile, Ala., Mobile Radio company, 360 meters.
WEAR—Baltimore, Md., Baltimore American and News Publishing company, 360 meters.
WEAS—Washington, D. C., Hecht company, 360 meters.
WEAU—Sioux City, Iowa, Davidson Brothers company, 360 meters.
WEAY—Houston, Texas, Iris theater (Will Horowitz Jr.), 360 meters.
WEB—St. Louis, Mo., Benwood company, 360 meters.
WEV—Houston, Texas Hurlburt-Still Electrical company, 360 meters.
WEW—St. Louis, Mo., St. Louis University, 261 meters.
WFAA—Dallas, Texas Dallas News and Dallas Journal, 476 meters.
WFAB—Syracuse, N. Y., 802 McBride street, Carl F. Woese, 234 meters.
WFAF—Poughkeepsie, N. Y., H. C. Spratley Radio company, 360 meters.
WFAH—Port Arthur, Texas, Electric Supply company, 360 meters.
WFAJ—Asheville, N. C., Hi-Grade Wireless Instrument company, 360 meters.
WFAM—St. Cloud, Minn., Times Publishing company, 360 meters.
WFAN—Hutchinson, Minn., Hutchinson Electric Service company, 360 meters.
WFAQ—Cameron, Mo., Missouri Wesleyan college, 360 meters.
WFAT—Sioux Falls, S. D., Daily Argus-Leader, 360 meters.
WFAV—Lincoln, Neb., University of Nebraska, department of electrical engineering, 360 meters.
WFI—Philadelphia, Pa., Strawbridge & Clothier, 395 meters.
WGAL—Lancaster, Pa., Lancaster Electric Supply and Construction company, 248 meters.
WGAN—Pensacola, Fla., 216 West Romana street, Cecil E. Lloyd, 360 meters.
WGAQ—Shreveport, La., Glenwood Radio corporation (W. G. Patterson), 360 meters.
WGAR—Fort Smith, Ark., Southwest American, 360 meters.
WGAU—Wooster, Ohio, Radio Manufacturing and Service company (Marcus G. Limb), 226 meters.
WGAW—Altoona, Pa., 1918 West Chestnut street, Ernest C. Albright, 261 meters.
WGAY—Madison, Wis., Northwestern Radio company, 360 meters.
WGAZ—South Bend, Ind., South Bend Tribune, 360 meters.
WGI—Medford Hillside, Mass., American Radio and Research corporation, 360 meters.
WGL—Philadelphia, Pa., 2308 North Broad street, Thomas F. J. Howlett, 360 meters.
WGR—Buffalo, N. Y., Federal Telephone and Telegraph company, 319 meters.
WGV—New Orleans, La., Interstate Electric company, 360 meters.
WGY—Schenectady, N. Y., General Electric

Continued on page 14.

THE CHICAGO EVENING POST TABLOID RADIO SCHEDULES

These stations are those most commonly tuned in evenings by the Chicago broadcast listeners. The time given is central standard. Pacific coast time is two hours earlier than that shown here. Mountain time is one hour earlier, and eastern time one hour later. Evening program schedules only are given. This list was compiled by The Chicago Evening Post Radio Department and is protected by copyright.

STATION	Miles	Met	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Chicago—									
KYW, Comm. Edison Bldg		536		6:30- 9:30	6:30-12:00	6:30- 9:30	6:30- 9:30	6:30-12 m.	6:30- 9:30
WAAF, Union Stock Yards		286	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00		
WMAQ, Hotel La Salle		448		7:00- 9:55	7:00- 9:55	7:00- 9:55	7:00- 9:55	8:00-10:00	
WDAP, Drake Hotel		360		7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	9:15-10:30
WJAZ, Edgewater Beach Hotel		448		10:00-12:30	10:00-12:30	10:00-12:30	10:00-12:30	10:00- 2:00	6:00- 9:00
Suburban—									
WCBD, Zion, Ill	39	345	8:00- 9:00				8:00- 9:00		
WIAB, Rockford, Ill	77	252			8:00- 9:00				
WRM, Urbana, Ill	120	360			8:50- 9:30				
WTAS, Elgin, Ill	37	275			7:30-10:00				
Eastern—									
KDKA, East Pittsburg	430	326	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WBZ, Springfield, Mass	802	337	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	
WEAF, New York City	733	405	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00
WGI, Medford Hillside, Mass	875	360	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	7:30- 9:00
WHAZ, Troy, N. Y	748	380	8:00- 9:30						
WGY, Schnectady, N. Y	698	280	6:45-11:30	6:45- 9:00	6:45- 9:00	6:45- 9:00	6:45-11:30	6:45- 9:00	
WGR, Buffalo	472	319	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	
WJY, New York City	733	405							2:30- 6:00
WJZ, New York City	733	455	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	
WOO, Philadelphia	677	509	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	
WRC, Washington, D. C	612	469	8:00-10:00		8:00-10:00		8:00-10:00		
Midwest—									
WCX, Detroit	245	517	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00		
WJAX, Cleveland	323	390		7:30- 9:30		8:00-10:30			
WLAG, Minneapolis	358	417	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	
WLW, Cincinnati	262	309	8:00-10:00	10:00-12:00	8:00-10:00	10:00-12:00			
WOC, Davenport	105	481	7:00-11:00		7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WTAM, Cleveland	323	300	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30
WWJ, Detroit	245	517	8:30-10:00	8:30-10:00	8:30-10:00	8:30-12 m.	8:30-10:00		
Southern—									
KSD, St. Louis	270	546	8:00-11:00	8:00-11:00	8:00-11:00		8:00-11:00	8:00-11:00	
WBAP, Fort Worth, Texas	855	476	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00		
WDAF, Kansas City, Mo	430	411	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	
WFAA, Dallas, Texas	853	476	6:45- 9:30	6:45- 9:30	6:45- 9:30	6:45- 7:30	6:45- 9:30	6:45- 9:30	9:30-11:00
WGV, New Orleans	858	350	7:00- 8:00		7:00- 8:00			7:00- 8:00	
WHAS, Louisville	271	400			7:30- 9:00				4:00- 5:00
WHB, Kansas City, Mo	430	411		7:00- 9:00		7:00- 9:00	7:00- 9:00		8:00-10:00
WMC, Memphis	480	500		11:00-12:00			11:00-12:00	8:00-10:00	8:00-10:00
WOAI, San Antonio, Texas	1,080	385		9:30-10:30				9:30-10:30	
WOS, Jefferson City, Mo	337	441	8:00- 9:30		8:00- 9:30		8:00- 9:30		
WSB, Atlanta, Ga	605	428	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	7:30- 9:00
Pacific Coast—									
KFDB, San Francisco	1,910	509	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30
KGW, Portland, Ore	1,895	492	1:00-2 a.m.	10:00-11:00	10:00-11:00	10:00 11:00	1:00-2 a.m.	10:00-11:00	9:00-10:00
KHJ, Los Angeles	1,795	395	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	10:00-12:00
KPO, San Francisco	1,910	423	6:30-12 m.	6:30-12 m.		6:30-12 m.		6:30-12 m.	10:30-12 m.

IVERSON C. WELLS
EDITOR

Assisted by a Staff of Regular and Special Contributing Writers.

The RADIO MAGAZINE Section is edited with the view of giving authentic news of the radio broadcasting field and authoritative information on the subjects of home construction of receiving and transmission sets, of the operation and maintenance of apparatus, and as an exchange of opinion for its readers.

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Cuba Says It Was on Air Nov. 19 as Logged

BY THE NIGHT PROWLER.

Well, fellow prowlers, here's another week. How was the going? Out on another page—No. 10—the editor informs us, you'll find what some of the clan have been doing since last we met over the dim glow of the 301-A and discussed things as they were, are and never were.

Some of the phans tell mighty remarkable stories. There's one or two that do not seem reasonable. But, in view of the fact that I have been present at two or three very, very wonderful demonstrations of long-distance work the last week, I'm ready and willing to swallow almost any old thing.

And then, too, Kenneth McKim, publicity manager of PWX, the Havana, Cuba, station of the Cuban Telephone company, comes along with a letter and confirms all those fellows I abused so shamefully a few days ago, and takes me to task.

Confirms the DX-ers.

Brother McKim says everyone that said they got his station on that supposed-to-be-silent night, Monday, Nov. 19, had it absolutely right. PWX WAS on the air that night, altho it was supposed to be a "silent" one.

Harry K. Goodall, classified manager of System Magazine, who was one of the DX-ers who reported having picked up the Cuban station, wasn't contented with letting things rest as they were, but wrote Mr. McKim and that gentleman wrote me the following letter:

I have a letter from Harry K. Goodall, classified advertising manager of the magazine System, in which he expresses his grief that you should have seemed to doubt his veracity when he said he had heard station PWX of the Cuban Telephone company on the night of Monday, Nov. 19. I hasten to the defense of Mr. Goodall's fair name.

On the night in question we put on a special program at the request of the Spanish colony, the music being furnished by the sextet of the Transatlantic liner, Cristobal Colon. This program was arranged in such a hurry that there was no opportunity to advertise it in the United States.

I am inclosing a copy of the printed program as further verification, and I hope that in the future you will think of Mr. Goodall as an upright citizen, and a great admirer of the truth under all circumstances.

Ain't that nice! It is for everyone but your humble servant It makes him look like a deuce spot. Oh, well, we're a good sport. We take our medicine and promise to profit by the experience.

Mr. McKim even sent a copy of the printed program, which shows the numbers the orchestra played and makes particular mention of the special occasion which brought about the special program on a special test-night occasion.

Which all goes to prove that a fellow, even if he is a "prowler," should be sure he is right before attempting to make a forward motion.

Grand Opera Tonight.

Grand opera is on again tonight. WMAQ is making its second attempt at the transmission. I had an idea it made a good job last week on the initial effort, but some of my readers seem to think differently as you will observe in the Letter Box department.

The bill this evening is "Andrea Chenier," in which Claudia Muzio sings the stellar role, Madeline De Coigny. This station announced last evening that it would use its regular wave length of 448 meters until 10 p. m., at which time it would drop to 345, with the idea that this would avoid interference with WJAZ.

If you will turn your variocupler over to a "tight" point—away up to the neighborhood of the 180 degree mark along about 10 p. m. and will tune in carefully, as this will produce a mighty sharp tuning, I am quite sure you can get the opera tonight.

Good luck to you.

Friday evening KYW comes on with "Carmen." Alice Gentle sings the title role. This station will hold to its regular wave length.

Look over the programs given you today. There's a real treat everywhere you turn for the evening. Let me know what you get in spite of the fact that all the big local stations are going to jam the air for those who have very sensitive receivers.

These are the star features on the coming week's local radio program. (1) Marx Oberndorfer, composer and pianist, WMAQ. (2) Alice Gentle, in the title role of "Carmen" by the Chicago Civic Opera company, Friday evening, Dec. 7. Broadcast by KYW. (3) Sports editor, WLAG (Minneapolis), reading bulletins of sport events. (4) George G. Smith, barytone, WJAZ.

Radio Programs

Below are given the complete schedules of all the Chicago and suburban broadcasting stations and those of the out-of-town stations which are most commonly tuned by local radiophans.

These schedules are a regular daily feature in The Chicago Evening Post.

On Thursday of each week a complete list and schedule of every broadcasting station in the United States is published in The Chicago Evening Post's sixteen-page Radio Magazine section.

CHICAGO STATIONS

(Central Time Is Shown.)

KYW—Located in Commonwealth Edison building; 536 meters; Wilson J. Wetherbee, director.

Day—9:30 a. m., news and markets; 10 a. m., market reports; 10:30 a. m., financial news and comment; 10:58 a. m., naval observatory time signals; 11 a. m., market reports; 11:05 a. m., weather report; 11:30 a. m., news and comment of the financial and commercial market; 11:35 a. m., table talk by Mrs. Anna J. Peterson; 12 m., market reports; 12:30 p. m., late market reports; 1:20 p. m., closing market quotations; 2:15 p. m., late financial comment and news bulletin; 2:30 p. m., closing stock quotations, Chicago Stock exchange; 3 p. m., late news and sport bulletin; 4 p. m., late news and sport bulletins; 5 p. m., latest news of the day; 5:30 p. m., late news, financial and final market and sport summary; financial summary furnished by the Union Trust company; 6:50 p. m., children's bedtime story.

Evening—8 to 8:20 p. m., twenty minutes of good reading by Rev. C. J. Pernin, S. J., head of department of English, Loyola university, Chicago; 8:21 to 8:25 p. m., traffic talks by the Chicago Motor club; 8:30 to 9:30 p. m., musical program given by the Edison Symphony orchestra, Morgan L. Eastman, conductor. Estelle Vernet, soprano. Program March, "The Steel King," (St. Clair); "Marche Pontificale," (Gounod); "Quoniam," (Mozart); "Ah, Fors' e Lui," from "La Traviata" (Verdi); "Nabucodonosor overture," (Verdi); "Menuet a la Mozart," (Korestchenko); Sari waltz, (Kalman); "Soprano Solo," (selected) by Estelle Vernet; "The Defender" (selection from Dennee) by Edison Symphony orchestra.

WAAF—Located at Union Stock yards; 286 meters.

Day—Live stock reports at 8:40, 10:30,

Continued on Page 15.

Dr. Pratt Invents a New Tube for Radio

The Chicago Evening Post Radio Magazine section today makes the first announcement to the world of a new vacuum tube, which, if the claims of its inventor are borne out by practice, will revolutionize radio reception and take from Flemming and DeForest the credit long given them for the discoveries of these devices.

The new tube is to be known as the Pratt radio tube and will be in production in a Chicago factory within the next thirty days.

The inventor, Dr. H. Preston Pratt, makes these claims for the new tube:

It has few of tube noises.

It will not distort.

It is free from unnecessary inductive and static disturbances.

It reproduces the natural quality of voice and instrument (tone color).

It will produce greater volume than any other known tube.

It will operate with plate voltage from 1 to 150.

It consumes only 1-30 to an ampere of current.

Long-distance reception easily is tuned by filament control.

It has the most rigid construction of any tube and therefore is more durable.

Its signal strength is proportionate to plate voltage.

Embodies New Features.

The Pratt tube embodies new features of gas and electron control. It employs the customary three-elements, which Dr. Pratt lays claim to as the inventor and claims priority over Dr. Lee DeForest by several years.

"The present-day tubes," Dr. Pratt told a representative of The Post Radio Magazine section, "have one great fault. It is their failure to control material particles, electrons, atoms and molecules in the tube.

"In the vacuum tube, as the public knows it today, there is a constant bombardment of these particles thruout the tube. They cover the entire space of the tube. They may be said to be running wild.

"My tube controls these particles absolutely. They not only are controlled, but they are amplified within the tube and are given a directional movement."

Then Dr. Pratt explained the principle of the tube.

"Let us imagine a common and central source of energy—the filament, which, when properly heated, throws off electrons," said Dr. Pratt. "In the vacuum tube of the present time these electrons are hurled in various directions against the sides of the tube and being repelled are forced back, whereupon they set up a free-for-all fight that might be likened to a mob without a leader, which has its movements clouded by the darkness of night, and engages in a death battle with each other."

Explains His Invention.

It is this disorderly condition of the electrons, Dr. Pratt maintains, that makes the present-day vacuum tube so inefficient.

"My method of controlling these disorderly material particles is very simple," said Dr. Pratt. "Let us assume that the source of electron energy—the filament—is located in the center of a tube in which a vacuum has been established. I place a reflecting device in the shape of a small cup on either side of this central spot, these reflecting surfaces facing each other. Interposed between these two cups, in addition to the spiral filament, is a spiral grid and a spiral plate, just the same as may be found in any three-element tube, except for design and arrangement.

"The two reflecting surfaces concentrate the material particles in the center of the tube at the central spot, taking them away from the outer surface of the tube. From this central point these material particles complete the filament-plate circuit in the tube."

This action, Dr. Pratt holds, tends to increase the strength, activity and intensity of the electrical oscillations. By electrical, magnetic, luminous, caloric, energy radiant and mechanical means, his method and apparatus, he avers, will establish, maintain and stabilize an electrical circuit between

Continued on Next Page.

Invents New Radio Tube; HitsDeForest

(Continued from Preceding Page.

the terminals within the vacuum tube, thru the conducting medium and polar action of the material particles that remain in the tube, or added to the tube after partial exhaustion has taken place.

Utilizes Stored-Up Energy.

By such means he says he is able to utilize the increase potential energy stored up within the tube, and is able to increase, decrease, concentrate and control and directionalize the movements of the material particles and ionize and electrolize the particles and gases.

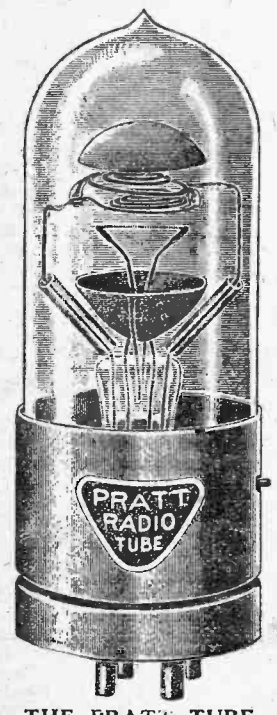
He is able, he says, to increase the number of electrostatic and electromagnetic lines of force within the tube and to use these lines of force, with their potential energies, to control the action and direction of the moving particles and gases.

Big Patent Fight Brews.

Dr. Pratt's announcement of the formation of a company to manufacture the new tube undoubtedly will stir up a lively fight. If claims of priority are maintained the DeForest patents on the three-element tubes and the Fleming patents on the original vacuum, or two-element tube, will be nullified and the credit these two inventors have enjoyed for years will be taken from them.

Dr. Pratt, who was a pioneer in vacuum tube work, having began his researches as early as 1876, makes the broad statement that the original Fleming and DeForest tubes were products of his own effort and submits proof of his claims in the shape of newspaper clippings, magazine articles and other evidence to back up his statements.

Dr. Pratt also makes the broad statement that the first wireless telephony by vacuum tube was made by him with tubes of his own invention and



THE PRATT TUBE.

construction many years before DeForest admits he began his research work and made his discoveries which have brought fame and fortune to him and revolutionized radiophony and made it possible to be what it is today.

"I began my first experimental work with Prof. Gray and Bell in 1876," said Dr. Pratt. "I worked independently at first, but later became associated with the Bell company. From 1876 until 1896 I experimented with every vacuum tube then in existence. "I was working on the power effect or speed of the atoms at that time, and was led into wireless telephony by my discoveries."

Shows Book of Clippings.

Dr. Pratt exhibited a scrapbook full of clippings from the daily press and the scientific journals of the late '90s. These clippings tell of his proposal to send wireless telephone messages from the top of fire stations located in various parts of Chicago to the cribs out in the lake.

These tests, apparently, were abandoned, but there is printed record of other broadcasting and reception in experimental tests and the newspapers were filled with the marvels of his discoveries.

In some of the public statements printed at that time Dr. Pratt's theories on the vacuum tube are fully explained and in some of the clippings a concise explanation is given of the method employed in transmission.

In 1896 Dr. Pratt first formulated a working hypothesis of the fundamental principles of the X-Ray, and was also the first person to use it therapeutically in the treatment of cancer, tuberculosis and kindred diseases. He has done as much scientific work in developing and discovering the contents of a vacuum tube as any other man whose work has become known. He was for many years the editor and publisher of the American X-Ray Journal, the first publication of the kind in the world and the first authority on X-Ray subjects.

Invents Several Tubes.

In 1897 he invented several types of radio tubes, one especially having the present three known elements, a filament, a wire grid and a wire coil or plate, which was used to detect, amplify, transform and transmit radio waves.

DR. H. PRESTON PRATT.

On April 19, 1899, and on Oct. 4, 1899, in the Chicago Daily News, on Aug. 18, 1901, in the Chicago Examiner, on June 18, 1901, in The Chicago American, and on April 20, 1899, in the Chicago Journal, were published accounts of his telephoning without wires, illustrating in an article published in The Daily News of April 19, 1899, one of the several forms of vacuum tubes invented by him for radio work with the three elements clearly shown.

Dr. Pratt says that at this date there are at least twenty-five persons living who saw his demonstrations more than twenty years ago.

Transmitting radio wave messages in any given direction was his discovery and invention, according to his claims, and were published at that time in several different papers which have been preserved. According to recent press reports, this directional radio feat was repeated by Marconi a short time ago.

Discovers Carrier Wave.

Superposing a current of one potential and frequency on another potential and frequency, and impressiong the radio and audio wave impulses on the carrier wave, and the method of transmitting and receiving several messages over the same circuit from the same antenna at the same time without interference, and connecting the coils, tubes and circuits for the reception of the varied potentials, currents and frequencies, were also partially disclosed by Dr. Pratt in the papers above referred to.

Dr. Pratt certainly occupies a unique position in relation to commercialized radio, if his claims are sustained.

First, he antedates all other inventors in this field by many years.

Second, he is the first discoverer, inventor and user of the vacuum tube recorded anywhere in the world for radio or wireless transmission and reception, without regard to whether the vacuum tube had one, two, three, four or more electrodes.

Invents Air Core Coil.

Another invention in radio to which Dr. Pratt lays claim is that of the air core which has wielded such a powerful influence in radio the last few years. A patent on the first air core device was granted him Jan. 20, 1885. Dr. Pratt still has this original coil which was used in a telephone receiver. A representative of The Post Radio Magazine section has seen this receiver and when tested it showed marvelous power.

Dr. Pratt has made some recent improvements in this coil and patents are pending on these. He proposes to utilize the old invention and the new in a loud speaker unit which gives great promise.

When Dr. Pratt made his application for patent on the air core device the patent office refused him his papers at first, declaring that the device would not work. It was necessary for him to go to Washington and prove in person that it would.

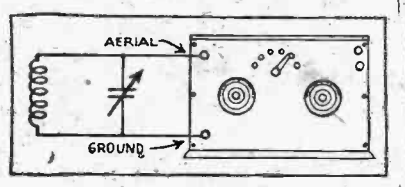
Dr. Pratt also lays claim to having made the first inductive air core coil in the shape of a pancake coil, which claim also attacks the DeForest three-coil inductance which have made him almost as famous as the vacuum tube.

Dr. Pratt has gathered around him a staff of executives and says that first production of the new tube will start within the next thirty days.

In next week's issue The Post Radio Magazine section will give the results of tests made with the new tube by Dr. Pratt in the presence of three representatives of this magazine. Later results of tests made in The Post experimental laboratory also will be presented.

Improves Wave Trap

If any of your readers have had trouble with the wave trap shown in a recent issue of The Post Radio Magazine, have them try shunting the



wires from the trap between the aerial and the ground of the receiver as per sketch. I did this and on my WD-12 set it works quite well.—O. W. Schreiber, 1742 Washington avenue, Wilmette, Ill.

VALUE OF AERIALS.

Long, single-strand aerials bring in long-distant stations, but selectivity is reduced.

Grounds Out Phone Hum

I am submitting an idea which, no doubt, will help the BCL who is troubled with near-by power or telephone lines and cannot change the direction of his aerial. I had a two-wire aerial in parallel with the telephone line. The wire next to the telephone line I grounded firmly. The other wire I led to my set. I noticed quite an improvement in my reception. The sketch shows the arrangement.—Kenneth South, 2145 Cleveland avenue, Chicago.

SOLDERING WITH LEAD.

A copper soldering iron can be coated with lead and used in same manner as solder in making lead plate storage "B" batteries if lead is used to fuse the terminals.

First and Only Broadcasting Station to Solve Upkeep by Community Fund

OFTEN the question is raised as to who is going "to pay the fiddler" in the broadcasting game when the glamour and glitter of running a station wears off and the present-day bagholders seek to turn loose. It would seem that the Twin Cities—St. Paul and Minneapolis—have solved the problem. Their method is told in the following article.—The Editor.

There are three outstanding features about WLAG station, Minneapolis and St. Paul. No. 1 of these is that it is the first and only radio broadcasting station in the United States conducted by a "community" interest. No. 2 is that it is the only broadcasting station in the world run entirely by a woman. No. 3 is that it was created by Bowden Washington.

Anyone of these three items ought to make WLAG famous—and they have. If they hadn't, there are enough other strong features about this unusual station to see that it did have its fame proclaimed from one end of the nation to the other.

WLAG recently celebrated its first anniversary. It was a celebration in which the two metropolises of Minnesota—St. Paul and Minneapolis—participated. This was because the Twin Cities had a personal interest in the station and its anniversary.

While Cutting and Washington built and installed the station in the "Land of Ten Thousand Lakes," and still own it for that matter, its upkeep is taken care of by ten large St. Paul and Minneapolis concerns. That is where the "Community" interest comes in.

Something About the Equipment.

WLAG was built by Bowden Washington, designer of United States naval and allied radio apparatus during the war and builder of WSA, East Hampton, L. I., the most powerful spark marine station in the world. WSA has a maximum radius of 11,000 miles and WLAG, a class B station, has been heard at extraordinarily great distances.

The station uses a Western Electric broadcaster of 500 watts rating, but develops up to 750 off the antenna at times. It is operating approximately eight solid hours a day and has not been out of commission for more than half a day from mechanical cause since it was opened. It operates on a wave length of 485 meters.

The Cutting and Washington Radio corporation launched WLAG and is continuing to operate it, broadcasting alternately from Minneapolis and St. Paul. The ten concerns in both cities asked to share cost of programs so that the Twin Cities, as a community, might regard them as "the community's own."

At a meeting of representatives of each of these ten subscribers, Prof. C. M. Jansky, of the University of Minnesota, said:

"There was expressed at a conference in Washington, D. C., some time ago that the present system of broadcasting was uneconomic and, therefore, was doomed. If that is the case, I am convinced that some plan similar to that used by WLAG will be the development.

"WLAG is one of the biggest things done in Minneapolis recently. The station represents an awakened spirit in St. Paul as well, St. Paul having insisted on a share in the enterprise."

Washington, the builder, recently at the Chicago Radio show, declared that an era of simplified radio, with more powerful broadcasting stations and receivers, is not far away.

Woman Runs Station.

Eleanor Poehler, the only woman radio managing director in the country, is in charge of WLAG. She hires and fires and inspires the entire staff. A talented singer, she has organized and developed her own staff of musicians, and her personnel includes "The Call of the North" orchestra and Charles Cordray, orchestra leader and song writer, who, whenever the studio feels the need of new material, lays aside his baton and composes something. His latest hit is "Georgia Lullaby."

Ray R. Sweet is chief engineer. Other members of the operating staff are C. W. Tuttle, Hal Rawson and Jack Sprague.

Mrs. Poehler's studio staff includes Paul Johnson, announcer; Tess Cooperman, story teller; Mildred Simons, program clerk; and Kay Westerveld, private secretary. E. R. Buell is assistant program director in charge of speakers.

The Minneapolis studio and antenna are on the Oak Grove hotel, overlooking the business section of the city. The St. Paul studio, just completed, is on the top floor of the St. Paul Athletic club building and broadcasts by remote control thru the plant in Minneapolis. This gives the Twin City radio central extraordinary possibilities for broadcasting important programs and talks from other stations.

Offers Varied Programs.

A recent check of programs from various parts of the United States indicates that WLAG is one of the leaders with respect to the kind of material broadcast.

Programs offered include market reports, household hints, health talks, weather reports, correct time, sport scores, church services, band concerts, orchestra music, recitals, instrumental and vocal soloists, short plays, sport talks, football games and baseball games, symphony concerts, news, theatrical productions, choruses, humor, verse, notices, short stories and magazine articles, farm talks, operatic selections, organ music, string and vocal trios, quartets and sextets, club meetings, chimes and fight returns.

One of the features of the station is its program of short talks. Its women's club at 2 o' clock, its general audience at 5 o' clock, sport talks at 6, and its farm lectures at 7:30, are daily features. Three times a week business talks are broadcast covering a wide range of subjects.

Orchestra concerts and other informal musical programs in the afternoon have become a recognized feature and its evening concerts present a variety ranging from jazz to studio programs, band and orchestra recitals, concerts and symphonies. These are interspersed occasionally with readings and short plays of both a serious and humorous nature.

Uncovers New Artists.

Advantage has been taken of the fact that the radio with its powers of amplification and its great range opens to the public an entirely new field of musicians and singers, those who have not the volume for the concert or operatic stage. Several of the sweetest voices presented from this station have been voices that would scarcely pass the footlights of the smallest theater.

Unique among the clubs of radio is the Radio Health and Toothbrush Club of America, which broadcasts every Saturday evening from WLAG, under the direction of Dr. F. W. Pepper and Rubert H. Whitcomb. This club has more than 10,000 members in all parts of the United States who have taken the pledge to clean their teeth once a day and to observe other health rules.

Figure 4. Eleanor Poehler, known as "the spunky little woman of WLAG," probably is the only woman in complete charge of a radio station in the United States. She is managing director in fact as well as in title and she hires, fires and inspires the entire staff. Figure 1. Paul Johnson is the "man with the golden voice" at WLAG. He is noted for his fine announcing and for the way he says "Goodnight, everybody." Figure 5. Whenever WLAG grows tired of its musical numbers and wants a new one Charles Cordray, orchestra leader, lays aside his baton, draws the curtains of the studio in front of him and presently comes forth with a new composition. His latest is called "Georgia Lullaby." Figure 9. Ray Sweet, chief engineer of the Twin City radio central, keeps the set from going "haywire." Figure 8. C. W. "Tug" Tuttle, chief operator, is shown at the desk. R. R. Sweet, chief engineer, is seen standing at the right. The door at his back opens into the generator room, shown in another photo. Figure 6. The motor generators. Note safety switch for lightning on the antenna overhead. Figure 7. Reception room. Dr. Bowden Washington is shown seated in the foreground. Figure 3. Aerial towers located on Oak Grove hotel, Minneapolis.

WLAG Selected by U. S. as Calibrating Station

MINNEAPOLIS, Dec. 6.—The United States bureau of standards today notified Ray A. Sweet, chief engineer of WLAG, the Twin City (Minneapolis and St. Paul) Radio Central broadcasting station, operated by the Cutting and Washington Radio corporation, that WLAG has been selected as the bureau's western calibrating station.

The bureau will start the calibration work Dec. 7, relaying standard signals from the east to the west coast, so that the 700 or more broadcasting and hundreds of thousands of receiving stations may tune their wave lengths.

KDKA, the Westinghouse station at East Pittsburg, has been designated as the eastern station. WLAG, collaborating, will relay wave lengths from 300 to 600 to the Pacific coast, where the signals will be picked up by a station not yet named, and rebroadcast. Stations tuning in will be able to regulate their wave lengths in a manner similiar to the way watches were set by telephone from a central station on the batttlefield during the war.

The selection of WLAG was made thru a series of tests of wave lengths and power. The tests disclosed that WLAG's wave length, 417, varies the least—only a few cycles. WLAG, which broadcasts alternately from Minneapolis and St. Paul, was built by Bowden Washington. It is one of the most powerful stations in the middle west, having been heard 450 miles west of Honlulu, and in Europe, Cuba and Mexico.

Stands Much Abuse

There is no danger in leaving an Edison battery in disuse indefinitely, as long as it has solution in it, and as long as the case is well painted or greased. These batteries can be put away at any time in any condition of charge or discharge without damage. The only thing to watch is to see that the cases do not rust out, and this may be prevented by painting with P. & B. paint.

Saves "B" Battery

With a 45-volt "B" battery and only using 22½ on the plate, half of the battery becomes exhausted. Use the 22½-volt tap as the minus terminal and the 45-volt tap as the plus, which will give you the required 22½ volts for the plate and almost double the life of the battery.

Chicago Phans Hear European Voices on Radio

Two Chicago broadcast listeners have picked up European radiophony in the last few days during the trans-Atlantic tests between amateurs of the United States and those across the seas.

Noble Cain, 2511 Eastwood avenue, Evanston, heard IWA, Aberdeen, Scotland, Tuesday evening, Nov. 27. A. J. Ferrick, 608 West 2d street, heard PLG, a Dutch naval vessel, Sunday morning at 1:55 o'clock.

In both cases the voice and music was very clear and the call numbers plainly heard so there was no mistake as to the correctness of the reception.

Mr. Ferrick says he was tuning in his three-tube Acme reflex, using UV-199 tubes and not seeking or thinking of the oceanic tests. To his surprise he heard someone announcing the call numbers, PLG, in broken English. The broadcaster stated that he had picked up a Chicago station (KYW) a few nights before that was broadcasting the speech of Senator Hiram Johnson. He took pains to repeat some of the senator's remarks to prove that he had heard him.

Mr. Ferrick says that the foreigner then introduced a very fine band (evidently the ship's band) and that he listened in for at least fifteen minutes to a most excellent program.

A Layman's (?) Record.

Mr. Cain's reception was remarkable also in that he had made no special preparations to pick up across-the-sea broadcasting and was using his everyday set. His letter to The Post Radio Magazine section best explains his achievement. It follows:

I am a layman at radio and hardly know a potentiometer from a grid leak. All I know is to tune in until I get something.

My set is a Radiola 4, which, I understand, is supposed to go out of date in favor of Radiola 5.

I do not know if the report I am going to make is remarkable or not, but it was very remarkable for me when I heard IWA, Aberdeen, Scotland, last Tuesday evening, Nov. 27.

I use three of those little tubes known as WD-11 dry cell tubes. When I heard the announcer tell of the trans-Atlantic test being made and asking everyone in America to let him know if he was being heard I nearly fell off the chair because I did not think my set was good enough for that. He signed off and gave his call letters very clearly, so that there was nothing else to believe but that I had actually heard this station.

I have heard both coasts of the United States, Calgary, Canada, and Mexico City, but when it comes to hearing them from across the old water I think I will keep my Radiola 4.

It Is Exceptional.

If you do not think this is remarkable I won't mind if you write and tell me so, because I want to know what really can be expected of a set like mine.

Just let me add that I have found practical use in two cases for your radio magazine, one in making that little wave trap which doesn't shut WJAZ clean off but dims it down so I have no trouble in going right thru. The other is in introducing a potentiometer into the aerial lead-in as suggested in your columns.

My best wishes for the continued appearance of your magazine section and your snappy comments, even if they do take you to task once in a while for calling them liars.

Two-way radiophone communication and regular broadcasting from England to the United States and vice versa was launched at the opening of National Radio week, Nov. 25 to Dec. 1, thru the co-operation of the British Broadcasting company and "Radio Broadcast" of America, at the initiative of Frank N. Doubleday, the publisher.

Designs Special Loop Aerial.

A special receiving station was completed on Long Island, including a special loop presented to Arthur H. Lynch, editor of Radio Broadcast, by Dr. J. Harris Rodgers of Hyattsville, Ind., the inventor, and a special superheterodyne made by George Elton, Jr., manager of the radio department of the Manhattan Electrical Supply company.

The Rodgers loop consists of ten turns, four feet in diameter, each turn made up of ten strands of bare copper wire spaced with special spreaders in the form of perforated discs. The advantage of this loop lies in the reduction of distributed capacity, making sharper tuning and greater selectivity possible. There are 1,200 feet of wire in all.

Army Posts to Get News By Radio Same as Navy

For several years the ships of the navy and outlying naval stations have been able to get the news daily from what is known as the Navy Press, which goes out by radio from NAA at Arlington each night. A similar scheme is now under consideration by the war department for sending news, especially army news, to its forces stationed at foreign ports and posts out of the regular news channels.

If the present plan goes thru, army posts at Hawaii and the Philippines will receive news bulletins at least once a week from a high-powered Pacific coast station. These radio bulletins would also be sent to army forces stationed in Alaska, Panama, Porto Rico and Cuba, and be picked up by some of the isolated posts in this country, where little, if any, army news percolates.

Cleaning Condensers

The plates of a condenser become covered with dust in a very short time and it is wise to clean them out if the set is to work efficiently. This dust if left will soon short circuit the condenser and also cause a crackling noise that is very bothersome. To clean the condenser a package of pipe cleaners may be procured. One of the cleaners is pushed between the plates and worked back and forth. This thoroly cleans the plates. One package of cleaners will last a long time, so the investment is not heavy.

Upper picture shows Arthur H. Lynch tuning in on European broadcasters on Long Island, New York. Note the special loop at left. Just below, Mr. Lynch, in shirt sleeves, is connecting up his transatlantic set. Lower photo shows Mr. Lynch repairing a wire broken in transit in the new Rodgers loop.

U. S. Adopts Super-Heterodyne Set to Insure Safety of Mail Plane Pilots

HEREAFTER, when an air mail pilot's engine stalls on him in midair, he may have a rescue party waiting for him by the time he reaches the ground. At least, the rescue party would be on its way to his relief by that time.

This comes from the comforting news sent out to pilots and would-be pilots by the postoffice department at Washington. It is that plans are under way for the use of radio receiving and transmitting sets on air-mail planes. Equipment of these planes is expected to be completed in a short time.

Tests Convince Uncle Sam.

This decision of the government authorities follows successful experiments made at Schenectady, N. Y., with a combination receiving and transmitting set of the super-heterodyne type, the most efficient apparatus in existence. Under most severe weather conditions, this set was found to function without failure.

Besides, its comparative simplicity on operation has caused its approval for this use.

Use of such apparatus on an airplane will obviate the necessity of pilots to depend solely on beacon lights at night, or on other forms of signaling during the day. Wherever they may be, night or day, in heavy fog or severe storm, all they need do is send out a call for landing assistance. With the pilot and the landing station talking to each other, the pilot can be directed to the ground with more safety than under any other condition.

Insures Pilot's Safety.

In case of emergency, when an unexpected landing must be made, the pilot need only send out a call for help and tell his position, to be certain of rescue. Without the radio equipment, pilots have landed in such out-of-the-way places that they had to undergo severe privations before their rescue was effected.

For these, and other humanitarian

reasons, radio equipment has been found essential to safe flying.

Since the mail plane carries only the pilot, to conserve space for the "paying load," or the mail, the radio engineers detailed to design a set for the planes had to make this a complete one-man, simple-control apparatus. It had to be simple enough not to interfere with the pilot's flying duties.

How the Set Works.

This requirement has already been fairly well met by the engineers at Schenectady. The only difference between the plane set decided upon and the simple telephone is the pilot has to operate a switch to talk or listen. This requires little effort.

The turn of a large knob to its maximum reading prepares the set for transmission. To receive, there are only two knobs to adjust in tuning. Once tuned in, all the pilot need do is throw the switch from "transmit" to "receive" and back, as he talks and listens.

A trailing wire of 200 feet acts as the antenna. When the plane takes the air the antenna is let out from a reel in the cockpit. It is grounded to the framework, engine and gas tank.

The sound of the engine, or interference from passing air currents, are as nothing against the efficiency of the super-heterodyne. That is why this set was chosen for this purpose. Its sensitivity and high selectivity reduces interferences to a minimum.

If actions speak louder than words, then President Alfredo Zayas of the republic of Cuba is speaking very loudly in this picture in favor of the new science of radiotelephony. He is shown speaking by radio from his office in the presidential palace for transmission by radio station PWX of the Cuban Telephone company at Havana.

Libraries May Lean on Radio

It may not be long before we shall be going to our libraries, not to withdraw books for home reading, but to listen to a broadcast radio program.

Or, instead of going there at all, we may be listening in on programs broadcast by our libraries for our home consumption.

That this is the trend of radio, so far as public education is concerned, is brought out by a recent dicussion of this subject by members of the American Library association in New York. Said Augustus H. Shearer, former president of the association:

"The position of the library with regard to radio must be considered very soon and with great care.

"The recent drop in circulation of books may be caused by interest in radio. But the library doubtless has a place in the broadcasting program."

In this, there are two ways open for the library, Shearer points out. One is the system of broadcasting education. The other of receiving educational programs for the benefit of the library's patrons.

"New books, book reviews and children's stories have all been proposed as fields for the librarian," Shearer explains, "and there is no doubt that the librarian expert in various lines would be glad to serve in these ways.

"Receiving by the library is still a question. Where libraries have suitable auditoriums it is possible that the library's function should be broadened to provide for its clientele the things which the books cannot give—the spoken word and music. This is one of the effects that radio may have on existing institutions, and the library must be alive to its possibilities."

Broadcast Daily Talks from Radio Bible Bureau

A daily radio message taken from the Bible will be added to the programs of many broadcasting stations, it was announced by the Radio Bible Service bureau organized in Cincinnati, "to give the World Daily a Message from the Word of God."

The bureau is non-sectarian and not for profit, and furnishes a month's copy free to all broadcasting stations desiring the service. It consists of a brief "Bible thought and prayer," including a Bible verse and a line or two of prayer based on the scriptural selection.

The new movement is intended as an added power for right thinking and right living, the underlying thought behind the "Back to the Bible bureau," which about three years ago began furnishing 2,000 newspapers with a daily Bible message.

The Radio Bible Service bureau is headed by Robert Watson Boston, president, with Addison Y. Reid, Cincinnati, secretary, and Arthur Wilson, Battle Creek, Mich., field secretary.

Relay League to Protect Railroads With Radio

"Wires down" no longer holds thoughts of terror and destruction and loss of life in a heavy storm. For when wires are down and no communication can be maintained by land with a stricken territory, radio can keep in touch with the district.

To assure safety and constant communication, storm or no storm, the Santa Fe railroad has arranged for radio help from the American Radio Relay league. Under the supervision of Norman R. Hood, manager of the Rocky Mountain division of the A. R. R. L., the amateurs of that district, especially those along the Santa Fe route, are ready to jump into the breach whenever and wherever it occurs.

This is only the beginning of a nation-wide plan for amateur aid, in the event of storm or other emergencies. The American Railway association is working out the program with the officials of the A. R. R. L.

Radio Jumps Mountain

Radio is being used in India to send messages over a mountain 15,000 feet in height. Considerable difficulty was found in wire communication, due to heavy snowdrifts and storms which severed the lines. Radio spans the distance between Srinagar and Jammu in Kashmir. Other installations have been effected or are planned in Bhopal, Gwalior, Hyderabad and Rejkot.

Why Some Chicago Autoplex Sets Won't Work and Others Prove Efficient

THIS, the fourth of a series of articles on the Autoplex circuit, completes the reports on the experiments and tests made by the author. Future articles may appear from time to time as new developments occur as result of experiments made in The Post laboratory or by others. Next week Mr. Wells begins a new series on a circuit that he considers the most reliable of all—the Armstrong three-circuit regenerative.

By IVERSON C. WELLS.
(Radio Editor The Chicago Evening Post.)

CONSIDERABLE trouble is being had by home builders with the Autoplex circuit. I have traced down most of source and find that the following causes largely are responsible for failure to get good reception, the ones most common being given in the order named:

First—Improper tubes.
Second—Insufficient plate voltage.
Third—Inefficient variometers.
Fourth—Inefficient tuning.
Fifth—Incorrect hook-up.

I have been very careful to specify the proper tubes. The smaller tubes, such as UV-199, C-299, WD-11 and WD-12 and their equivalents in the Deforest and other makes of tubes will not give any satisfactory results in this circuit.

These tubes do not have sufficient capacity to handle the enormous amount of energy thrown into them. They will work, fairly well on local reception, but not with sufficient volume to warrant the use of the Autoplex. It would be better to employ any of the standard sets with these tubes. On outside signals they will fail utterly.

Power Tubes the Best.

Experience has shown that the 5-watt power tubes work the best, such as 216A, UV-202, VT-2, etc. These should be given the limit of their rated plate voltage. Do not make the mistake of thinking that these tubes will produce the volume necessary for loud-speaker operation on ordinary plate voltage. They won't.

The 201A and 301A tubes work next best to the 5-watters. They are not so efficient, but give very satisfactory service. They should carry at least 110 volts on the plate. On far distant stations—if you seek to bring them in on loud speaker, you may have to shoot up the voltage to 130, but do not make this a regular practice. It is a little too much for these tubes. Continuous application of this high voltage will shorten the life of the tube.

I admit this means a lot of B batteries, but remember you are getting the volume of three tubes, and what you gain in one direction in the way of economy is going to be made up in another direction, to some extent at least.

List of Some Good Variometers.

The quality of the variometers has much to do with the efficient working of this circuit. I have worked so far the following brands and found them adapted to the circuit: Columbia, Atwater-Kent, Kellogg, Dayton, White and Victory. Of course, there are others that will answer equally as well. I have not tried them out in tests and, therefore, cannot give them a place in this list.

Here are the requirements for the variometers: It must have a high inductance ratio. It must have a low distributed capacity. Usually, the type that has the stator wound inside has these qualifications but not necessarily. There are many of this type on the market.

In a number of sets I had the occasion to examine the last week made by home builders I made a discovery that I believe is causing half the trouble with the Autoplex circuit around Chicago.

It seems that several dealers, anticipating a demand for the Miloplex circuit parts, had a number of variometers placed in their original cartons with a special marking showing that they were for the circuit. Now, these variometers are so made that by simply changing the terminal connections they be used either as a split variometer or as a plain variometer. In this case the split connections were made by the dealer.

Unfortunately, the demand for Autoplex parts far exceeded those for the Miloplex, and dealers, without thought, sold a great many of the ones especially connected up for the Miloplex to Autoplex home builders.

I found one of these in each set in two homes I was a guest of the last week. Naturally, there were no results from this arrangement. By simply connecting the terminals in the regulation way all the trouble disappeared and the set worked like a Trojan.

Because of these experiences I would advise all that are having difficulty in getting their Autoplex to work to take a peep at the terminals and see if these are properly connected.

Tuning Important Factor.

Inefficiency in tuning is the next serious trouble with the Autoplex, according to the experience of those who have brought their troubles to The Post.

The Autoplex tunes very, very sharply. It is a set that a high-strung, impatient, nervous sort of cuss should shun like he would smallpox. If you are not careful, you will slip over half a dozen stations and not know it. The signal whistle comes in quite sharply, almost like a short click on many of the sets. This means that a vernier knob must be employed on both variometer dials to permit of close adjustments.

Once the little whistle is heard, or the sharp click makes itself known, nurse it tenderly. Gradually increase the regeneration and force up the applied power until the full signal strength is in.

You will find that however far the station may be away from you it will come in with sufficient volume to operate the speaker. It may be that the coast stations will not be strong enough for the speaker, but they certainly will come in much stronger in the head phones than any one tube set you ever heard.

The Autoplex is noisy. It is about as noisy a proposition as one ever went up against on a tuning panel. It will shriek and howl and squeak, but don't mind. That's a characteristic and proves the set is working good.

Make a finer adjustment. When you have the set in complete resonance with the incoming station the Autoplex quiets down and becomes as peaceful as a kitten.

How to Balance Circuit.

You will find that it will be better to vary the two variometers in unison, or as near to unison as is possible. When you make one movement on one variometer follow it up with a similar movement. Keep this up until a rushing noise is heard in the phones or in the speaker. This is the signal that indicates you have reached the wave length and signal of the incoming station.

Get this in your mind and hold it there: The two circuits—the grid and the plate—must be in complete resonance. You will find that the variometer dial readings practically will be identical whenever the resonance points are reached. The resonance points may run anywhere on the dials from the zero to the 180.

There are many who have trouble who have not followed the circuit diagrams carefully. The hook-up is simple and easily followed, but some seem to get mixed up on it, just the same.

I am republishing the circuit diagram today so that those who have mislaid former publications may have it as a guide. Take this and study it closely. Also take the pictures of the Autoplex published last week and note the arrangement of the parts on the panel. Keep your leads short.

And this is important: If you use an aerial, be sure it is a good one. At least 150 feet is necessary. If ground only is used, be sure it is a perfect one.

Audio and Radio Amplification.

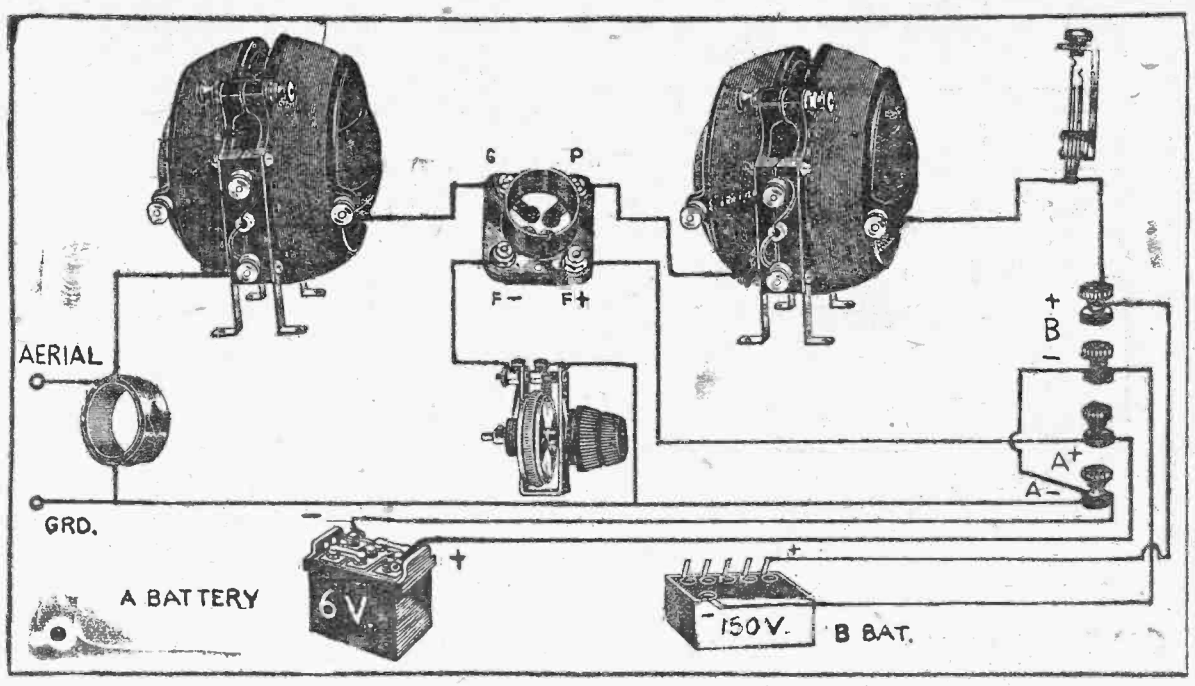
Many inquiries are coming about radio-frequency and audio-amplification. So far experiments with radio-frequency have not been successful. Frankly, I have not had the opportunity to give it much of a trial. My own brief experience and that of others, including Mr. Muhleman, the inventor of the circuit, is that it reduces the volume considerably. In other words, it almost takes the super out of the circuit.

I would like to hear from readers who have experimented with radio-frequency amplification.

Audio-amplification lends itself admirably to the circuit, altho it is not required. Most of the stations in the United States will come in heavy enough to operate a loud speaker. If some do not, it may be well to add just one stage of audio. The connections are made in the usual manner. The addition of this one stage gives an unusually strong volume.

Keep Batteries Watered

Now that the steam heat days are here, the water in your storage battery will evaporate as fast, or faster, than during the summer. Keep the level of the electrolyte above the plates. Add only distilled water, which can be had at any drug store. It is cheaper by the gallon bottle. It is well to give the battery a slight charge after filling.



AFTOPLEX SCHEMATIC DIAGRAM

How to Add One Stage of Radio to Reinartz Set

ORDINARILY there is little to be gained in the addition of one stage of radio-frequency amplification to a regenerative receiver, but in some instances such as the Reinartz tuner, the added stage appears to give the set the final touch to make it the most selective apparatus of its type.

Amateurs have been reluctant to try radio-frequency in conjunction with regeneration since usually the two have refused to combine with any great success. Particularly was this true with the transformer type of coupling.

With the improvements in tuned radio-frequency and especially in the apparatus developed for these interstage couplings the usual drawbacks have disappeared.

Popular Idea Fallacy.

Many times radio enthusiasts have read that radio-frequency amplification could not be added to a Reinartz because the latter circuit was based on an aperiodic or untuned primary.

The premise was wrong, altho the latter fact was correct. The primary is untuned, but the secondary is sharply tuned by the tap switches and the 23-plate condenser. If the argument had held any weight the conclusion still would have been wrong for the simple reason that the radio-frequency coupling device handled the output of the tube and not the input.

An excellent receiver with a high sensitivity and an unusually high degree of selectivity can be assembled by combining the plain Reinartz tuner, one stage of tuned radio-frequency amplification and one stage of good audio-frequency amplification, according to the diagram.

How to Wind Variometer

The interstage coupling by which the tuning is accomplished should consist of a variometer containing at least sixty-five turns on rotor and stator respectively. The variometer should be selected by its radio characteristics. The clearance between rotor and stator should be as small as possible. The wire should be as large as will allow the required turns to be placed within the available limits and the substance out of which the frame and rotor ball are made should be either of thoroly dried nonresinous wood, or composition having low high frequency losses.

If it is found impossible to secure a variometer with the full number of turns it is not advisable to attempt to increase the tuning range by inserting a condenser across the entire instrument. In general it would be best to give up the idea rather than work with the makeshift.

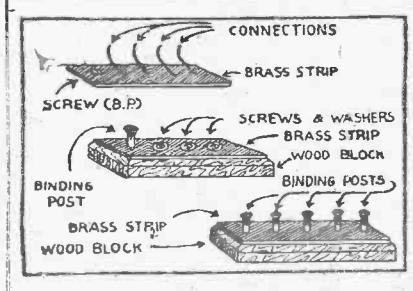
Tubes Are Critical.

The tube for the radio-frequency stage plays a far more important part in the action than is usually credited to it. Not every type of tube and not every tube in a suitable type will be found to work properly. Instead of amplifying the high frequency impulses fed to the tube thru the secondary of the Reinartz, the tube elements being too close together act as condensers and merely pass the impulses straight thru, short circuiting the regular tube action. If this circuit is worked out, it will be wise to experiment with an assortment of hard tubes until the best one is found. Then and only then will the full measure of results be secured from the single radio-frequency stage.

Positive Contacts for Panel Binding Posts

When a set is used to try out different hook-ups as they appear, and connections are not very permanent, the ground and aerial binding posts often become overcrowded so that a poor connection results, or if the connections are soldered, no single wire may be removed without disturbing the whole group.

If a brass strip (see sketch) is attached to the back of the panel to the



binding-post screw, and the connections soldered to it, they will be much more easily changed if need be. If connections are not soldered, the strip may be mounted on a block and binding posts placed along it (five or six), it will greatly facilitate changes in hook-ups. Screws (brass) with washers may be used instead of binding posts when appearances are not important. —A. F. McAllister, 2118 West 109th street, Chicago.

Dead End Wires Hurt Selectivity of Sets

One way toward selectivity in a receiving set is to eliminate all the wire on the tuning coil that is not in use.

Vacuum tubes will bring in signals for a distance of about five miles without an aerial. Some receivers will work greater distances. If there is an excess amount of wire on the coil the unused part will be receiving some other station and the two will be heard in the phones.

The unused portion of the tuning coil has a certain definite frequency to which it will respond, therefore if the signal received is near this frequency this part of the coil will absorb some of the received energy.

These two reasons should be enough to make any phan tear the wire, that is never used, off his coupler or tuning coil. If this is done there probably will be a noticeable difference on local stations and surely on all distant stations worked.

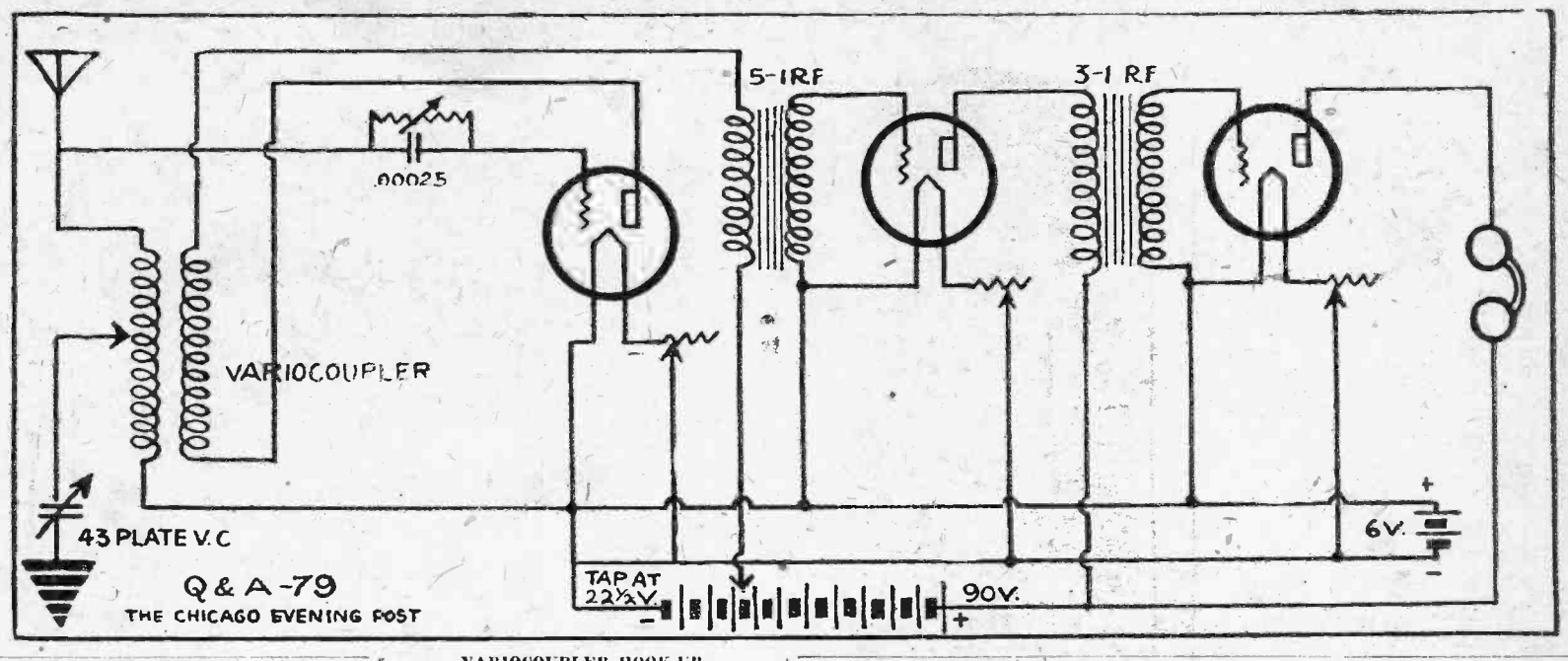
Testing Storage Batteries

Never use an ammeter to test a storage battery. A voltmeter will give a fair indication of the battery, but the best all around, sure fire test is that made with the hydrometer. Do not test just after adding distilled water.

Questions You Ask and Answers We Give

FREE SERVICE

QUESTIONS asked on any subject pertaining to radio will be answered in this department in either the daily edition or The Radio Magazine section published each Thursday. No charges are made for this service. If personal reply is desired by return mail, enclose self-addressed and stamped envelope. Write on only one side of the sheet, and where a check is desired on a faulty circuit be sure to send legible diagram as used in the hook-up.



136—CHICAGO—I have a one-tube Reinartz set with a Bremer-Tully vernier tuner and a 23 and 43 plate condenser. I use a UV-199 tube, two 1½-volt A batteries and 22½-volt B battery. I get the local in strong without any body capacity or howling of any kind. But on the distance stations I have considerable howling in my tube and rheostate, and when I put my finger on the phone post on the 23-plate condenser it seems to stop the howling a good deal. I have body capacity on my 23-plate condenser, which is next to my rheostat. I have a .000025 2-meg grid leak, but no phone condenser. Is there any way to stop howling and body capacity? If I use a phone condenser, what kind, and capacity is the best for my set and the proper place to put it? I will sure appreciate any information you can give me on this.

Try a phone condenser of .022 mfd. capacity. A great deal of body capacity can be eliminated by shielding panel with tin or lead foil. Better results can be obtained with a C. R. L. variable grid leak. UV-199 tubes require a 40-ohm rheostat. If this is not adhered to trouble such as you have would result.

RHEOSTAT OHMAGE.

128—CHICAGO—My ultra-audion set has been working very well up to lately. When I get a whistle and turn the rheostat down, I hear a click and everything is gone. I can also make that same click by turning the condenser. Is it because the rheostat is the wrong ohmage? If so, would you please tell me the right ohmage for a C-300 tube?

The click you refer to is characteristic of an ultra-audion set. Rheostat should be six ohms. The binders are ready for delivery. They will be mailed upon remittance of the price of 50 cents, or you can call at the office for the same.

TABLE MOUNTING.

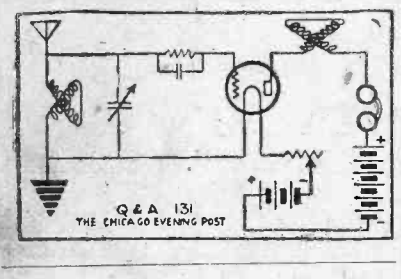
121—CHICAGO—I enjoyed very much the reading of your magazine, and am certain it is a welcome addition to us amateurs and to our library. I have built one set, a one-tube, which is giving good results. I noted with interest the photo of "A Practical Testing Set" in a recent issue. It appeals to me as a very practical way of laying out your set. Can you tell me where I can get the details of this set, blueprints, photos and list of parts? I am ambitious to build a better and larger set. Magazine issued Nov. 15, page 6, is the one I refer to.

The set you refer to was shown as an illustration of a method of wiring and mounting for experimental purposes. This can be applied to any circuit by buying parts that can be table-mounted. Experimenters usually employ this method for temporary hook-ups of new circuit. When they have satisfied themselves of its efficiency, they mount in the regular way—that is, on panel and in cabinet.

VARIOMETER CIRCUIT.

131—CHICAGO—Please send me a clear diagram of a set in which I can use the following parts: Two variometers, one vernier condenser and one WD-4 tube. What is the mileage on the set which your diagram shows with and without outside aerial?

Diagram of circuit requested has been mailed you. It is the Armstrong three-circuit



regenerator, known commonly as the variometer hook-up. The range, approximately, is 1,500 miles under good conditions.

130—CHICAGO—The inclosed diagram is of a circuit that a friend of mine is using and he claims wonders for it. He uses a WD-12 tube with 1½ volts and a 22½ "B" battery. Would it be possible for you to give this circuit a tryout in your shop and inform the writer of your findings? If it is as good as he claims, it could be passed along to any of your readers who would like to change from a crystal set to a single tube set. I take this opportunity to congratulate yourself and The Chicago Evening Post on its remarkable magazine.

The circuit is O. K. It is a single circuit regenerative set. An article on this type set will appear in our columns in the near future.

134—CHICAGO—I was reading your article on the wonders of the Autoplex receiver and I am especially pleased. I have been wanting a set that could get distance and good volume. What do you use in place of a rheostat? Would a switch to turn the tube off and on be all right? How far are you able to hear on these sets? Would you use a duo-lateral 1250 or 1500 honeycomb coil?

A switch is O. K. on Western Electric 216-A and the VT-2 tubes. On others such as 201-A you may use rheostats. Range of set is unlimited. Use DL-1250 turn coil.

AUTOPLEX R. F.

116—CHICAGO—Was much interested in your article on the Autoplex circuit. I would be greatly obliged if you would give me the hook-up for same with the radio-frequency (one stage), also showing how the stage of audio-frequency could be added. I also would like your recommendation as to the best variometers and oscillating coil and all other parts to use in making this set. Could the Croseley radio-frequency amplifier and tuner be used in the radio-frequency amplification in this circuit? And if so, what tube would work best and how much "B" battery would be necessary on the tube you would recommend for the radio-frequency amplification? I notice your conservatism in your article and also notice a reluctance to accept unqualifyingly all reports on this circuit. I appreciate the necessity of saying nothing derogatively in a published article—but would like to know if you have found any peculiar or unsatisfactory features in your working of it.

As yet no satisfactory method of radio-frequency amplification has been perfected. We have found that, altho it stabilized and in some cases makes it finer tuning, it also kills the super-regenerative volume to some extent. We hope to have this circuit ready for the public in a short time. The Croseley cannot be used.

There are no unsatisfactory features in the Autoplex, except that it requires a skillful hand to tune it. The following parts are recommended: Any variometer of high inductance ratio and low capacity with the stator wound inside with pig-tail connection; a 1,250-turn D. L. coil; one 216-A Western Electric or a VT-2 tube. All other parts are standard.

MORE AUTOPLEX DETAILS.

117—CHICAGO: Will you please send a real plain Autoplex circuit that an amateur may construct? How many turns in honeycomb coil are necessary, and how many volts in "B" battery are necessary? Will this circuit work with a Cunningham 6-volt detector? Your magazine is great. I want a binder when they are ready.

Circuit was reprinted in a very clear manner in the Nov. 28 issue of The Post Radio Magazine, together with constructed details. There are 1,250 turns in the coil; 150 to 300 volts of "B" battery with a Western Electric 216-A, or VT-12 tube should be used. A Cunningham detector will not work, nor will the UV-199, WD-11 or other small tubes be satisfactory. The 201-A or 301-A tubes work next best to the big power tubes, 216-A or VT-2.

PEANUT WHISTLE IN SET.

114—CHICAGO: Your section is fine—a real radio magazine, in fact. Will you tell me why I heard a regular "peanut whistle" on my set (two-stage Reinhartz, with dictograph loud speaker), all thru the opera KWY broadcast the other night? I would pick up WDAP or WJAZ and the whistle was gone, but, altho I tried several adjustments, I could get the opera fine with one certain setting and the peanut whistle no matter how high or how low I adjusted tubes.

Send us a hook-up of your set with values, and we will try to solve your problem. There may be many causes, one of which could be improper grid leak value and faulty tuning.

TUNED RADIO-FREQUENCY.

112—CHICAGO: Allow me to congratulate you on your first Radio magazine. It fills a need for every radiophan. I have a DeForest three-tube set, using honey-comb coils. Will it be of advantage to me to add a step of tuned radio-frequency, and just what better results should I get?

Radio-frequency could be added, altho it would require completely rebuilding your set, and two steps would be necessary. With it, set would receive further distance and tune finer. There would be no increase in volume.

MINER'S SUPERDYNE.

302—CHICAGO: Congratulations on your weekly Radio Magazine. It has much valuable information for the Radio bugs. I was all ready to try my luck in building a super-heterodyne, but after reading about Mr. Miner's superdyne, I am interested in obtaining this hook-up. Can you advise me where same may be obtained?

We hope to be able to publish diagram and full details of the Miner superdyne circuit shortly. At the present we cannot give you the desired information.

AUTOPLEX VARIOMETER.

111—ELGIN: I read your Radio Magazine every Thursday and it sure is a great help to the radiophan. Your article on the Autoplex circuit was very interesting. (1) I find that you specify a special variometer for use in this set, so I am asking you to give me a list of the variometers suitable for this set that are on the market. (2) Would the special variometer advertised by Montgomery Ward & Co. be all right? (3) Could you send me a wiring diagram of this set? The one in the paper is obscure.

(1) Variometers should be of good-moulded bakelite type preferably, those having high ratio of inductance with stator wound inside and of the well advertised brands answering this requirement will do. (2) Should work all right. (3) A clearer hook-up was given in Nov 28th issue of the Radio Magazine of The Post with construction details. We have mailed you a new diagram, however. Use 216-A Western Electric or VT-2 tube.

110—CHICAGO: Several weeks ago I assembled an Autoplex set when it first came out in the Radio News, but with indifferent success. After trying it out for several weeks, was about to give up when I noticed your article in The Post Radio Magazine and the success you have had, and decided to give it more time. My aerial is two wires of thirty-five feet each outside; 1,250 turn D. L. coil; a 45-volt B Battery; one dry cell for an A battery and a WD-12 tube. The variometers are of the wooden type with stator wound on the inside. All I ever could tune in was the Drake and Wieboldt's, both 360-meter stations, and these with only fair volume. Never got any DX or even KYW. Can you suggest any change in parts or make any suggestions that would enable me to get KYW and outside?

Your main trouble is due to the fact that you are using a WD-12 tube which has not enough capacity to handle the super-regenerative currents in an Autoplex circuit. Tube should be Western Electric 216-A or VT-2 with 150 to 200 volts of B battery on the plate. Would advise moulded bakelite variometers of high ratio inductance. Aerial is not sufficient for any set from which you expect to get distance work. You have a thirty-five-foot aerial, not seventy feet. One single strand of wire 150 feet long will give you much better reception.

MINER'S SUPERDYNE.

223—CHICAGO: Your article on Miner's Superdyne circuit in the first issue of the Radio Magazine reads so well I would like to make one, and will appreciate very much your letting me know where I can obtain information regarding the construction of this receiver. The Radio Magazine is one of the most interesting publications I have come across, and, while not a regular reader of the Evening Post, I certainly won't miss the Thursday issue.

The first announcement of Miner's Superdyne does not give the schematic diagram for the hook-up, but we are seeking to obtain the same and will publish it in a subsequent issue.

VARIOCOUPLER HOOK-UP.

79—JOP: Please print diagram of good hook-up with variocoupler, 43-plate variable condenser and two steps of audio-amplification. Please give range and selectivity.

A good circuit using parts described is given herewith. It has a range of 1,000 to 1,500 miles under ideal conditions. The selectivity is fair. By adding a wave trap, such as was described in the issues of Nov. 15, Nov. 22 and Nov. 28, you will add to its selectivity.

LOCATION OF KYW.

80—CHICAGO—Where is KYW station located? I want to see it and I want to get a picture of it for my album.

On top of the Commonwealth Edison building, Chicago. This station was described and pictures of the studio, operating room and personnel printed in the Nov. 15 issue of The Post Radio Magazine.

PARAGON OR ZENITH?

301—CHICAGO: I am desirous of purchasing a three-circuit regenerative radio set and would like your opinion on whether I ought to buy a Paragon or Zenith. I am inclosing self-addressed envelope.

This is a mighty hard question to answer, for several reasons. It is just about like asking a fellow what sort of a suit of clothes a fellow should buy. The Paragon is a most excellent receiver. So is the Zenith. They would give the writer very, very satisfactory service. We cannot say as for you.

If you asked what sort of a receiver the writer preferred for his own personal use, we could give you a more satisfactory answer, but as to whether it would answer your requirements, we cannot say. The writer uses a three-circuit feed-back regenerative sets something like the Paragon, but with a few little wrinkles in it that give more selectivity and better range. This set has three stages of audio-frequency. When it is located close to a local broadcasting station, as it was the past year and until recently a wave trap such as was described in the Nov. 28 Post Radio Magazine was used. This was because it was within three blocks of WDAP. It is not required at the present address—about eight blocks from WJAZ.

WHAT IS REGENERATIVE?

115—CHICAGO: (1) Is a circuit employing variocoupler as tuner, with lead or beginning of windings connected to antenna and switch arm to ground, the rotor connected to plate and to telephone jack, a regenerative or feedback circuit, or must a variometer be used in connection with the coupler to make it regenerative? (2) Can a variable condenser be used to advantage in circuit instead of variometers? (3) If variable condenser is either antenna or ground circuits "cut down wave length" as radio writers tell us any variable condenser in rotor or plate circuit increase wave length, then why is variable condenser used at all in antenna or ground in blue print circuits and seldom if ever shown in plate (rotor) circuit? (4) If I use 43-plate in antenna circuit as single circuit diagram shows would I gain any point by placing a 23-plate variable condenser in rotor (plate circuit or from plate—1 end—to phone and thru jack to plus B, of course). (5) It is my understanding that a regenerative set should always employ a fixed condenser (across the telephones). Now, I am not sure where to place same, this .0005 mf condenser, I mean. The diagram shows it connected from rotor one end across to plus A and minus B. I have tried it in this point and notice no improvement. My jacks are wired, bottom connected to plus B—the two center leaves to primary (in and out) of transformer, top leaf to plate and input runs to plate, also rotor of coupler runs to top jack. I am somewhat of an amateur but have successfully built a Reinhartz, two-stage set. The other newspaper radio editors, I find, are so slow in replying that a hook-up is made without waiting for a reply.

(1) It is, and a variometer is not required. (2) Variable condenser could not be used in place of variometer, but would be of more use in a single circuit regenerative set that a variometer. (3) The natural wave length of an ordinary antenna plus that of the primary winding of a variocoupler is generally greater than 600 meters, therefore a method of cutting down the wave length other than increasing it is necessary. (4) Not particularly. The best position for it would be across grid and filament leads from primary of variocoupler. (5) A condenser across phones is not necessary. We are afraid we, too, have been rather tardy in replying to your letter but my mail reaches many hundred inquiries each week, and while I have three stenographers at work it seems impossible to catch up with my correspondence. I am sorry. I have received in this department as many as a hundred queries like yours in a day, many of which required hours of research work to answer intelligently.

IT WAS PUBLISHED.

132—CHICAGO: Will you please send me a list of parts, blueprint if possible of the Autoplex published in The Post? If special makes of tubes, variometers, etc. are needed, give the names and prices. Can a WD-11 be used? My own set at present is a one-tube Reinartz, but it doesn't seem to function as good as could be expected. For one thing, when trying for long-distance stations, I have plenty of howls and more of a popping noise. Is it grid leak trouble? Am submitting a diagram of my aerial. May be that is where the trouble lies. Someone told me at one time to attach to my aerial little clusters of seven strand wire, about a foot in length. Well, there are about ten of those hanging like bells on my aerial. My ground construction is to a steam-heat radiator. My best for your Thursday editions. They're fine!

List of parts for Autoplex with construction details was published in The Post Radio Magazine, Nov. 28. 216A or VT-2 tubes are best. They list at $12, and use from 150 to 200 volts of plate-battery. Neither the WD-11 or UV-199 is satisfactory in this circuit. The 201-A works next best to power tubes. On your Reinartz set use a variable grid leak, such as can be bought of any dealer, and .00025 mica condenser. A proper aerial should be of the "L" type, single wire, 150 feet long, six to ten feet above all obstacles. The spiral coils hanging vertically may improve your aerial.

302—CHICAGO: Please tell me where these stations, WOAD, WFAD and KFKD are located. I received them on my one-peanut tube set. Your radio section is mighty fine.

WOAD is the Friday Battery & Electric company at Sigourney, Iowa. It is a 360-meter. No WFAD is registered. Probably is WSAD of Providence, R. I., on 261 meters. No KFKD listed. Probably KFKB of Milford, Kan., on 286 meters.

SILENT NIGHT CODE.

345, CHICAGO: Is there anything we can do to get 9BBS and 9ASN to observe silent night?

Probably not. The first named is registered in the call book as at Waukegan, Ill., and the other at St. Paul, Minn. Silent night on Mondays here applies only to local stations and amateurs. These two amateurs are withing their rights. You should not have any interference from them, anyway. Your set is working on too low a wave length. Load it up and get above the amateurs.

FAULT IS IN TUBE.

80, CHICAGO: Referring to Autoplex circuit described in Nov. 18 Radio Magazine Vsection: I built this receiver from specifications given in the Radio News, using the following parts: Two Manhattan variometers, 600-meter range; one 1,500 turn honeycomb coil and one standard socket. I use a Silvertone, DeForest tube, and have tried all the various plate and filament voltages, but to date the only station I can tune in is KDKA, East Pittsburg. I cannot receive even the local stations. When they are on the air the only thing I can get is a few station whistles and now and then a faint voice reception. I have tried all kinds of energy collectors, including good single-wire outdoor aerial, a few feet of lamp cord, ground alone, and Ducon plug, but the results are the same. KDKA station comes in when only a few turns of the rotors are outside of the variometer molding. I also tried a 1,250 turn H. C. coil, but this made no difference. What is your idea of the proposition as outlined? Frankly, it has me guessing.

From your information we gather that your set works efficiently at a certain point of regeneration. When this point is reached your apparatus is set so as to receive on a narrow band of waves lengths that take in KDKA. If you notice, there is no other station in a considerable distance on or near 326 meters, therefore our conjecture. We would suggest that you use a harder tube such as 216-A or VT-2, which will not oscillate as freely. Be sure to vary the "B" battery voltage. Then have tubes take up 300 volts on the plate. Apparatus mentioned should be O. K. except for tube.

CAUSE OF AUTOPLEX FAILURE.

122, CHICAGO: I have built the Autoplex from the blue print and had the same looked over by a good radio man, but up to the present am unable to get results. Cannot get WJAZ at all. Too much noise. Can you inform me of the trouble? Kindly advise when your radio binder is ready for delivery.

Your information as to construction of your set, parts used, aerial, etc., is inadequate. Your trouble probably lies in the fact that you are not using a 216-A or VT-2 tube as was specified. This is of great importance. These are 5-watt power tubes and require six volts on filament and from 150 to 300 volts on the plate. Use as much "B" battery as the tubes will stand if you expect this circuit to give you the volume it is capable of. The common causes for failure with the Autoplex, first, is not enough plate voltage; second, improper tubes; third, inefficient tuning, and, fourth, poor construction and parts.

NEEDS A WAVE TRAP.

126, CHICAGO: The loose-coupler hook-up submitted is a description of my loose-coupler. I am having fairly good results, receiving all Chicago stations, but I am troubled quite a bit by not being able to tune out WJAZ to receive KYW's opera on Saturday night. I am willing to improve this hook-up if I don't have to go to much expense. The material I have on hand that I find no use for so far is one 43-plate variable condenser, one .00025 phone condenser and an iron core with a slider and about 50 turns of (⅛-inch in thickness) wire wound around it. I would not mind purchasing any other small articles if necessary.

The wave-trap diagram in The Post Nov. 28 Radio Magazine will solve your problem. The parts necessary for its construction you have at present.

NEEDS MORE BATTERY.

125, CHICAGO: I have constructed the circuit from sketch of your article in The Post Radio Magazine of Nov. 15, but I cannot get the whistling sound as you described there should be. Can you suggest what I should do to make this circuit work properly? Any suggestion you make will be carried out to the letter. The parts I have are: 1 Honey-comb coil, 1,500 turn coil; (2) variometers, mahogany type; 64 turns on rotor; 1 vacuum tube U. V. 201; 1 socket, 1 rheostat, 5 to 6 ohms; 1 storage battery, 100 amps; 2 "B" batteries, 45 volts.

Use 1,250 turn coil and 150 to 300 volts of "B" battery. I would suggest first trying honeycomb coil. Then more "B" battery. If this does not correct trouble, obtain Western Electric 216-A or VT-2 tube and put in place of VV-201. These power tubes require six volts on filament and from 150 to 300 on plate.

WANTS WORKING PLANS.

123, CHICAGO: I would like to know if you have a larger diagram of the Autoplex one-tube set you wrote up in your Radio Magazine. As I am an amateur as well as green about the different symbols, I ask you where can I get the above design, as I want to build a smal. compact set.

A diagram such as you wished is for sale in several of the loop radio stores. Also note construction details in Nov. 28 issue of The Post Radio Magazine section.

124, CHICAGO: I would like to know what makes variometers are best suited for the Autoplex circuit and where they can be purchased.

Use any good molded variometer having a high ratio of inductance and low distributed capacity. The stator should be wound inside. Any dealer can supply you with the type referred to. Do not buy cheap variometers. They don't work.

AS TO AERIAL WIRE.

127, CHICAGO: So glad of the radio section. Now I won't have to take two evening papers. For a starter: Is plain copper wire better for an aerial than insulated wire? Does an aerial on the roof affect the insurance on building? Are lightning arrestors necessary?

Plain copper wire is best. An aerial on the roof does not affect the insurance of a building. A lightning arrestor is not necessary, but desirable as a protection to the set.

WANTS SELECTIVITY.

129, WILLIAMS, IOWA: My set is a Clapp-Eastham HR receiver with HZ 2-stage amplifier. Please tell me what changes I will have to make to make it a dry-cell outfit. Also, how can I make it more selective?

Substitute WD-12 tubes for ones you are using at present. Use two dry cells in parallel (not in series) in place of storage battery. Set can be made more selective by adding a wave trap such as was shown in the Nov. 28 Radio Magazine section.

RADIOLA "R. C."

104, CHICAGO: I have a Radiola "R. C." three-tube set, but I do not understand just how to hook up the "B" batteries. There are four binding posts on the bottom of set in the order given: A plus and B minus; A minus; detector B plus; amp. B plus. I want to use sixty-seven volts across amplifiers and eighteen on detector. How could this set be made more efficient or selective? Could a unit be built and added or hooked to the binding posts? Is this a single circuit regenerative? Please mail me diagram.

In reply to your incuiries in letter of recent date, hook-up is given on this page. Set could be made more selective by adding wave trap which we have described in the Nov. 28 issue of The Post Radio Magazine. The Radiola "R. C." is a variation of the single circuit regenerative hook-up.

GETS ONLY LOW WAVE LENGTHS.

219—CHICAGO: I take liberty in writing to you concerning the Autoplex circuit. Would like to know just what variometers

(Continued on Page 12.)

How to Add Three Stages of Audio-Frequency Without Distortion in Output

BY an unusual streak of good fortune The Post Radio Magazine has obtained a series of highly interesting articles on radio and audio-amplification by Benjamin Freund, the young Chicago radio engineer, whose work in the radio engineering field has been of inestimable value to the industry. The first of these articles, all of which have been written exclusively for The Post Radio Magazine, and are protected by copyright, is published today. Next week's article will deal with the subject of home-built "push and pull" transformers.—The Editor.

BENJAMIN E. FREUND.

By BENJAMIN FREUND.

THERE has been a constant demand by many for a means of amplifying radio-reception efficiently past the second stage of amplification. Generally those who have tried three stages of audio-frequency amplification have met, to a great degree, with failure.

In the contents of this article I will endeavor to explain in a most explicit nontechnical manner just how a third stage of amplification can be used efficiently.

In order to create this amplification clear to all we will go back to the fundamentals of amplifying circuits.

The current impressed from one tube to another in a vacuum tube circuit is an alternating current, coupled with transformers. An alternating current is one which alternates, first flowing in one direction and then in the opposite.

As voice or music is carried thru a vacuum tube little electrical variations in the circuit are created which correspond to the variations of the voice or music.

In a detector tube circuit these electrical impulses generally are strong enough to operate only a pair of phones. If greater volume is desired these impulses must be magnified or made more intense.

In order to create this amplification the output of the detector tube is connected to the primary of a transformer which is designed specially for this purpose. This primary is a coil of very fine wire wound around an iron core built up of a great many laminations of the softest kind of sheet iron.

Over the primary is wound another coil of wire with a greater number of turns than on the primary. The secondary winding generally has from three to ten times as many turns as the primary and it is this ratio of turns that is meant when the manufacturer of a transformer rates the transformer as a three to one or five to fone ratio transformer.

How Sound Is Amplified.

As the impulsing current of the detector tube passes thru the primary a likewise impulse is induced in the secondary, only with greater potential due to the step-up factor of the transformer. This greatly intensified impulse is applied to the grid of the succeeding tube, which in turn intensifies the variations of the plate circuit thus giving forth greater signal strength due to the amplifying factors of the transformer and vacuum tube combined.

After this form of amplification has been carried thru two tubes or two stages of amplification, a loud speaker can be applied, giving forth great volume. On local stations sometimes one stage of amplification is all that is necessary to give satisfying results.

Now, if another stage of amplification for greater volume is tried there usually is a great amount of noise noticeable, which is generally called tube noise. The reason for these noises is quite apparent when explained.

For easy examples we will substitute a water pipe for a vacuum tube, water for the current passing and water pumps for each stage of amplification.

If this pipe is capable of passing ten gallons of water thru it in a given amount of time and if one pump will push five gallons of water it will take two pumps to push ten gallons, thus pumping the maximum amount that the pipe will hold. Now, if an other pump was to be applied the pipe would be carrying an overload of water and would possibly spring a leak or burst under the pressure applied.

This also applies to amplification with the vacuum tube, where the pressure applied would be the "B" battery or plate voltage used.

Why Distortion Results.

After amplification has been carried on to the second stage the amount of power that that tube is carrying is generally the full capacity of the tube. Like in the water illustration, if the power is now pushed thru a third stage of amplification, this third tube is being forced and instead of giving forth pure amplification of voice or music, whichever it might be, it distorts to a certain extent due to internal noises within the tube being created and amplified with the voice.

In some instances where poorly designed transformers are used the voice or music is given forth in blurts which is generally due to the transformer not being able to cover all of the frequencies within the musical range with even volume.

Now, in order to carry on amplification past the second stage without distortion or amplification of tube noises, either tubes capable of carrying greater power or differently designed transformers must be built, or probably both are necessary. As most power tubes necessitate more than six volts for filament lighting and as most transformers are not designed for power tubes both of these methods are impracticable.

We will then look forward to a method that has been used for the amplification of speech in telephony with great success for many years. Some of the readers probably are aware of the method which I will try to explain. This method of obtaining amplification beyond the second stage with efficient results is called the "push-and-pull" method of amplification.

Now it is well known by all who dabble in radio that every tube has a grid and a plate which form part of the input and output circuits, respectively.

Balances Up the Output.

Now when the secondary of an amplifying transformer impresses a potential upon the grid of the tube it is connected to, the grid only passes one-half of the cycle of the alternating current. That is, as the current passes first in one direction and then in the other direction only one of the alternations affects the grid.

In the "push-and-pull" method, the secondary of the transformer is tapped, thus dividing it in two. One half of this winding is connected to one tube and the other half is connected to another tube. This allows one tube to take care of one alternation while the other is impressed by the other alternation.

The connections for the input of such a transformer are as illustrated in figure 2.

G-1 is one end of the secondary winding and G-2 is the other end of the secondary winding. F-1 is the return lead from the grids of both tubes and is generally connected to the negative filament or to the negative of the "C" battery when one is used. It is generally advisable to use a "C" battery in this form of amplification in order to give the grid the proper amount of bias or negative potential, which is highly desirable for the deliverance of great power.

A "C" battery can be made of small size ordinary flashlight batteries. From 3 to 20 volts are sometimes necessary to give best results, depending upon the characteristics of the tube used and the amount of plate voltage or "B" battery used. The greater voltage applied on the plate of the tube the greater must the voltage be which is to be applied on the grid.

In ordinary amplifying circuits where the voltage used on the plate does not exceed 100 volts, sufficient bias, or grid potential, can be obtained from the "A" battery by connecting the grid return lead from the transformer to the negative of the "A" battery, as shown in figure 3.

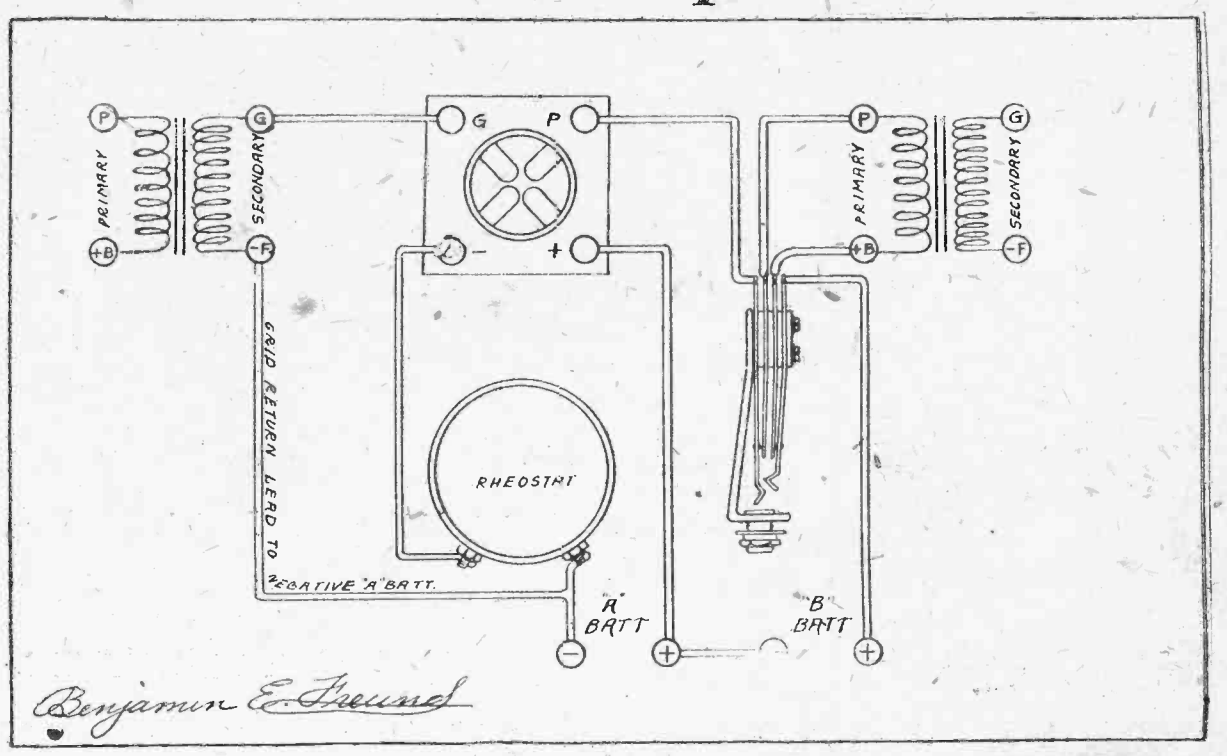


FIGURE 1—One stage of audio-amplification.

Now, getting back to the push-and-pull amplifier, it readily will be seen that an output transformer is necessary as a collective agency for the outputs of the two tubes. We, therefore, must have a transformer which has a means of combining the outputs of both tubes to one common output. This is done by having a transformer with a tapped primary, the tap dividing the primary evenly in two parts, as illustrated in figure 2, where P-1 and B-1 form one half of the primary and B-1 and B-2 form the other half.

In this manner the burden is divided, each tube doing half of the amplifying and then combining their output, which is induced into the secondary of the output transformer and by connecting a loud speaker to L-1 and L-2 on figure 2, clear, distortionless amplification can be had with terrific volume and without any strain whatsoever on the tubes being used.

As this is the beginning of a series of articles dealing with audio-frequency and radio-frequency amplification, we will not go any further into the explanation of the push-and-pull amplifier. Next week's article will deal with the construction of push-and-pull amplifiers, made of ordinary equipment that can be obtained at any radio retail store. This initial article is mostly explanatory, so that when the following articles on the construction of amplifiers appear the reader will be able to understand to a better extent just how and why it is done.

Don't Force Tubes

When tubes refuse to oscillate forcing them by applying more filament current will not solve the problem. It only shortens the life of the tube. Look elsewhere for the trouble.

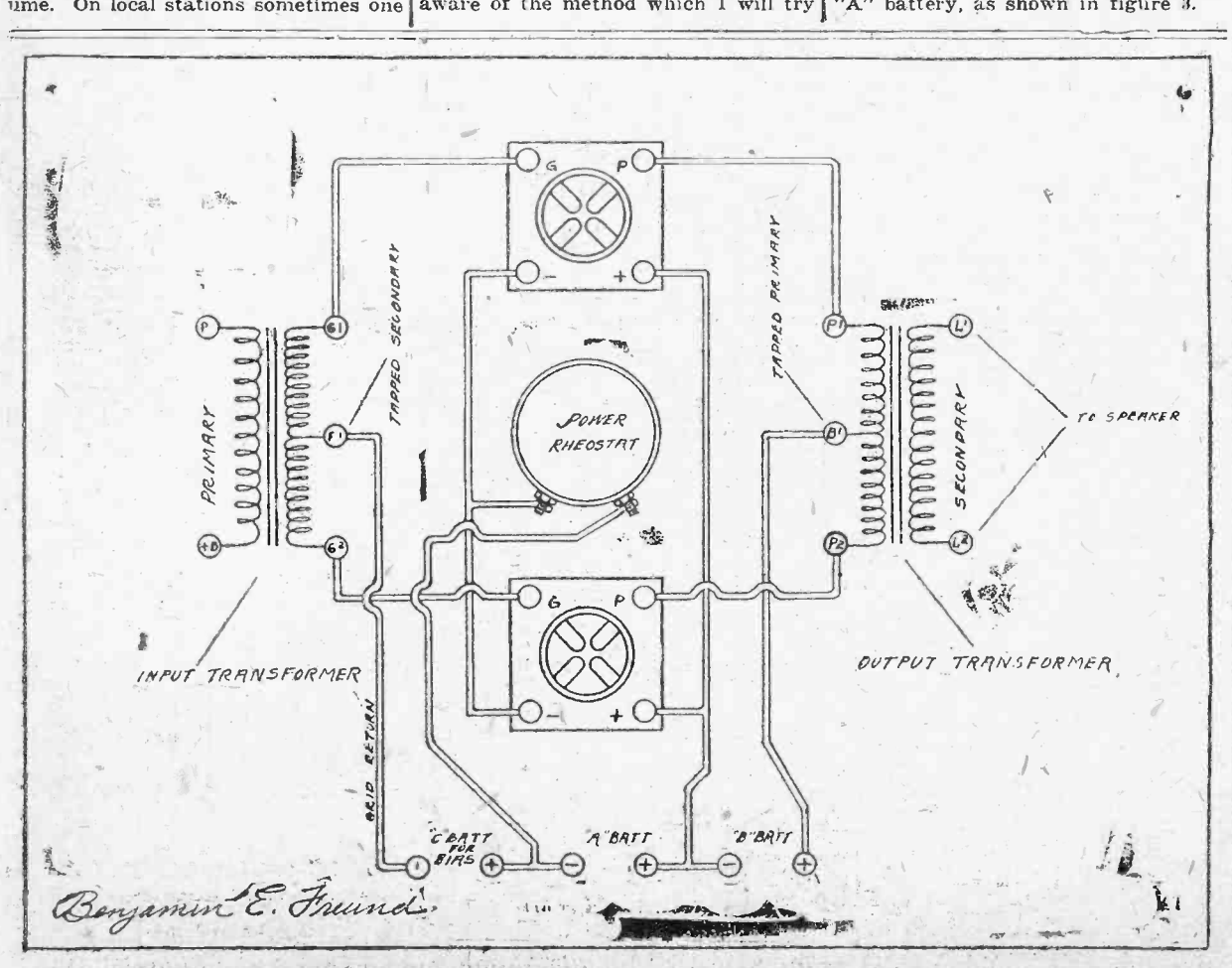


FIGURE 2—One stage of "push and pull" power audio-amplification.

Post Makes Hit with Bible

WILLIAM ZIEGLER NOURSE.

The Chicago Evening Post's broadcasting of the Goodspeed "New Testament: An American Translation" on Sunday evenings from station KYW (Chicago) has aroused favorable interest among the radio listeners of the country. What was originally planned as a feature for only four Sundays has now become so favored among the invisible Sunday audiences that the broadcasting station has decided to extend this service indefinitely.

Letters to KYW from all parts of the country have shown how radiophans have enjoyed the fifteen-minute readings from the Goodspeed translation. William Ziegler Nourse, who has read the selections for KYW, has been commended for his clarity of voice which has helped to bring to many people portions of the message at contained in this new American version of the New Testament.

Writing of the religious significance of such a service as this broadcasting of the Goodspeed New Testament, Rev. Herbert L. Willett recently stated in the Christian Century: "Quite aside from the interest attaching to a modern speech edition of the Scriptures, public attention will be drawn afresh to this masterpiece of the world's literature, this narrative of the life of the founder of Christianity, and the story of the beginnings and growth of the early church. The results of such an event upon the general biblical intelligence of the nation will be incalculable."

Mr. Nourse broadcasts each Sunday between 6:30 and 6:45 p. m., reading selections from the "New Testament: An American Translation," by Edgar J. Goodspeed, as they appear exclusively in The Chicago Evening Post.

Crystal DX Loggings

Crystal radiophans are making some records these days, especially with the Hagerman Long Distant Crystal receiver published in The Post Radio Magazine section. Here are some examples of stations brought in the past week:

GETS FIVE DX STATIONS.

RADIO EDITOR—I made your long distance crystal set as per your Radio Magazine section of Nov. 28. "I'll say she perks." Last night (Dec. 3) I got KDKA, WOS, WTAS, WDAF and WCBD. Many thanks for your description.—S. L. HELD, 3439 Fulton avenue, Chicago.

GETS KDKA ON CRYSTAL.

RADIO EDITOR—At the risk of being considered the world's greatest prevaricator, I desire to say that last night (Dec. 3) I got station KDKA (East Pittsburg) on the dinkiest crystal set you ever saw. Once before I had detected St. Louis in the air, but very, very faintly, but last night KDKA was plain enough to distinguish the evening story, music, etc.

I always can get Zion and Elgin, but this was my first real distance connection.

The crystal set mentioned is nothing but a spider-web coil inside a cabinet, about 3x5 inches in size. It has a row of terminal posts over which the finder (or whatever you call it) passes. The set is grounded on the radiator and I clip it to an outside single aerial about eighty feet long. The set is so small it has attracted the curiosity and comment of my friends. It was purchased as it stands, but I do not know the name of the maker. The above may not be unusual generally, but it certainly is with me.—ARTHUR S. LYTTON, 1460 North avenue, Hubbard Woods, Ill.

Long-Distant Hounds Smash Records

Roy J. Blum, 309 Deyo street, Congress Park, Ill., has run in forty stations in one night, and makes a sworn affidavit to those figures. His mark is one to shoot at, as it comes close to a world's record.

The stations were received on the night of Nov. 5 and covered the entire continent. New York in the east Dallas, Texas, in the south; Calgary, Canada, in the north, and Portland, Ore., and Los Angeles, Cal., in the west, are the outpost stations. The remainder are, of course, scattered thruout the United States.

Lest there be some one who would doubt Mr. Blum's record, he had it taken to a notary public and made affidavit to its accuracy.

Then the complete report was sent to Wilson J. Wetherbee, director of the Westinghouse station KYW in Chicago.

Here are some of the DX reports sent in by The Post Radio Magazine readers since last week's issue:

Gives Details of Work.

The complete report as made by Mr. Blum, with the notary public's notations, follows:

This is to certify that I, Roy J. Blum, residing at 309 Deyo avenue, Congress Park, Ill., a suburb fourteen miles west of Chicago, Ill., heard on the night of Nov. 5, 1923, the following radio broadcasting stations with the following equipment:

Receiver—Westinghouse type R. C. serial No. 58197.
Tubes—Radiotron 201A for detector and 201 for amplification.
Telephones—Baldwin type C.
Loud Speaker—Lyradion, Baldwin type C unit.
A-Battery—Hörgis 6 volt, 60 amperes, testing 1250.
B-Battery—Everyready, 15 cell, 45 volts.
Antenna—One strand T type, long strand 75 feet, hung due east and west, short strand, due north and south, highest elevation 50 feet, lowest point 40 feet.
Lead In—20 feet long.
Ground Wire—Connected to water pipe.
Temperature—40 above zero.
Static mild.

STATIONS HEARD.

Call letters.	Location.	Time p. m.
KDKA	Pittsburg, Pa	6:00
WDAP	Chicago	6:02
WCX	Detroit, Mich	6:23
WDAF	Kansas City, Mo	6:25
WCK	St. Louis, Mo	6:26
KYW	Chicago	6:31
WPAD	Chicago	6:33
WOC	Davenport, Iowa	6:42
WGY	Schenectady, N. Y	7:00
WBAP	Fort Worth, Texas	7:33
WHB	Kansas City, Mo	7:35
WLAG	Minneapolis, Minn	7:37
WDAR	Philadelphia, Pa	7:43
WOQ	Kansas City, Mo	7:50
WCAE	Pittsburg, Pa	7:54
WHAZ	Troy, N. Y	8:01
WCBD	Zion, Ill	8:03
WOS	Jefferson City, Mo	8:05
WWJ	Detroit, Mich	8:22
KSD	St. Louis, Mo	8:23
WLW	Cincinnati, Ohio	8:27
WIAB	Rockford, Ill	8:45
WRAD	Marion, Kan	8:46
KFKB	Milford, Kan	8:48
WBAV	Columbus, Ohio	8:57
WOR	Newark, N. J	9:06
WJZ	New York, N. Y	9:08
WRC	Washington, D. C	9:14
WMC	Memphis, Tenn	9:15
WOO	Philadelphia, Pa	9:17
WOAW	Omaha, Neb	9:19
WFAA	Dallas, Texas	9:29
WPAH	Waupaca, Wis	9:35
WBAH	Minneapolis, Minn	9:40
KFDL	Denver, Colo	10:10
WGR	Buffalo, N. Y	10:22
WSB	Atlanta, Ga	10:52
KFI	Los Angeles, Cal	11:00
KFAB	Portland, Ore	11:34
CFCN	Calgary, Canada	11:38

Signed, R. J. BLUM.

Personally there appeared before me this 6th day of November, 1923, Roy J. Blum, who under oath swears that the above is true and correct.

J. F. GRUNDLACH, Notary Public.
(Seal.)
My commission expires Dec. 20, 1925.

HE HEARS HAVANA ALSO.

RADIO EDITOR—I was very much interested in the announcement in your department that quite a few radiophans had heard Cuba Monday, Nov. 19, in spite of the fact that it was not their regular broadcasting night. I beg to say that I also had them on that evening, very much to my surprise, and I got the last three numbers of the program, which was given by a sextette from an ocean liner that was evidently docked at Havana, but on account of the decidedly Spanish accent of the announcer, I failed to catch the name of this vessel. The program was very distinct, clear and loud, one of the numbers being our old friend, "La Paloma." I wrote on Monday, asking them if they had changed their broadcasting evening but have not had time up to the present writing to receive an answer.—LOUIS GEYLER, 2635 South Wabash avenue, Chicago.

"BEG YOUR PARDON."

RADIO EDITOR—I am about to take issue with you on radio miracles, and suggest a "Beg Your Pardon" column for your magazine. On Monday night, Nov. 19, we had station PWX, Havana, Cuba, from 10 to 10:35 p. m., central standard time. At 10:15 p. m. announcer commented thusly: "If you hear clock ticking this is Havana, Cuba." Program consisted of an orchestra playing from some ship. Signed off at 10:35 p. m., "Station PWX."—HARVE C. VICK, Alta Vista, Iowa.

HEARS KFI ON ONE TUBE.

RADIO EDITOR—Last Monday night, Nov. 26, I broke my record of silent night reception with the following stations: KDKA, KFAF, KSD, WBAP, WBAV, WBZ WCBD, WCX, WDAF, WFAA, WFI, WGR, WGY, WHA, WHAZ, WHK, WIP, WJZ, WLAG, WMC, WOAW, WOC, WOO, WOR, WOS WSB, WSY, WWS, WTAS, KLZ.

These thirty stations came in clear. There were a few whom I could not understand. I have a one-tube ultra-audion set with which I heard KFI, Nov. 18, 1923, from 11:10 until 12 midnight.—ECH MURRAY, Elmhurst, Ill.

RADIO EDITOR—The list of twenty-two stations, which follows is the result of last Monday night's efforts (Nov. 26). My set is a one-tube reflex hook-up.

KDKA—Pittsburg, Pa.
KSD—St. Louis, Mo.
WBAH—Minneapolis, Minn.
WCAE—Pittsburg, Pa.
WCBD—Zion Ill.
WCX—Detroit, Mich.
WDAF—Kansas City, Mo.
WDAR—Philadelphia, Pa.
WEAF—New York, N. Y.
WGY—Schenectady, N. Y.
WLW—Cincinnati, Ohio.
WMC—Memphis, Tenn.
WOAW—Omaha, Neb.
WOC—Davenport, Iowa.
WOR—Newark, N. J.
WOS—Jefferson City, Mo.
WPAH—Waupaca, Wis.
WRC—Washington, D. C.
WSB—Atlanta, Ga.
WTAS—Elgin, Ill.
WWJ—Detroit, Mich.
WOO—Philadelphia, Pa.

I also heard part of a "flag-waving, red fire" address, but lost it before the conclusion of the speech. This came in at about 10 p. m.—WM. R. MEACHAM 3544 South Morgan street, Chicago.

WEAK LOCALLY STRONG ON DX.

RADIO EDITOR—Since you are inviting lists of stations received, I am giving you the following which I have received in the past thirty days on a three-tube Clapp-Eastham set—detector and two steps of audio—and using an inside aerial made up of fourteen-strand wire, silk and cotton covered, without rubber insulation, which rests in the picture molding in my room and which is sixty-six feet long with a ten-foot lead-in.

I have found this aerial much more successful than my outside aerial one hundred feet long with a thirty-five-foot lead-in. It gives slightly less volume on local stations, but more volume and more selectivity on the DX stations. Here is the list:

Shepherd stores, Boston; Sudbury, Ontario, Can.; Elgin, Ill.; Cincinnati, Ohio; Buffalo, N. Y.; Baltimore Sun, Baltimore; Zion City, Joliet, Milwaukee, Schenectady, N. Y.; Troy, Pittsburg, two stations; Memphis, Detroit, two stations; Cleveland, Louisville, Philadelphia, Kansas City, Atlanta, Jefferson City, Washington, D. C. (WCAP); New York city (WEAP); Providence, R. I. (WJAP), The Outlet store; Fort Worth, Dallas, Los Angeles (KFI); Davenport, Minneapolis; Omaha, two stations; Santa Barbara, Cal.; Hastings, Neb. (KFKX); Birmingham.

I have letters verifying the long-distance stations such as Boston, Atlanta, Los Angeles.—ALLEN SINSHEIMER, 223 West Jackson boulevard, Chicago.

GETS TURKEY ON PLATE CIRCUIT.

RADIO EDITOR: Well, the old Armstrong three-circuit tuner reached out its long arm last month and grabbed only 470 long-distance stations. I had hoped to make it an even 500, but on Thanksgiving day, with a house full of guests, I could only pick up Turkey. Then later we got "Hungary."

Some of the boys picked up twenty-five stations Thursday, but with everybody tuning in with their appetite in the plate circuit I could not even get near my three WD-12 tube set with two-step amplifier.

Altho I built my set at night, she's a bear for distance in broad daylight. The other day she brought in a whistle like a peanut stand, which later turned out to be WJZ, New YoYrk city. WOAW, KSD, WOC, WWJ, WHAS, WCAP, WRM, WDKA, WTAS and WCBD have all beeu heard with remarkable volume in broad daylight.

In compiling the statistics for my DX report for November, I have only listed those stations that were heard clearly. I am a strong advocate of "honest" records among radio fans, and do not believe The Post should be used for a Munchausen column.

I also agree with the editor who stated some radio fans are liars. The fellows who picked up WDAJ, WGM and WHAS on Monday night really performed a miracle. The first two mentioned have not been in operation for months and the latter is absolutely silent after 6 o'clock Monday night. Some reports showed KWH, Los Angeles, which is the Los Angeles Examiner station. They were not in the air, as reported.

The Examiner was broadcasting thru KFI, Los Angeles Radio Central, and I suppose some of the boys did a little guesswork and put down KWH. My DX report for November follows:

Total hours on air, 68½.
Total distant stations heard, 470.
Total mileage, 268,520.
Total different stations heard, 64.

The list of different stations I received follows:

CFAC, Calgary; CFCN, Calgary; CKCK, Regina; KDKA, East Pittsburg; KFDL, Denver; KFEL, Denver; KFI, Los Angeles; KHJ, Los Angeles; KLZ, Denver; KGW, Portland; WAAW, Omaha; WBAH, Minneapolis; WBAK, Harrisburg; WBAP, Fort Worth; WCAE, Pittsburg; WCAP, Washington; WCBD, Zion; WCK, St. Louis; WCX, Detroit; WDAF, Kansas City; WDAR, Philadelphia; WDT, New York; WEAF, New York; WFAA, Dallas; WFAV, Lincoln; WFI, Philadelphia; WGR, Buffalo; WGY, Schenectady; WHAM, Rochester; WHAS, Louisville; WHAZ, Troy; WHN, New York; WHB, Kansas City; WIP, Philadelphia; WJAR, Providence; WJY, New York; WJZ, New York; WLAG, Minneapolis; WLW, Cincinnati; WMAK, Lockport; WMC, Memphis; WOAI, San Antonio; WOAW, Omaha; WOC, Davenport; WOO, Philadelphia; WOR, Newark; WOS, Jefferson City; WOI, Ames; WPAH, Waupaca; WPAR, Fargo; WRG, Washington; WRM, Urbana; WSAI, Cincinnati; WSB, Atlanta; WSY, Birmingham; WTAS, Elgin; WTAM, Cleveland; WJAX, Cleveland; WWJ, Detroit; WWAE, Joliet; KRO, San Francisco; KSD, St. Louis; 8XG, Cleveland.

IRVING JOHNSON,
4551 North Clark street.

MY! MY! OH, MY!

RADIO EDITOR: I am a reader of The Post who was about to change to another paper in order to get the radio announcements when your new radio department was opened.

The article on Nov. 30 apparently gives a boost to WMAQ on its broadcasting of the opera last Wednesday night. I don't know when or where "The Night Prowler" listened in, but it was a weird and an awful example of broadcasting.

First, this station announced a wave length of 345 meters. Instead it came in squarely on 326 meters and was so weak that it was drowned out by KDKA at East Pittsburg, who came right thru the opera on the loud speaker.

The first act was simply impossible. WMAQ slid around from 326 to 345 meters. At the upper range it was hardly audible and at the lower range blotted out by Pittsburg.

It was not until the second act that the opera could be put on the loud speaker to be audible ten feet away. Thruout this act and the third act the wave length was changed every five or ten minutes sufficiently to nearly throw it out entirely and necessitating retuning. It was not until the fourth act that the wave length was constant.

"Oh Fatal Stone" came thru clear, but with no volume, and one had to be within ten feet of the loud speaker to hear comfortably.

The above reception was on a three-circuit honeycomb coil, regenerative set with a Western Electric 10-D loud speaker.

All the radio enthuiasts I know of are agreed that it was the worst hash they had ever listened to.

KYW started to give us two nights of opera a week this season. First, came a lot of agitation about interference troubles with single circuit sets, talk about action in the city council and then, without warning, WMAQ horns in and announces it will broadcast the opera.

It was a crime to have as beautiful an opera as "Aida" butchered in such a manner. All the phans I know are very indignant about it, and it would be very interesting to read in your columns an explanation of why it was so poor rather than that statement that WMAQ had made a hit. Also, the information if the opera broadcasting is to be ruined for the season in this manner.

The opera is the biggest and best feature that comes on the air. The arrangement of Mrs. Oberndorfer's exposition of the principal arias on the piano was most interesting and a very good feature. WMAQ arranged a good program, but the technical work of the broadcasting was the worst massacre in this vicinity since the one at Fort Dearborn.

I am sure that anything your columns can do to insure good broadcasting of the opera will be appreciated by the public. It will be a shame if so interesting a feature is to be spoiled for the public by rivalry between two different broadcasting stations should such be the case.

If the station WMAQ is designed for 448 meters and cannot operate properly on a lower wave length, why not leave KYW alone? That station has been handling the subject in an admirable manner to date.

Let me add. Early in the evening WMAQ came thru in good shape on its regular wave length.

AMASA C. BULL,
834 Greenwood avenue, Glencoe, Ill.

(EDITOR'S NOTE—The above letter is a fair example of several letters and telephone message received by The Post Radio Magazine taking exception to "The Night Prowler's statement in last Friday's Post that WMAQ'S broadcasting of the opera was unusually fine. "The Night Prowler" was speaking only for himself. As stated, he was at a friend's home on the north side that Wednesday evening, and altho the receiver was within four blocks of WJAZ the opera came in on a loud speaker with sufficient volume to be heard all over the house. It is true, however, that there was considerable complaint all over Chicago about faulty reception. However, this same complaint seems general as to KYW, also, which all goes, perhaps, to show that the trouble lies more in the receivers and the tuning thereof than in the broadcasting station. Many radio sets have not been properly adjusted to the new wave length, and until they are, and the sharper tuning of the present-day sets are mastered, there will continue to be complaints of this nature.)

HERE'S A REAL DX-ER.

RADIO EDITOR: Just finished reading The Post's Radio Magazine and noticing Night Prowler's lists of stations received by various DX-ers, would like to put up my list of stations to see how many can beat it.

Don't know whether I, with my single circuit two-stage Armstrong regeuerative, am considered as a DX-er, as did not have the pleasure of reading last week's edition of the magazine. However, my list is a real one, and am listing the stations in the order I received them, regardless of location.

I keep a record or log of time up so can at any time without much variation select any station and tune in again without any delay. Here's the list as received to date:

WCAE, Pittsburg; WHAS, Louisville; WFI, Philadelphia; WHAZ, Troy; WBAP, Fort Worth; WFAA, Dallas; WOF, Jefferson City; WGR, Buffalo; WGY, Schenectady; WCK, St. Louis; KDAV, Columbus, Ohio; WDAF, Kansas City; WEAH, Wichita; WLAG, Minneapolis; WDAJ, College Park, Ga.; WMC, Memphis; KSD, St. Louis; WLW, Cincinnati; WOC, Davenport; WGM, Atlanta; WWJ, Detroit; WEAF, New York city; WHB, Kansas City; WHA, University of Wisconsin; WCX, Detroit; WJZ, New York; WBZ, Springfield, Mass.; WSB, Atlanta; WPA, Fort Worth; KHJ, Los Angles; KFAF, Denver; WAAK, Milwaukee; WPAD, Waco; KFDL, Denver; WOAI, San Antonio; WGAZ, South Bend; WOAW, Omaha; WGF, Des Moines; KFI, Los Angeles; KLZ, Denver; WNAC, Boston; WSY, Birmingham, Ala.; WBAW, Marietta, Ohio; WOI, Ames, Iowa; WHAK, Clarksburg, W. Va.; WTAM, Cleveland; WCBD, Zion; WTAS, Elgin; WJAX, Cleveland; WSAI, Cincinnati; WPAH, Waupaca, Wis.; WIP, Philadelphia; WMAK, Lockport, N. Y.; WIAK, Omaha; WOR, Newark; KFKB, Milford, Kan.; WAAW, Omaha; WGI, Medford Hills; WOO, Philadelphia.

This, along with the Chicago stations, makes a total of over seventy, and am adding them every day. Receive all my stations but very few on a Baldwin unit, with adapter for Victrola as loud speaker. While I do not claim any unheard-of distance, I believe this is covering the country. For some reason unknown I have never been able to tune in any Canadian station as yet, but time will tell.

Your magazine section is surely a great scoop and am sure will have a wide circulation as well as being a great help to the amateur in his troubles. Good luck.—I. C. ERNST, 9655 South Hoyne Avenue, Chicago.

HEARS LOS ANGELES.

RADIO EDITOR: You were right about last Monday being a good receiving night. Brought in sixteen stations on my home-made three-tube set, including KFI, Los Angeles, Cal., over loud speaker clear as one could wish. Your Thursday magazine is great.—GEORGE S. BALLARD, 1026 Michigan Avenue, Evanston, Ill.

RADIO EDITOR: Here is my DX for Thursday, Nov. 22. I received most of them while Chicago stations were on. I have an ultra-audion with one stage of audio-frequency, using two WD-12's. The stations received are as follows: WJZ, New York, N. Y.; WSB, Atlanta, Ga.; WCAE, Pittsburg, Pa.; WOR, Newark, N. J.; WOC, Davenport, Iowa; WDAF, Kansas City, Mo.; WEAF, New York, N. Y.; WHB, Kansas City, Mo.; WBAP, Fort Worth, Texas; WWJ, Detroit, Mich.; WHAS, Louisville, Ky.; WMC, Memphis, Tenn.; WGY, Schenectady, N. Y.; WJAX, Cleveland, Ohio; WCAP, Washington, D. C.; WOAW, Omaha, Neb.; KSD, St. Louis, Mo.; WBAH, Minneapolis, Minn.; WFAA, Dallas, Texas; CKCK, Regina, Saskatchewan, Canada; KHJ, Los Angeles, Cal.; KFI, Los Angeles, Cal.; KPO, San Francisco, Cal.; KGW, Portland, Ore.

I want to congratulate you on your wonderful radio magazine section.—JAMES DE LANEY, 5447 Michigan Avenue.

USES CASEY ULTRA-AUDION.

RADIO EDITOR: Following is my entry for number of DX stations in one evening—Monday, Nov. 5: KFI, Los Angeles; KGW, Portland, Ore.; KSD, St. Louis; KFAF, Denver, Colo.; KFAE, State College, Pa.; KDKA, East Pittsburg; WCAE, Pittsburg; WDAR, Philadelphia; WOO, Philadelphia; WGR, Buffalo, N. Y.; WBAH, Minneapolis, Minn.; WDAF, Kansas City; WHB, Kansas City; WDT, New York city; WJZ, New York city; WHN, New York city; WEAF, New York city; WBZ, Springfield, Mass.; WJAR, Providence, R. I.; WRC, Washington, D. C.; WSB, Atlanta, Ga.; WGY, Schenectady, N. Y.; WHAZ, Troy, N. Y.; WMC, Memphis, Tenn.; WHAS, Louisille, Ky.; WCX, Detroit, Mich.; WWJ, Detroit, Mich.; WCBD, Zion City, Ill.; WOC, Davenport; WOS, Jefferson City, Mo.; WPAH, Waupaca, Wis.; WBAV, Columbus, Ohio; WLW, Cincinnati; WAAW, Omaha, Neb.; WBAK, Harrisburg, Pennsylania.

These stations were brought in between 5 p. m. and 1 a. m. on a two-tube set I made from the Casey ultra-audion hook-up. This brings my total outside stations for this season up to sixty-five, including several stations in Canada, Texas, Alabama and Florida.—C. M. BARTON, 1437 Greenleaf Avenue.

What His Zenith Does.

RADIO EDITOR—My record for last Monday, Nov. 26, with Zenith receiving set was: WOAW, Omaha; WWJ, Detroit; WRC, Washington; WDAS, Worcester, Mass.; WOO, Philadelphia; WBAP, Fort Worth; WCAE, Pittsburg; WLAG, Minneapolis; KDKA, East Pittsburg; WTAS, Elgin; WOC, Davenport; WCBD, Zion; WOS, Jefferson City; KSD, St. Louis; WLW, Cincinnati; WFAA, Dallas; WMC, Memphis; WGY, Schenectady; WDAF, Kansas City; WHAZ, Troy; WBAD, Minneapolis; KFKX, Hastings, Neb.; KFI, Los Angeles; WSB, Atlanta; WGR, Buffalo; WIAO, Milwaukee, and WHAS, Louisville. This includes twenty-seven stations and seventeen states. All came in very good, except Milwaukee at times. Have also picked up, at times, KWH, Los Angeles; KFKB, Milford, Kan.; WBL, Anthony, Kan.; WKY, Gainsville, Ga., and KGW, Portland, Ore. Am enoying your radio section of The Post very much.—P. W. FERRIS, 924 South Grove avenue, Oak Park, Ill.

Hear Ye, Reflexers!

RADIO EDITOR—I haven't seen many lists of stations heard on reflex sets yet. I have a one-tube reflex set made up of Erla parts, but not just like the Erla hook-up. By accident I discovered a change in the circuit that improved the volume 20 per cent and the quality also. I am using a C-299 tube with 90 volts on the plate. With a C-type Baldwin attached to my phonograph we can hear the local stations all over our three-room apartment. Last Monday, Nov. 26, I received sixteen out-of-town stations listed below:

KDKA, Pittsburg, 7:30; WLAG, Minneapolis, 7:45; WCAS, Elgin, Ill., 7:50; WHB, Kansas City, 8:05; WCBD, Zion City, 8:08;

(Continued on Page 12.)

Selection of Parts for Home-Built Radio Sets and How to Judge Them

IN this, the fourth installment of Mr. Cardwell's series of articles on "Everyday Radio Engineering for the Home Builder," the author takes up "The Selection of Parts and How to Judge Them." This is one of the most interesting of the series so far and contains advice to the home-builder that is incalculable.—The Editor.

By ALLEN D. CARDWELL.

IT IS difficult even for the radio buyers of large radio concerns to know what apparatus is the best of its type. As an example, take any ten loud speakers you like and try to decide which is "best." Your final judgment probably will result in qualifications. One loud speaker is the "best $10" instrument. Another is the "best volume" loud speaker, while a third may be the "best quality" reproducer. Everything is relative in radio as in other sciences.

The basis of selection for the parts which are to go into your receiving set may be set down under certain points:

1. Electrical efficiency (including non-distortion).
2. Appearance.
3. Size and weight.
4. Cost.
5. Convenience.
6. Mechanical efficiency.

For example, you may have in mind a type of loud speaker which is efficient electrically and mechanically, is neat and attractive, and is satisfactory in every respect but its cost, which is more than the cost of your receiving set. This suggests that you apportion the cost of your set so that you will not build a superb receiver and then operate it on an inferior loud speaker or use an expensive horn with a cheaply constructed receiver.

High Cost of Low Price Products.

If you have planned your receiver properly, you will not attempt to use a $75 circuit on a $25 budget. Some circuits do not permit much economy beyond a definite minimum. To use inferior parts will cost you more in the end than to buy the best grade or standard types.

There are some parts which are not high priced and yet are remarkably efficient. The price tag is no criterion whatever of the quality of a product. Neither is its appearance or its "theoretical pose."

The "theoretical pose" of a radio product is the manufacturer's "proof" as to why his product must be better. If he claims his telephone receiver is better because it has only one pole and the tension, therefore, correctly is centered on the diaphragm, it is one way of convincing you. If he explains that his diaphragm is of a "non-resonant" material that is another argument. Some of the arguments are better than the products.

Ordinary common sense, in many cases, can put your mind at rest on the problems of selection. A loud speaker "speaks for itself." If you are not a judge of quality in music and are anxious to avoid a poor selection call in a friend to help you check up the demonstrating quality of a variety of loud speakers. Again, the reputation of the manufacturer and the dealer who handles the line, will be of material help in making selections.

A head set (unless intended for use in a loud-speaking attachment) does not need to be super-sensitive or extraordinarily efficient for ordinary radio usage. Many head sets are a choice of style and finish. The one you select may be used only to tune in stations and the bulk of your broadcast enjoyment may be via a loud speaker. For crystal sets or where you are intent on long distance tuning, select a head set which will assure comfort, sensitivity and service.

A cabinet can be selected in the same way you pick furniture. A panel of a standard insulation material may be based upon its maker's reputation and the mechanical strength required for the receiver you are assembling.

Many Units Are Involved.

Consider how many specific products you are dealing with:

1. Inductances.
2. Condensers.
3. Tube sockets.
4. Insulation and supports.
5. Adapters.
6. Connecting leads.
7. Aperiodic radio-frequency transformers.
8. Tuned radio-frequency transformers.
9. By-pass condensers.
10. Potentiometers.
11. Rheostats.
12. Shields.

Each of these units is a fit subject for a volume in itself. To attempt to show how to select each in the space of one article would be foolish and I do not expect that any serious reader will refer to one article if he is seeking "the last word" on any topic. All that can be done is to outline a few important points.

These can be resolved into questions which you should be able to answer by inspection, study of the manufacturers' circulars and by the salesman at the radio store, if you are technically informed.

INDUCTANCES.

1. Will the winding afford the proper wave lengths when used with a variable condenser or if used without a condenser?
2. Has the coil a low distributed capacity?
3. Is the coil wound with good cotton or silk covered wire?
4. If a variometer, will the bearings permit the rotor to touch the stator?
5. If a rotor is used, is the friction or pigtail connection apt to cause trouble?
6. If a spider web what material is used for the support and is it a good material to use?
7. Are the taps on the coils so attached that they will later cause difficulty if the leads are to be removed or changed?
8. Is the winding firm or will it slip out of place easily?
9. Is the winding varnished or treated with a compound to hold it in place?
10. If the coil is self-supporting, is it sufficiently rigid to stand up under any ordinary shock or jar?
11. Will the coil require shielding from other parts of circuit or can it be so mounted that its field will not affect the other parts of the circuit?

CONDENSERS.

1. If a tuning condenser, will it secure the wave length range called for in use with a given inductance?
2. What is the ratio of its maximum to maximum capacity?
3. Does the design utilize a large mess of insulation in any part of the frame or support?
4. Are the bearings liable to wear and cause plates to get out of true or even touch?
5. Is the condenser rigid so that it cannot be warped by pressure?
6. Are the plates perfectly straight?
7. Can the tension be adjusted?
8. Is the contact to rotor apt to cause microphonic noises?
9. What is the resistance of the condenser at radio-frequencies?
10. Can any of the rotor plates be turned on the shaft?
11. What kind of insulation is used?
12. Is the condenser bulky or heavy?
13. Is the rotor counter-balanced or a friction sleeve used to prevent it from slipping due to its weight?
14. Are the plates thick enough to prevent misalignment?
15. Is the spacing of the plates uniform?
16. Is the rotor grounded to the frame, or is the stator built as part of the frame?
17. What metal-to-metal contact is used for the bearings?
18. Does the condenser require shielding?
19. Is the vernier (if on the condenser) practical mechanically? What is the ratio?

TUBE SOCKETS.

1. What insulation is used?
2. Will the springs lose their tension or bend easily?
3. Do the socket leads cross or increase the tube capacity?
4. Are the binding posts soldered to the prong springs?
5. Is the sleeve of the socket the right diameter to prevent jamming when the tube is inserted?
6. Will the prong springs corrode?
7. How much surface contact is made between the tube prongs and the springs?
8. Is the shape neat and practical?

Rely Upon Good Advice.

The questions listed above may be puzzling to readers who would say, "Well, how am I to know if the resistance of a condenser is low? Suppose I did know, how would I be helped in knowing it?"

This, I must admit, is the curse of the problem in selecting any unit of radio apparatus—that unless you have devoted a good deal of time in experimenting and using all kinds and varieties of apparatus, you will never gain much by trying to answer the questions.

If you are a real novice, I would advise you to rely upon the suggestion of a professional set builder or an amateur who makes it a hobby to know all the reasons and why of radio apparatus. Such an adviser may be employed in a dealer's store or may be a neighbor or an acquaintance.

I do not believe every dealer's clerk is a real authority or impartial adviser, where you enter a store and ask for a "good coupler," as an example. Radio dealers are human. They have stock on their shelves which represents a choice—whether good or bad. Once on the shelf the salesman's job is to advise you to buy what they have in stock, as they know that they will get the sale then, but if they advise you to get something not in stock they are afraid you will not be satisfied to wait, but will try other stores. Hence, do not assume dealers will give you impartial advice, altho most reputable dealers will recommend parts which they honestly consider "good as any other."

One way to insure satisfaction is to send your circuit and list of parts (all units indicated plainly) to six or seven selected dealers and ask them to make the best recommendation they can, regardless of delivery, date or price. Tell them you will order those parts of the one dealer who gives you the best recommendations and you will be prepared to buy your tubes, batteries, etc., at the same store.

This puts the dealer on the defensive. If your circuit is of any type using three tubes, the chances are the best grade of parts will cost at their regular list price at least $50, and with batteries, cabinet and tubes a set with really good units costs around $100. Hence the dealer can afford to give time to a careful selection in order to make the sale. Furthermore, he can "sell by mail," which means that he can study your circuit when his store is not rushed with customers and you will get really individual attention.

Gives You Best Service.

This practice is recommended especially where you can take your "bids" to an impartial adviser and without letting him know which dealers made up the lists, you will get an entirely unbiased and cross-checked result. The dealer whose technical information is most reliable will stand out easily, because his selections will be most consistent and practical.

Incidentally, if your order is large the dealer can afford to give you some concession on your order, tho this should not be expected any more than that your doctor should rebate you and be expected to give you the same attention and skill as he gives to patients who pay his customary fees.

One of the most progressive steps taken in the direction of accurate parts selection may be properly referred to.

The Veriton Radio company of Chicago, which recently has been organized, operates on a policy which assures the buyers of radio apparatus information which is absolutely unbiased.

I wish to quote from a letter of Mr. Hatch, the president, exactly how they operate:

> Recognizing that the intelligent user has no way of actually determining quality except by reputation, price or the manufacturer's own statements, and also that all of the discussions regarding standardization have not as yet reached any extensive application, we have adopted the policy of furnishing with each article which we handle a certificate stating its electrical characteristics.
>
> On condensers, for example, this certificate will cover, maximum capacity, minimum capacity, phase angle loss at 360 meters, curve, A. C. voltage breakdown and brief remarks concerning any special features.
>
> These specifications will appear in our catalog as well as on a certificate which each individual purchaser will receive. Dealers have welcomed the idea with an eagerness which has surprised us.

This policy, while expensive for the distributer at the start, should be imitated everywhere by dealers whose standard is service and not mere advertising claim.

Three Ways to Buy Parts.

Two or three ways of selecting your equipment, therefore, are open:

1. Acquaint yourself with the various types of each unit and satisfy yourself by learning what the apparatus should do and how each type measures up to the standards.
2. Call in some adviser who will not be influenced by the possible sale of the equipment recommended.
3. Write to a number of dealers for bids and suggestions. Make the job as easy and specific as possible. Give a good circuit drawing and list of parts. Inclose a stamped reply envelope.
4. Turn over your set to a professional set builder. Provided he is well recommended by other experts, this may be the most economical in time and results. You can expect to pay about 40 per cent of the cost of the parts for his services, including installation, if he has the order for the entire job.
5. Some published set designs and "blueprinters" give full specifications on how to build a set, and the best parts to use are listed. This gives satisfaction for a great many builders and the costs are reduced.

This brings up the point: "Is it really practicable for a home builder to make a set or should he buy a commercial type and forget all about building one himself?"

The answer to that is again qualified by your objective, ability, tools, radio education, etc. If you are an enthusiast, enjoy using tools and doing manual work, are willing to study radio problems—then you will never be satisfied to accept a "ready built."

Another consideration is based on patents. Various radio patents are so divided among a number of companies that almost no manufacturer can build an entirely consistent receiver because he will infringe. Hence, if you are determined to have a special circuit, the only way you may be able to get it will be by altering a commercial design or building it yourself.

What Sets Should Cost.

As to the relative costs, I believe it generally is appreciated that no receiving set of pretentious qualities can be sold to the public for less than $75 or $100, and such receivers do not represent the best units or parts in all cases. A few one-tube sets are available at about $50, but the quality of the material is not and cannot be the same grade that you would expect in the best designed apparatus.

Bear in mind a receiving set carries with it many special charges, such as service in event of defects, packing, testing, etc., as well as the labor in assembly. A set builder cannot secure quantity orders at this time, nor build more than one season ahead, and any concern making 1,000 sets a week is considered very busy and up to full capacity, whereas a parts manufacturer may be able to make 1,000 parts or units a day and hence be able to effect economies in production on a larger quantity.

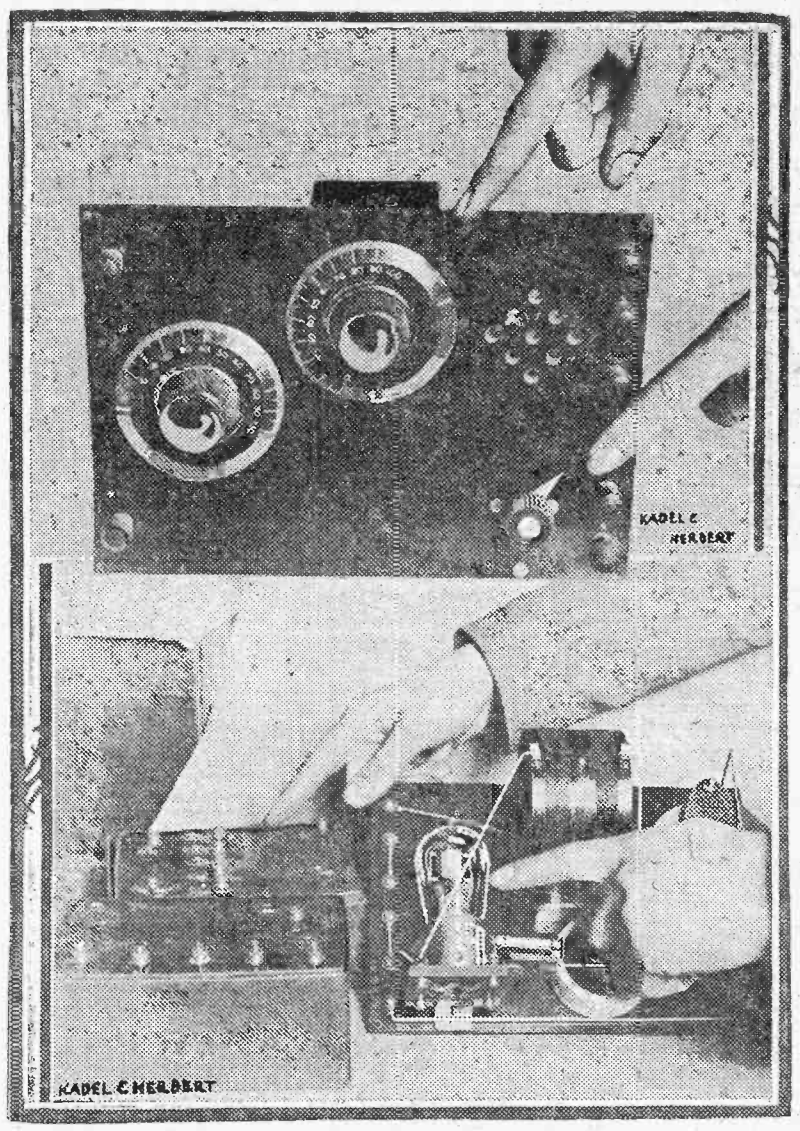
For the average radio set builder, it would not be desirable to suggest that he attempt to build any instrument which would cost him over $200 in parts, exclusive of his own labor or tools. When such a sum is invested in a receiver, it is better to buy a commercial type in order to get satisfactory service from it. Be sure you are an exceptional builder before you tackle an expensive receiver.

In selecting parts one would be interested in trying to maintain uniformity where it can be secured. For example, all the dials should be similar in design. If nickel-plated parts are used, it would be well to have these match as on the handles or corner plates, etc. Inside the cabinet the appearance is not so important, but a sense of satisfaction is always felt if the receiver gives an impression of thoroness which always reveals itself in details.

Plan Your Set for Future.

In buying parts try to foresee every contingency that might later cause a change. If, for example, you use an aperiodic radio-frequency transformer to cover from 200 to 600 meters, you may be wise to so mount it so that it can later be changed if the wave lengths used for broadcasting go up or down. Use of special sockets for 199 tubes is desirable rather than standard sockets with adapters. Thirty-ohm rheostats may be a wise selection even if only six ohms are needed at the time. A few conditions can be gauged in advance, and if you assume that some change may be desirable later on, you probably will so plan the set, that these changes can be made easily.

Mr. Cardwell will be glad to receive letters from readers on subjects in which they are interested and would appreciate knowing what experiences the readers may have had in securing satisfactory radio apparatus. Be sure to enclose a stamped reply envelope. Give circuits if asking specific questions. Address Mr. Cardwell, care of the Chicago Evening Post.



When You Buy Parts Pay Particular Attention to these Special Items.

Radio Reaches Deep Canyons

A thousand feet below sea level, in the canyon of the Colorado, recently a portable radio set picked up stations hundreds of miles distant and carried news and entertainment to the ears of a little party of government engineers and scientists engaged in charting hitherto unsurveyed territory.

Doubt has been expressed whether the etheric waves would penetrate this abyss, but, apparently, there is no pocket of the earth's surface, however remote or however deep, which the broadcaster cannot search out and fill with his vibrations.

Thrills Mark Experience.

Col. C. H. Birdseye was in command of the surveying party. He is chief topographic engineer of the United States geological survey. The exploratory trip had its big thrills. It was while at the bottom of the canyon and in its narrowest stretch that their receiving set startled them with the tragic announcement of President Harding's sudden death.

About the middle of September they were endangered by a sudden rise in the river. It was not anticipated that it would come up more than five or six feet, but this limit was exceeded speedily. The party passed strenuous hours retreating beyond the flood—ten feet, fifteen feet, twenty feet, twenty-one feet and the crest.

Cling to Radio Set.

News of the flood reaching the outside world aroused anxiety as to the survey's safety. Not until Oct. 2—two weeks later, was a point reached, at Diamond Creek, 164 miles below the Little Colorado, and 225 miles from their place of departure, where it was possible to let civilization know of their escape.

Broadcasting was not possible, so telegraph had to be used; but that night their radio set, to which they had clung thru all dangers and difficulties, brought them the news of their own emergence from the valley of perils.

THE HOME WORKSHOP

Performs Work of Many Dials

Here is a suggestion that leads to the muchly sought unicontrol receiver. It is a multum in parvo switch which cuts out dials and simplifies tuning.

A disk of bakelite, fiber or hardwood, two inches in diameter, has a flat provided on the periphery, and this is clamped to a condenser or variometer shaft by means of two nuts, and made to function as a cam.

The flat portion is sat at right angles to either extreme setting of the condenser or other instrument, so that a contact strip or strips will be engaged by the round portion when the instrument is adjusted to the normal working position.

Diagram A shows the general arrangement of the idea, where two metal strips are normally in contact with each other in order to ground the aerial. When the instrument is adjusted from the zero position, the cam breaks the contact with aerial and ground by forcing the long strip away from the shorter one, and holding it there while the average adjustments are made. This will be clearly understood by referring to diagram B, which depicts the action of the cam on the long strip.

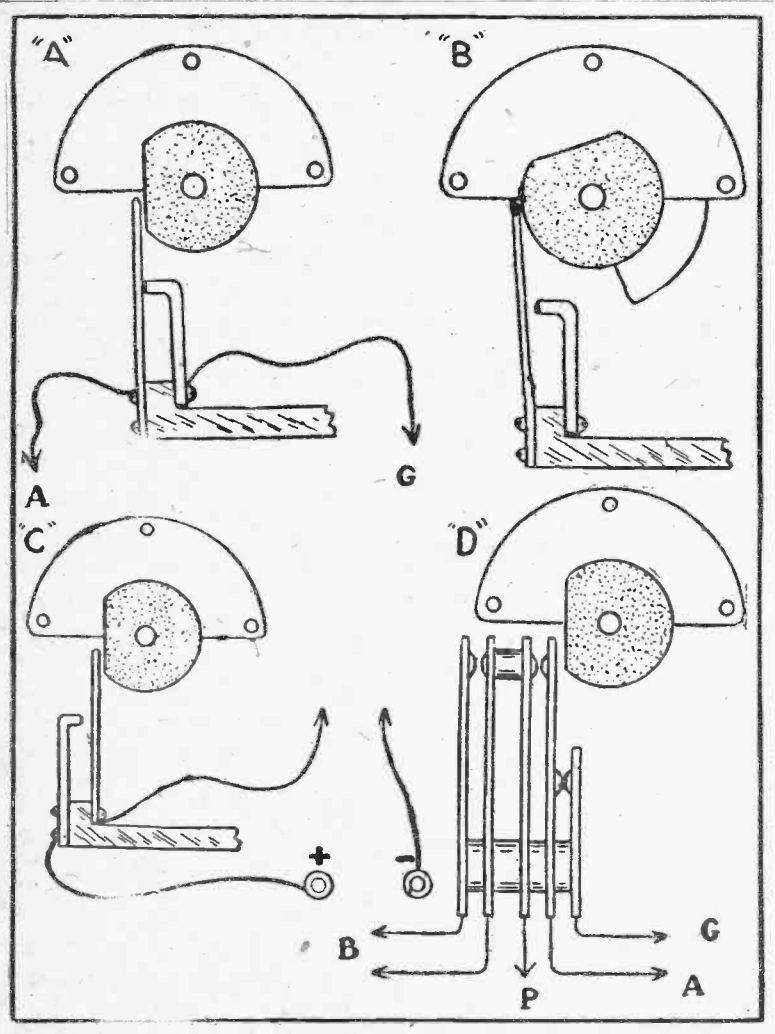
Diagram C shows how the strip may be arranged in a reverse manner—that is, to act as a simple "on and off" switch, simultaneously with the on and off positions of the instrument, for controlling the plate or filament current, and diagram D, which is merely a suggestion, the writer not having actually tried this arrangement, shows how an old key switch may be utilized in conjunction with the cam to act as a simple combination switch controlling B, the plate or filament current, and A and G, aerial to ground change-over, and P primary tuning coil connection with aerial.—P. T. GLOVER, Hinsdale, Ill.

Prize Awards
For Useful Suggestions

THE POST offers $1 for every accepted and published suggestion made by readers which will enable the home builder to improve his work.

A special prize of $3 each week is made for the best of these suggestions.

Send your entries to Workshop Editor, care Radio Dept., Chicago Evening Post. Inclose pencil sketch if necessary to convey idea.



Logs Station by Meters and Finds then Quickly

I inclose a schedule of stations, arranged according to the wave meters, and I have used this as a log. It comes in mighty handy if you want to find a station quickly, and also as an indication where to look for a near-by station in comparison to one that I already registered.

KSD—St. Louis, Mo.	546
KYW—Chicago, Ill.	536
WOAW—Omaha, Neb.	526
WWJ—Detroit, Mich.	517
NCX—Detroit, Mich.	517
WIP—Philadelphia, Pa.	509
WOO—Philadelphia, Pa.	509
WMC—Memphis, Tenn.	500
KGW—Portland, Ore.	492
WEAF—New York, N. Y.	492
WOC—Davenport, Iowa	484
WBAP—Fort Worth, Texas	476
WFAP—Dallas, Texas	476
KFI—Los Angeles, Cal.	469
WCAP—Washington	469
WRC—Washington	469
WJZ—New York, N. Y.	455
KDZE—Seattle, Wash.	455
WJAZ—Chicago, Ill.	448
WMAQ—Chicago, Ill.	448
WOS—Jefferson City, Mo.	441
CFCN—Calgary, Can.	430
CFCE—Montreal	430
WSB—Atlanta, Ga.	429
CFCA—Toronto, Can.	425
KPO—San Francisco	423
WLAG—Minneapolis, Minn.	417
WDAF—Kansas City, Mo.	411
WHB—Kansas City, Mo.	411
WDT—New York, N. Y.	405
WOR—Newark	405
PWX—Havana, Cuba	400
WHAS—Louisville, Ky.	400
Harrisburg, Pa.	400
Rochester, N. Y.	400
KHJ—Los Angeles, Cal.	395
WDAR—Philadelphia, Pa.	395
WFI—Philadelphia, Pa.	395
WJAX—Cleveland, Ohio	390
WTAM—Cleveland, Ohio	390
WOAI—San Antonio, Texas	385
WGT—Schnectady, N. Y.	380
WHAZ—Troy, N. Y.	380
WBM—Urbana	360
WPAD—Chicago, Ill.	360
WDAP—Chicago, Ill.	360
KFAF—Denver, Colo.	360
WGI—Medford	360
WHK—Cleveland, Ohio	360
WHN—New York, N. Y.	360
WSY—Birmingham, Ala.	360
WHA—Madison, Wis.	360
WCBD—Zion, Ill.	345
WBZ—Springfield, Mass.	337
KDKA—Pittsburg, Pa.	326
WGR—Buffalo, N. Y.	319
WLW—Cincinnati, Ohio	309
WSAI—Cincinnati, Ohio	309
WNAC—Boston, Mass.	278
WTAS—Elgin, Ill.	275
WDAJ—College Park, Ga.	258
WIAB—Rockford, Ill.	252

Those that I have coupled together, such as Detroit, Philadelphia, Washington, Chicago, Kansas City, Cleveland, etc., are on the same meter, but are never on at the same time, just as WJAZ and WMAQ are never on at the same time. That is one reason why they are coupled up on the list.—LOUIS GEYLER, 2635 South Wabash avenue, Chicago.

Marking Panel for Holes for Marking Apparatus

It is seldom that the fan is lucky enough to get a template with a condenser, coupler or variometer. This lack of foresight on the part of manufacturers is most annoying, owing to the fact that to get the holes for the mounting screws in the right place is difficult without some form of template.

This problem is solved by buying a small jar of white paint in a store that carries drawing materials. This paint should cost no more than a quarter and one jar will last two years or more.

First drill the shaft holes in the panel. Then place the mounting screws in their holes in the instrument that is to be mounted. Paint the heads of the screws with the white paint.

Place the shaft in the hole in the panel and then press the instrument firmly down in the panel in the position that it is to be mounted. Remove quickly and straight.

There will be there on the panel white dots where the screw holes should go. These may be easily drilled without further marking. If there is any surplus paint on the panel it may be wiped off with a rag.

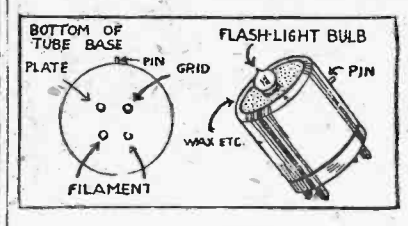
Food and Poison

Fusing copper wire across a lead storage battery will ruin it. On the other hand, if you have a sluggish Edison battery, this treatment is beneficial, and a short-circuit discharge once in a while is a good thing.

Protects Tubes From 'B' Battery

Abel F. McAllister, 2118 West 109th street, Chicago, wins the first weekly prize of $3 for workshop aid suggestions. His offering follows:

It is usually a rather risky thing to do to put a tube in its socket immediately after changing the hook-up, for the B battery is sometimes accidentally connected so that insertion



of the tube without some precautions usually means $5 or $6 out of the pocket.

In order that a socket may be tested to see that the valuable VT will not be blown out, the following device may be resorted to:

Take the base of a broken bulb, and connect to the two filament wires an incandescent bulb of the same voltage as the VT in use in the set at the time. (See sketch.) Flashlight bulbs may be used for dry-cell 1.5 or 3 volt tubes—auto bulbs for the 6-volt tubes. The bulb should be soldered so that the connection may be dependable.

After all connections are completed, the base may be filled with some hard wax or plaster-of-paris, so that it may have a finished appearance. If it is desired, two small binding posts, or two switch-points, may be connected to the grid and plate wires for purposes of testing, but it is not necessary.

Long-Distant Hounds Smash Local Records

Continued from Page 10.

WOS, Jefferson City, Mo., 8:14; WCAE, Pittsburg, 8:23; WBAP, Fort Worth, Texas, 8:30; WHAZ, Troy, N. Y., 8:35; WFAA, Dallas, Texas, 8:47; WGY, Schenectady, N. Y., 9:18; WLW, Cincinnati, Ohio, 9:45; Los Angeles, Cal., 10:10; WRC, Washington, D. C., 10:20; WSB, Atlanta, Ga., 11:20; WDAF, Kansas City, 11:50.

I was unable to hold Los Angeles long enough to get the call letters, but heard the announcer say: "Los Angeles Times coming on the air." Then three or four harmonious notes similar to WMAO was heard. At this time my set showed effects of body capacity. This set me wondering if it were possible that I was being aided in picking up these stations by somebody's set "re-radiating." It seemed like I got them the loudest when I could hear the whistle of someone else's set. Do you think it possible? I got several of the stations listed many times in fishing for other stations. Nevertheless I heard these stations on my reflex set, no matter how they got onto my aerial.

Would like to hear from some other reflex experimenters. I'll look for them in your letter box, for your magazine is too good to miss a single number.—G. B. ASHTON, 318 South Richmond street, Chicago.

An Audion's Fine Work.

RADIO EDITOR—Monday, Nov. 26, I received twenty-nine stations, coast to coast, on an ultra-audion and one step. They follow:

WTAS, KDKA, WCBD, WAAW, WPAH, WHAZ, WDAF, WOR, CKCK, WCAE, WOC, WMC, WOO, WFAA, WOS, WDAR, WBAV, WLW, WGR, WBAH, CKCE, CFCA, WRC, KFDL, WOAW, WBAP, WSB, WHN, KFI. Heard during 8 and 11:30 p. m.—P. J. BUCH, 2030 Lane court, Chicago.

Gets Twenty-two on One Tube.

RADIO EDITOR—How is this for a silent (?) night reception on a one (WD-11) tube ultra-audion set?

6:05, WCAE, Pittsburg; 6:15 WCX, Detroit; 6:25, WDAF, Kansas City; 6:30, WOC, Davenport; 7:12, WOO, Philadelphia; 7:15, WHB, Kansas City; 7:25, WEAF, New York; 7:26, WCAP, Washington, D. C.; 7:34, WBAP, Fort Worth; 7:39, WLAG, Minneapolis; 7:41, WWJ, Detroit; 7:45, WTAS, Elgin, Ill.; 7:47, WLW, Cincinnati; 7:50, KDKA, East Pittsburg; 8:01, WCBD, Zion, Ill.; 8:06, WOS, Jefferson City; 8:15, WSB, Atlanta; 8:20, KSD, St. Louis; 9:23, WOR, Newark, N. J.; 9:29, WFAA, Dallas; 9:43, WOAW, Omaha; 10:05, KFKX, Hastings, Neb.

This makes a total of twenty-two for one night, Dec. 3, 1923. Your radio section is still the best there is, altho many are trying to beat you. Hope that you will continue the good work.—GEORGE W. ALM, 3217 West Polk street, Chicago.

RADIO EDITOR—Here is a list of fifty-three stations heard on the nights of Dec. 2 and 3. Am using a Zenith receiver—the same kind WNP uses, but can't do very much as the antenna is temporarily grounded to a gutter. However, don't think the list is so bad. Also get WJAZ and WDAP QSA (very) on a few meters above 200. QSY 200? Hi.

1-AOL, 1-BBN, 1-BE, 3-ER, 8ACT, 8-ADS, 8-AYT, 8-BAY, 8-BCT, 8-BFM, 8-BPB, 8-BPA, 8-BQB, 8-BVT, 8-BZD, 8-CAF, 8-CBW, 8-CPD, 8-COP, 8-DDX, 8-DKM, 8-DXN, 8-DDC, 8-ER, 8-FC, 8-NR, 8-UF, 8-VT, 8-ZZ; 9-AAU, 9-AAW, 9-AIM, 9-AQX, 9-BA, 9-BAM, 9-BHL, 9-BTD, 9-BUH, 9-BUU, 9-BWP, 9-BZD, 9-CEK, 9-CR, 9-DH, 9-DON, 9-DRO, 9-DXY, 9-EHH, 9-EKF, 9-HW, 9-IS, 9-NU. Phone, 9-CAX.—B. DUDLEY, 9-BR, and A. R. R. L., assistant city correspondent.

Cleveland DX-er Reports.

RADIO EDITOR—I have a Copp circuit with one-stage audio-frequency, WD-12 tubes, home-wound coupler of 90 turns, 30-foot-long inside antennae, 30-foot lead-in and ground (total). I get WJAZ, KYW, WDAP and WMAQ frequently. WJAZ will sometimes give audible results, with this set, on a loud speaker, consisting of one Baldwin "C" unit and a vertical horn of metal, which looks like a Magnavox, but isn't.—R. W. KNOWLES, 14704 Coit road, Cleveland, Ohio.

MIXING WATER AND ACID.

Water added to acid in a mix for storage batteries will result in a serious explosion. Add the acid to the water.

Questions and Answers

Continued from Page 8.

are used: I have experimented with that circuit, using the basket wave variometer, and both the 1,250 and 1,500 H. C. coils, but am unable to get wave length over 326 meters, that of KDKA. I think it best of the supers, if it could be made selective. I used WD-11, getting KDKA and WLW Detroit police, and WAIS with a ground. Would appreciate all the information that is possible to obtain on the Autoplex without putting you to any great trouble.

You will find in the Nov. 22 and 28 issue of The Post Radio Magazine section most of the information you have asked for. You have gotten good results from your present hook-up when you take into consideration you are using only a WD-11 tube. If If you would use a 216-A or VT-2 you would get still much better results. If you would use a 216-A tube you would receive still better results. Since your variometers do not give you the high wave length, you can raise these values by inserting a 75-turn coil in the grid circuit and also another one in the plate circuit. This means that one of these coils will be connected between the lead from the variometer to the grid on your tube socket and one on the lead between the plate post on the socket and the other variometer. Be sure that both of the coils are identical in the number of turns. Also be sure that the two variometers are identical, not only in their windings, but also that they are the same type and made by the same company. This is necessary to properly balance the circuit and if this balance is not absolutely maintained, you will not get as good results. The basket weave variometers are quite satisfactory.

LOCAL INTERFERENCE.

222—CHICAGO: Is it not possible to do something about the interference of Chicago broadcasting stations with each other—particularly on the nights for broadcasting the opera. We have a three-tube radio, but, after trying all last evening to hear the opera broadcast by KYW, I gave up in disgust because every time I thought I had it some other station interrupted with a jazz orchestra or something else. Ever since KYW changed its wave length last spring their programs have been drowned out by other stations. We have tried every possible combination and cannot tune out other stations. Can you give us any information?

Your troubles in eliminating interference are general in every community where there are one or more local broadcasting stations of high power. There is no exception to this condition in Chicago, and if you are not located too close to one of the stations, it is possible to tune out the interference by the employment of a wave trap. A sketch and diagram of an efficient wave trap is shown on page twelve of The Chicago Evening Post's radio section of Nov. 15. This can be constructed at a very small cost and very easily by any home builder. Another appeared in the Nov. 27 issue.

Distant Stations Foggy.

211—CHICAGO—Congratulations on your six-cylinder radio section. Would like to have good hook-ups using variometers and loose coupler which would be selective. Have 23 and 43-plate condenser which might help. Am using WD-11 tubes and have difficulty in clearing up reception of distant stations. What's the remedy?

The hook-up mailed you is very efficient on short and long wave lengths. Use variable grid leak and .00025 mfd condenser.

List of Autoplex Parts.

212—CHICAGO—In your Radio Magazine of Nov. 15, on page 7, you have cut of one-tube receiver developed by M. L. Muhleman. Have you a list of material that should be used for this and a blueprint, which one who is mechanically inclined but does not know much about radio, could follow to build one of these?

List of parts and drawings you desire appear in Nov. 27 issue of the Radio Magazine.

R. C. Receiver Needs Battery.

214—CHICAGO—I have a Westinghouse R. C. receiver, 2-tube WD-12. Local reception is very good on loud speaker. Out-of-town is very faint and I am not able to hold after I have them regardless of how close I tune them, with head set. Batteries used, B, 67½ volts; A is of three dry cells, about 4½ volts. Antenna is 150 feet, three wires, ground is good and tubes also. Why is reception poor on out-of-town?

We suggest you try 45 volts of "B" battery on detector. Aerial should be one wire a hundred feet long on four wires fifty feet long, three feet apart, six to ten feet above all obstacles.

AERIAL TOO LONG.

138, CHICAGO: On Monday nights I can tune in distant stations, but on other nights I cannot tune in distant stations, because Chicago stations are so loud. Why is this? I have a three-circuit regenerative set with two stages of audio-frequency and my aerial is two wires, 150 feet long. Would it be advisable to put honeycombs on this set.

Your aerial is entirely too large. Use one wire 100 feet long. A large aerial will make any set broad tuning and is of advantage only on a crystal set. Honeycomb coils would not aid your set. I refer you to articles on wave traps in Nov. 15, Nov. 22 and Nov. 28 issues of The Post Radio Magazine. Those sharpen up tuning and also enable you to tune out local stations.

104, CHICAGO: Have read your Radio Magazine and found it very interesting as well as useful. I was extremely interested in your account of the Autoplex circuit and would like to know whether or not a WD-11 or 12 tubes can be used in this set? Will you also tell me whether this set can receive at a distance, and if so, how far? Am submitting diagram of my present set and would like you to tell me the reason why it will not work.

WD-11 or 12 tubes do not work efficiently in the Autoplex circuit. This circuit, if hooked up properly, with a 216 A or VT-2 tube will receive distance. A set assembled as shown in submitted diagram, should work, but would suggest wiring as is shown in sketch on this page. Use variable grid leak and .00025 condenser. Primary of coupler should have 60 turns, secondary 40.

Opinions of Phans Freely Given

NOTICE—If the subscriber who wrote such an interesting letter regarding broadcasting programs and the manufacturers' part in maintaining them, will send us his name and address, as a mark of good will, we will be glad to give publication to his communication. We require this of all correspondents, altho names will not be printed if so requested. Please write on only one side of the paper.—THE EDITOR.

McMILLAN'S ARCTIC VOICE.

RADIO EDITOR—Am submitting two clippings from papers, one from your esteemed magazine and one taken from Dubuque Telegraph-Herald. "What's wrong here?"—HARVE C. VICK, Alta Vista, Iowa.

(Note—The Dubuque clipping refers to an Associated Press dispatch sent out of Chicago following the opening ceremonies of the new Chicago Yacht club's house in which it was stated that "the voice of Dr. McMillan" was heard at the club "from a metrophone on the deck of the Bowdoin" which is is Arctic waters. The clipping that was taken from The Post Radio Magazine, referred to amateurs "faking" Dr. McMillan's voice and pretending that voice messages from the Arctic explorer were being sent to the states and being picked up. The Post stated that the so-called "voice messages" were impossible because Dr. McMillan does not have a transmitter powerful enough to broadcast voice. He does all his communications by code. The Associated Press story should have said Dr. McMillan's message was in CODE and not voice. The error was committed thru ignorance of radio terms.—THE EDITOR.)

PINCHING SHOES.

RADIO EDITOR—News items says: "Assurance of co-operation on the part of radio stations in Canada, whose wave lengths offered the only possible other interruption to the plans, were received by E. E. McDonald Jr., president of the Zenith Radio station, today. The W. W. Grant Radio corporation has a powerful station in Calgary, Alta., which has interfered several times with Chicago messages to the captain. Mr. McDonald notified the officials," etc.

This from WJAZ, the station which gives nightly lectures to disgruntled radio fans who want to hear the opera on how easy it is to tune out interference. It is to laugh.—PAUL THORNE, 927 Buena Park Terrace.

YES, MADAM, THE TRUTH.

RADIO EDITOR—Your Night Prowler on radio must have thought he heard the opera Wednesday night (Nov. 29). If he did he was the only one who did. It could not be held or heard by anyone and I hope if they ever broadcast any more WMAQ will be excused. Nothing else could be heard after WJAZ started. Not a sound from opera. Would like to be able to have the truth from your radio page.—MRS. R. K. SMITH, Lake Park and 56th street.

(Note—"The Night Prowler" assures us he told the truth about the reception referred to. In fact he named his witnesses as corroboration. It is true, however, that many are complaining about the failure to pick up WMAQ on the night in question. This was due largely, however, to a lowered wave length, which many receivers are not adapted to cover.—THE EDITOR.)

GETS NEWS IN NEW MEXICO.

RADIO EDITOR—I am one year on our way to the coast with the Peerless Sales Palace (auto) and have heard of your new magazine. Will try to get a copy. Best of luck and success to The Post in its great undertaking.—B. G. MEYERS, special representative Peerless Light Company, en route, Sante Fe, N. M.

A GOOD SUGGESTION.

RADIO EDITOR—Inclosed is a copy of a rough graphic summary of the radio programs given in your Radio Magazine of Nov. 28, which may be of interest to you. The advantages are obvious, as it shows the stations that are in the air at any hour.

I would suggest that you consider printing a similar graph in your magazine, and believe it would be of considerable assistance to the restive prowler. It may be that the makeup expense would be prohibitive, and that you have already considered it—if not, the idea, such as it is, is yours with my compliments.—A. W. CORNELL, 6108 Kimbark avenue.

(Note—The idea is a good one and may be adopted at a later date. Thanks.—THE EDITOR.)

WANTS CORROBORATION.

RADIO EDITOR—I got 5X3 Nov. 27 at 9:25 p. m. The announcer said: "This is 5X3 transmitting the trans-Atlantic test," and said he had only a few minutes left. Then a band played "Nearer My God to Thee." If you, or anyone, was tuned in on 5X3 at that time will you please write and let me know? The radiophans here don't believe I got 5X3. My set is a Westinghouse, type RA, with an extra step. I use one 48-volt and one 24-volt Willard wet "B" battery.—J. C. MARR, Alta Vista, Iowa.

MANUFACTURERS' FAULTS.

RADIO EDITOR: Why don't manufacturers of radio apparatus generally assist the amateur or attempt to assist him by giving him some help along the following lines:

Who ever saw a dry battery plainly marked — or + or showing exact voltage tap, other than some faint impression in the sealing wax. Have you ever had your dry cell block down in a cabinet where it's dark and tried to decipher whether it was 45 or —? How easy it would be to put a sticker in red and white or black and white to show this information.

Some manufacturers could well afford to put a longer shaft on their instruments, so a fellow could mount it back of the panel further.

Why does a manufacturer of a new tube come out with a different base on his tube so a fellow has to get a new socket for a new tube?

A lot of manufacturers are omitting even instruction sheets with their parts. Of course, a fellow ought to know. I bought a potentiometer, a volt meter and ammeter, and, while I know how to use them there positively was no direction sheet with any of them.

Amplifying transformers don't always assist poor beginners by P— G equals F—F, altho perhaps it makes no difference. Anyway, it would help a fellow building 'em up.

Experimenter's sets constructed for quick hook-ups. Connections to be made to plainly marked binding posts, vario-coupler on a separate panel, split vario-meter, etc. One popular mica condenser had copy stamped in the wax fiber instead of on the metal where you could read it. And then no lead tap to solder to unless you do it right up close to where you could ruin the fixed condenser. Do manufacturers care to help?—F. J. SADILEK, 1428 23d street, Chicago.

Radio for Hikers

Harry Farkough.

LIKE a soldier carrying his ammunition, any hiker may carry a whole radio set with him. In fact, the set shown here is powerful enough to operate a loud speaker and receive at great distances. Henry Farkough of New York is its designer. Every part, even the batteries, has its place on the belt. The aerial is zigzagged in a folding pad that the hiker can hang from his shoulders.

Daily Weather Bulletins Sent by Radio to France

Each evening, Sundays and holidays included, the weather bureau of the United States department of agriculture sends a radio bulletin to the French meteorological service at Paris. It contains observations taken at a number of stations in the United States, Alaska and Canada, the position at the same hour of dominating high and low pressure areas, and weather reports from a limited number of ships in the Atlantic ocean.

The bulletin, which is addressed to "Angot, Paris," is forwarded thru the United States naval radio station at Annapolis (NSS) to the radio station at Lyon (YN). The transmissions are made on a wave length of 17,145 meters C. W.

The messages are for the most part coded in a modified form of the international meteorological code. The bulletin in its present expanded form began in July, 1922, as a result of arrangements made during a visit to the United States weather bureau by Capt. Phillippe Wehrle and Prof. Marcel Coyecque, French meteorologists.

Telegraphic weather reports have been furnished to the French meteorological service for more than twenty-five years. The American reports received as "Angot" bulletins are broadcast from the Eiffel tower radio station for the benefit of other European meteorological services and ships in western European waters, as they are intended for general benefit. Shipmasters are at liberty to pick them up during transmission from Annapolis to Lyon and to use the information contained therein.

Short Waves Fade Most So "Q. S. T." Tests Prove

The report of a large number of observations on wireless "fading" is given in brief in "Q. S. T." Observations to date indicate that the fading is greatest for waves within a certain range, and is less for waves which are above or below this region.

Fading is more pronounced at wave-lengths in the neighborhood of 250 meters than at longer wave-lengths. Transmission experiments using waves of 100 meters length also indicate less severe fading than on 250 meters.

It is easier for a large mass of matter to obstruct a 200-meter wave than a 2,000-meter wave.

A preliminary statistical study of the transmission range of certain broadcasting stations indicates that at distances of the order of 150 miles a noticeable decrease is observed in the signal strength, the latter increasing again at greater distances. The distance at which this effect occurs depends upon the wave-length, which suggests that its explanation is associated with the variation of ground absorption with wave-length.

Lynch Orchestra Makes Big Hit with Radiophans

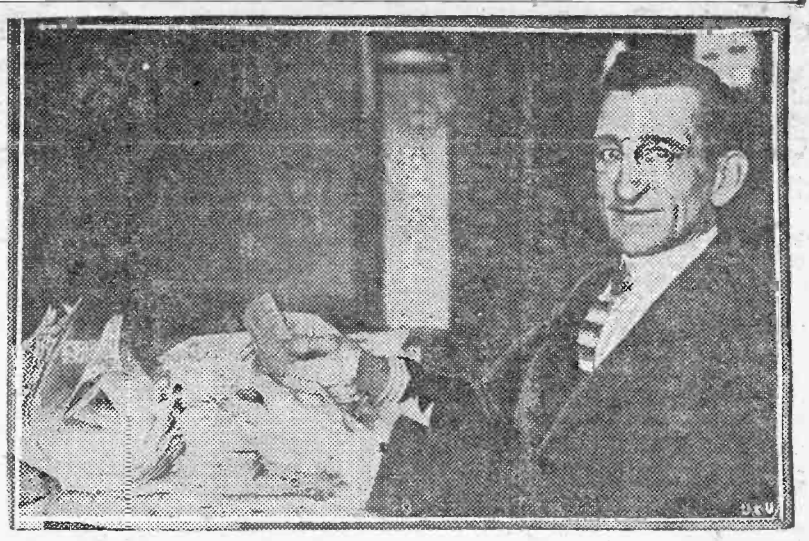
WMAQ's new orchestra, under the direction of Rhea Dorothy Lynch, is making a hit with the radiophans, judging from the letters of commendation received by this station.

Friday evening the orchestra will play the prize-winning numbers in the recent composers' contest. They are: "Arkansas," by Irving Marks; "Sheba Queen," by H. J. Hasselquist; "My Pet," by Emil Biorn; "Spanish Dance," by Merle Kirkman; "Mammy's Croony Lullaby," by Mel Lorch; "Just Melody," by Evart Mellander, and "Red Feather," by Stanley Church.

The members of W. M. A. orchestra are Elizabeth Burton, pianist; Mrs. Corydon D. Smith, xylophone; Rhea Dorothy Lynch, first violin and director; Gardner Herz, saxaphone; Wilbur Zimmerman, second violin, and Harold Mueller, banjo.

Avoid Leaky Aerials

Many persons who wonder why their signals and the music do not come in so loud in the wet weather as when there is no storm should be very careful of the insulation of their aerial and also the lead-in. The latter is probably the worst offender in the matter of losses in radio reception. In several cases where the aerial was carefully insulated, but the lead-in ran against the house, a path for the weak currents was made in wet weather, resulting in a great loss of volume in the radio receiver. Poor connections also result in a great loss. Solder all joints to be sure, as the receiving current is very weak.



W. E. DOWNEY is supervisor of radio in the department of commerce. He is taking a radio census these days. It's a big job, too, he'll tell you. The census has been gained thru broadcasting an appeal to radio users to send in their names and addresses and those who enjoy the use of radio sets. Downey finds that 70 per cent of the sets have vacuum tubes and 30 per cent crystal detectors. Photo shows Downey compiling his radio census.

Novice Homebuilder Must Take Kindergarten Course

THERE is usually very little doubt in the minds of most radio fans as to what constitutes a good radio receiver. The characteristics which a radio receiver must have in order to mark it as a set worthy of praise are so well known that any radio fan can call them off on his fingers.

When a man who knows how to get his money's worth plans to make a receiver he knows that if he is to get the utmost satisfaction in its operation the set must have certain well-defined qualities and characteristics.

But while it is always well to set one's objective far ahead, it is not advisable to try to cover the gap that separates the novice from the expert in one leap.

Begin in Kindergarten.

Rome was not built in a day; you don't get a finished education in a single year, and a radio expert isn't made by a few hours' study of radio books, magazines and newspaper articles.

If you begin in a small way by constructing one of the simpler single-circuit type of sets you will get more enjoyment and a better knowledge of radio than by jumping to a superheterodyne ir neutrodyne set the first crack off the bat.

Most people seem to have the idea that the building of an efficient radio receiver consists merely in assembling a number of parts and connecting them in accordance with a wiring diagram. Nothing, however, could be farther from the actual facts.

There's a Difference.

Two fans, one a novice and the other an experienced experimenter, can both build sets from the same wiring diagram and get entirely different results.

After the experienced fan solders the last connection he can connect up aerial, ground and batteries, insert the tubes in their sockets, plug in his phones or loudspeaker, turn on the juice and after a few minutes' manipulation of the dials tune in stations from one coast to the other, loud and clear.

The novice, on the other hand, even granting that he has all the parts properly connected together, may find difficulty in tuning in even the local stations.

Experience the Secret.

What is the trouble? Why should the set of one be such a success and that of the other such a howling failure when the circuits of both are identical?

The secret lies in the one word, "experience."

The real fan has thought of the set he is to build for a long time before he actually begins to make it. He has definitely decided whether he wants to get loud results from local stations or good signal strength from distant stations. He has taken into account the number of stations located near him so as to eliminate all possibilities of interference.

He has made sure that his aerial is properly installed to give the greatest efficiency. Many a good set is blamed for poor results due to an inefficient aerial.

Makes Test Set First.

He doesn't lay out his contact point holes with a lead pencil, thus short-circuiting the windings.

He makes sure that all his parts are of good quality and in working order before connecting them in his set.

He tries out the various circuits on a board and experiments with them for some time before he even thinks of mounting them on a panel.

In a word, he has studied all those points which make for efficiency and incorporated them in his set and has watched carefully that no weaknesses are present in his set.

It is careful attention to details and painstaking care in its construction that makes the difference between a good and a poor receiver.

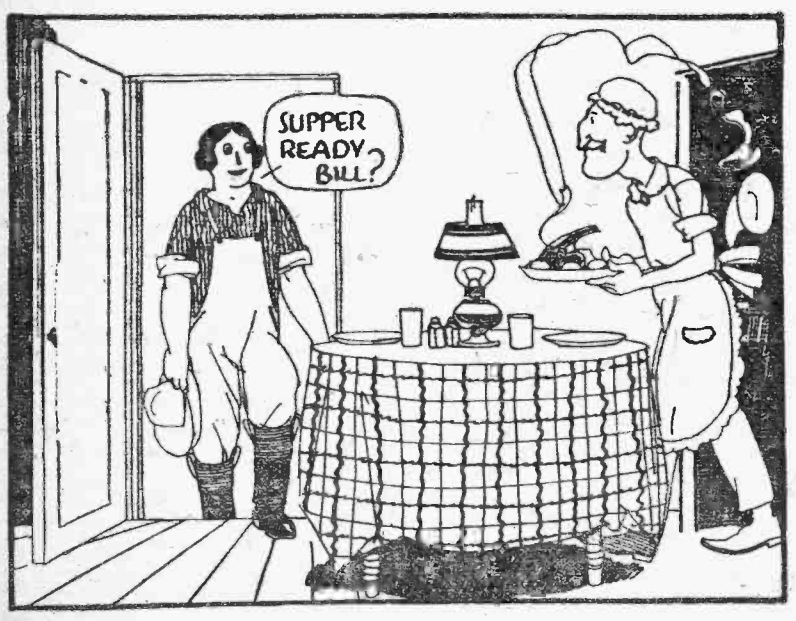
Radio for Fireboats

Boston has installed radio on its fireboats. Now these can be reached in an instant, no matter where they are. It took a messenger before to reach them.

INCREASES BATTERY LIFE.

Use low gravity acid, not over 1,220 specific gravity by hydrometer test, when making storage "B" batteries. This means larger batteries to deliver same amount of current, but it increases battery life about three times.

Broadcast Bill's Radiolays



By William E. Douglass.

WHEN you come to think about it times have changed around aplenty since the Pilgrim Fathers landed in December, 1620.

Take that first Thangsgivin' mornin' back in 1621, Mister Pilgrim shot his turkey with a muzzle-loadin' gun. In this century it's diff'rent fer it seems that over night if there's any shootin' bein' done, it's prices out of sight. An' Hezekiah Bingle sez the ol' times were the best an' by that I calculate he means when he first moved out west. He'd rather have the ol' days back an' lead the simple life away from growin' towns like ours an' wickedness an' strife. Leastwise that's how he puts it, as fer me I'm satisfied with almost any place at all that fortune may provide.

An' here's the reason fer it just fer instance take today fer an up to date Thanksgivin', an example you might say. In the mornin' there were chores to do which didn't take me long an' while Min stuffed the turkey, we both listened to a song that one of them big stations in the east wuz sendin' out. An' then a speaker told us what Thanksgivin' wuz about.

Now of course, I'm mighty thankful fer a lot of diff'rent things but most of all fer radio an' the pleasure that it brings.

While we were eatin' dinner, frum some place in this here land didn't we even hear the music of a military band? Then later after I had et my second piece of pie, I sez "We need excitement, you sit tight I'm goin' to try to tune in on a station sendin' out a football game."

Guess it took a couple minutes but I got it just the same. Say it must a been a dandy, we could almost see them boys plowin' up an' down the gridiron. We could hear the yells an' noise an' that's why I am satisfied an' mighty thankful too to hang my hat most any place an' while it may be true I live out in a little town I'll say at any rate it don't prevent our havin' a Thanksgivin' up to date.—Copyright, 1923, Westinghouse Electric and Manufacturing company.

Alphabetical List of U. S. Radio Stations

ABERDEEN, Wash.—KNT.
ABILENE, Texas—WQAQ.
AGRICULTURAL COLLEGE, N. D.—WPAK.
AKRON, Ohio—WOE.
ALBANY, N. Y.—WNJ.
ALEXANDRIA, La.—KFFY.
ALLENTOWN, Pa.—WCBA.
ALLENTOWN, Pa.—WSAN.
ALTADENA, Cal.—KGO.
AMARILLO, Texas—WDG.
AMARILLO, Texas—WQAC.
AMARILLO, Texas—WRAU.
AMES, Iowa—WOI.
AMSTERDAM, N. Y.—WPAS.
ANDERSON, Ind.—WABC.
ANN ARBOR, Mich.—WQAJ.
ANTHONY, Kas.—WBL.
ARDMORE, Okla.—WOAA.
ARLINGTON, Ore.—KFGL.
ASHEVILLE, N. C.—WFAJ.
ATLANTA, Ga.—WGM.
ATLANTA, Ga.—WSB.
ATLANTIC CITY, N. J.—WHAR.
ATWOOD, Kas.—WEAD.
AUBURN, Ala.—WMAV.
AUSTIN, Texas—WCM.
AUSTIN, Texas—WNAS.

BAKER, Ore.—KFDA.
BAKERSFIELD, Cal.—KDZB.
BALTIMORE, Md.—WCAO.
BALTIMORE, Md.—WEAR.
BALTIMORE, Md.—WKC.
BALTIMORE, Md.—WNAY.
BANGOR, Me.—WABI.
BANGOR, Me.—WPAY.
BATON ROUGE, La.—KFGC.
BAUDETTE, Minn.—KFGY.
BAY CITY, Mich.—WTP.
BEAUMONT, Texas—WMAM.
BELLINGHAM, Wash.—KDZR.
BELLOWS FALLS, Vt.—WLAK.
BELOIT, Kas.—WPAR.
BELOIT, Wis.—WKAW.
BELVIDERE, Ill.—WOAG.
BERKELEY, Cal.—KQI.
BERKELEY, Cal.—KRE.
BERRIEN SPRINGS, Mich.—KFGZ.
BILLINGS, Mont.—KFCH.
BINGHAMTON, N. Y.—WIAV.
BIRMINGHAM, Ala.—WSY.
BOISE, Idaho—KFAU.
BOISE, Idaho—KFDD.
BOISE, Idaho—WFFB.
BOONE, Iowa—KFGQ.
BOSTON, Mass.—WNAC.
BOULDER, Colo.—KFAJ.
BOWLING GREEN, Ky.—WNAB.
BOZEMAN, Mont.—KFDO.
BRIDGEPORT, Conn.—WKAX.
BROOKINGS, S. D.—KFDY.
BROOKVILLE, Ind.—WSAL.
BUFFALO, N. Y.—WGR.
BURLINGTON, Iowa— WIAS.
BURLINGTON, Iowa—WLAT.
BURLINGTON, Vt.—WCAX.
BUTLER, Mo.—WNAR.
BUTTE, Mont.—KFAP.

CAMDEN, N. J.—WRP.
CAMERON, Mo.—WFAQ.
CANTON, N. Y.—WCAD.
CANTON, Ohio—WWB.
CAPE GIRARDEAU, Mo.—WSAB.
CARTHAGE, Ill.—WCAZ.
CASPER, Wyo.—KFDF.
CAZENOVIA, N. Y.—WMAC.
CEDAR RAPIDS, Iowa—WJAM.
CEDAR RAPIDS, Iowa—WKAA.
CENTERVILLE, Iowa—WDAX.
CHARLESTON, S. C.—WNAQ.
CHARLESTON, S. C.—WOAH.
CHARLESTON, W. Va.—WPAZ.
CHARLOTTE, N. C.—WBT.
CHENEY, Kas.—KFGP.
CHICAGO, Ill.—KYW.
CHICAGO, Ill.—WAAF.
CHICAGO, Ill.—WBU.
CHICAGO, Ill.—WDAP.
CHICAGO, Ill.—WJAZ.
CHICAGO, Ill.—WLAG.
CHICAGO, Ill.—WMAQ.
CHICAGO, Ill.—WPAD.
CHICAGO, Ill.—WSAH.
CHICKASHA, Okla.—KFGD.
CINCINNATI, Ohio—WAAD.
CINCINNATI, Ohio—WHAG.
CINCINNATI, Ohio—WIZ.
CINCINNATI, Ohio—WLW.
CINCINNATI, Ohio—WMH.
CINCINNATI, Ohio—WSAI.
CLARKSBURG, W. Va.—WHAK.
CLEARFIELD, Pa.—WPI.
CLEMSON COLLEGE, S. C.—WSAC.
CLEVELAND, Ohio—KDPM.
CLEVELAND, Ohio—WHK.
CLEVELAND, Ohio—WJAX.
COLLEGE PARK, Ga.—WDAJ.
COLLEGE STATION, Texas—WTAW.
COLORADO SPRINGS, Colo.—KFCK.
COLORADO SPRINGS, Colo.—KFFQ.
COLUMBIA, Mo.—WAAN.
COLUMBUS, Ohio—WBAV.
COLUMBUS, Ohio—WCAH.
COLUMBUS, Ohio—WEAO.
COLUMBUS, Ohio—WMAN.
COLUMBUS, Ohio—WPAL.
CORVALLIS, Ore.—KFDJ.
COUNCIL BLUFFS, Iowa—WPAF.
CRANSTON, R. I.—WKAP.

DALLAS, Texas (portable)—KFFZ.
DALLAS, Texas—WDAO.
DALLAS, Texas—WFAA.
DALLAS, Texas—WRR.
DARTMOUTH, Mass.—WMAF.
DARTMOUTH, Mass.—WSAQ.
DAVENPORT, Iowa—WHAI.
DAVENPORT, Iowa—WOC.
DAVID CITY, Neb.—WRAR.
DAYTON, Ohio—WABD.
DAYTON, Ohio—WJAJ.
DEARBORN, Mich.—WWI.
DECATUR, Ill.—WBAO.
DECATUR, Ill.—WHAP.
DENVER, Colo.—KDZQ.
DENVER, Colo.—KFAF.
DENVER, Colo.—KFDL.
DENVER, Colo.—KFEL.
DENVER, Colo.—KFEP.
DENVER, Colo.—KFIC.
DENVER, Colo.—KFLE.
DENVER, Colo.—KLZ.
DES MOINES, Iowa—KFDP.
DES MOINES, Iowa—WGF.
DETROIT, Mich.—WCX.
DETROIT, Mich.—WWJ.
DETROIT, Mich.—KOP.
DOUGLAS, Wyo.—KFEV.
DUBUQUE, Iowa.—WQAK.
DULUTH, Minn.—WJAP.
DULUTH, Minn.—WMAT.

EAST LANSING, Mich.—WKAR.
EASTON, Pa.—WMAP.
EAST PITTSBURG, Pa.—KDKA.
EAST PROVIDENCE, R. I.—WKAD.
EDGEWOOD, R. I.—WEAG.
ELGIN, Ill. (Near)—WTAS.
EL MONTE, Cal.—KUY.
EL PASO, Texas—WDAH.
EL PASO, Texas—WPAL.
EMPORIA, Kan.—WAAZ.
ERIE, Pa.—WOAV.
EUGENE, Ore.—KFAT.
EVANSVILLE, Ind.—WGAM.
EVERETT, Wash.—KFCL

FAIRBANKS, Alaska—WLAY.
FALL RIVER, Mass.—WSAR.
FALL RIVER, Mass.—WTAB.
FARGO, N. D.—WDAY.
FAYETTEVILLE, Ark.—KFDV.
FLINT, Mich.—WEAA.
FORT DODGE, Iowa—KFER.
FORT DODGE, Iowa—WEAB.
FORT MONROE, Va.—WNAW.
FORT SMITH, Ark.—WGAR.
FORT WORTH, Texas—WBAP.
FRANKFORT, Ky.—WOAK.
FREMONT, Neb.—WOAE
FRESNO, Cal.—KMJ.
FROSTBURG, Md.—WPAQ.

GAINESVILLE, Ga.—WKAY.
GALVESTON, Texas—WHAB.
GALVESTON, Texas—WIAC.
GLADBROOK, Iowa—KFIK.
GLOUCESTER CITY, N. J.—WRAX.
GRAND FORKS, N. D.—WOAB.
GRAND ISLAND, Neb.—KFJA.
GRANVILLE, Ohio—WJD.
GREAT FALLS, Mont.—KDYS.
GREELEY, Colo.—KFJD.
GREELEY, Colo.—KFKA.
GREENCASTLE, Ind.—WLAX.
GREENSBORO, N. C.—WQAZ.
GREENVILLE, Ohio—WCBB.
GREENVILLE, S. C.—WQAV.
GRIDLEY, Cal.—KFU.
GROVE CIY, Pa.—WSAJ.
GUNNISON, Colo.—KFHA.

HAMILTON, Ohio—WBAU.
HAMILTON, Ohio—WRK.
HARRISBURG, Pa.—WABB.
HARTFORD, Conn.—WDAK.
HASTINGS, Neb.—WQAY.
HAVRE, Mont.—KFBB.
HILLSBORO, Ore.—KFFO.
HOLLYWOOD, Cal.—KFAR.
HONOLULU, Hawaii—KDYX.
HONOLULU, Hawaii—KGU.
HONOLULU, Hawaii—KYQ.
HOOD RIVER, Ore.—KFHB.
HOOD RIVER, Ore.—KQP.
HOULTON, Maine—WLAN.
HOUSTON, Texas—KFCV.
HOUSTON, Texas—WCAK.
HOUSTON, Texas—WEAY.
HOUSTON, Texas—WEV.
HOUSTON, Texas—WRAA.
HUNTINGTON, Ind.—WHAY.
HUTCHINSON, Kan.—KFHX.
HUTCHINSON, Minn.—WFAN.

INDEPENDENCE, Mo.—KFIX.
IOLA, Kan.—KFID.
IOWA CITY, Iowa—WHAA.
ITHACA, N. Y.—WEAI.

JACKSONVILLE, Fla.—WABG.
JACKSONVILLE, Fla.—WDAL.
JEFFERSON CITY, Mo.—WOS.
JOHNSTOWN, Pa.—WTAC.
JOPLIN, Mo.—WHAH.
JUNEAU, Alaska—KFIU.

KALAMAZOO, Mich.—WLAQ.
KALAMAZOO, Mich.—WOAP.
KANSAS CITY, Mo.—WDAF.
KANSAS CITY, Mo.—WMAJ.
KANSAS CITY, Mo.—WHB.
KANSAS CITY, Mo.—WOQ.
KEARNEY, Neb.—KFHP.
KELLOGG, Idaaho—KFEY.
KENOSHA, Wis.—WOAR.
KNOXVILLE, Tenn.—WNAV.

LACEY, Wash.—KGY.
LACONIA, N. H.—WKAV.
LA CROSSE, Wis.—WABN.
LAKE FOREST, Ill.—WABA.
LAKESIDE, Colo.—KFKH.
LAMONI, Iowa—KFFV.
LANCASTER, Pa.—WDBC.
LANCASTER, Pa.—WGAL.
LANSING, Mich.—WHAL.
LAPORTE, Ind.—WRAF.
LARAMIE, Wyo.—KFBU.
LAREDO, Texas—WWAX.
LAWRENCEBURG, Tenn.—WOAN.
LE MARS, Iowa—KFCX.
LE MARS, Iowa—WIAU.
LEXINGTON, Ky.—WQAH.
LIHUE, Hawaii—KFHS.
LIMA, Ohio—WOAC.
LINCOLN, Neb.—KFDU.
LINCOLN, Neb.—WFAV.
LINCOLN, Neb.—WJAB.
LINCOLN, Neb.—WKAC.
LINCOLN, Neb.—WMAH.
LINDSBORG, Kan.—WDAD.
LITTLE ROCK, Ark.—WCAV.
LOCKPORT, N. Y.—WMAK.
LONG BEACH, Cal.—KSS.
LOS ANGELES, Cal.—KDZF.
LOS ANGELES, Cal.—KFI.
LOS ANGELES, Cal.—KHJ.
LOS ANGELES, Cal.—KJS.
LOS ANGELES, Cal.—KNR.
LOS ANGELES, Cal.—KNY.
LOS ANGELES, Cal.—KNX.
LOS ANGELES, Cal.—KUS.
LOS ANGELES, Cal.—KWH.
LOS GATOS, Cal.—KFHQ.
LOUISBURG, Kan.—KFIL.
LOUISVILLE, Ky.—WHAS.
LOUISVILLE, Kan.—WLAP.
LOWELL, Mass.—WQAS.

MACON, Ga.—WMAZ.
MADISON, Wis.—WGAY.
MADISON, Wis.—WHA.
MANHATTAN, Kan.—WTG.
MARIETTA, Ohio—WBAW.
MARIETTA, Ohio—WSAA.
MARION, Ind.—WIAQ.
MARION, Kan.—WRAD.
MARSHALL, Mo.—WJAT.
MARSHALLOWN, Iowa—KFJB.
MATTOON, Ill.—WQAL.
MAYVILLE, N. D.—KFHU.
McKEESPORT, Pa.—WIK.
McLEANSBORO, Ill.—WRAS.
MEDFORD, Ore.—KFAY.
MEDFORD HILLSIDE, Mass.—WGI.
MEMPHIS, Tenn.—WMC.
MIAMI, Fla.—WQAM.
MIDDLEPORT, Ohio—WSAK.
MIDDLETOWN, Conn.—WOAS.
MILWAUKEE, Wis.—WAAK.
MILWAUKEE, Wis.—WCAY.
MILWAUKEE, Wis.—WHAD.
MILWAUKEE, Wis.—WIAO.
MINNEAPOLIS, Minn.—KFDZ.
MINNEAPOLIS, Minn.—KFEX.
MINNEAPOLIS, Minn.—WBAD.
MINNEAPOLIS, Minn.—WBAH.
MINNEAPOLIS, Minn.—WCAS.
MINNEAPOLIS, Minn.—WCE.
MINNEAPOLIS, Minn.—WLAG.
MINNEAPOLIS, Minn.—WLB.
MISHAWAKA, Ind.—WOAO.
MOBERLY, Mo.—KFFP.
MOBILE, Ala.—WEAP.
MODESTO, Cal.—KXD.
MONTEREY, Cal.—KLN.
MONTGOMERY, Ala.—WKAN.
MOORESTOWN, N. J.—WBAF.
MOOREHEAD, Minn.—WPAU.
MORGANTOWN, W. Va.—WHD.
MOSCOW, Idaho—KFAN.
MOUNT VERNON, Ill.—WABF.
MUNCIE, Ind.—WJAF.

NEAH BAY, Wash.—KFHH.
NEENAH, Wis.—WIAJ.
NEWARK, N. J.—WAAM.
NEWARK, N. J.—WBS.
NEWARK, N. J.—WOR.
NEWARK, N. J.—WRAZ.
NEWARK, Ohio—WBBA.
NEW BEDFORD, Mass.—WDAU.
NEW HAVEN, Conn.—WPAJ.
NEW LEBANON, Ohio—WPG.
NEW ORLEANS, La.—WAAB.
NEW ORLEANS, La.—WAAC.
NEW ORLEANS, La.—WCAG.
NEW ORLEANS, La.—WGV.
NEW ORLEANS, La.—WIAF.
NEW ORLEANS, La.—WWL.
NEWTON, Iowa—WIAH.
NEW YORK, N. Y.—WBAY.
NEW YORK, N. Y.—WEAF.
NEW YORK, N. Y.—WJX.
NEW YORK, N. Y.—WJY.
NEW YORK, N. Y.—WJZ.
NEW YORK, N. Y.—WLAW.
NEW YORK, N. Y.—WQAO.
NEW YORK, N. Y.—WSAP.
NEW YORK, N. Y.—WWZ.
NORFOLK, Neb.—WJAG.
NORMAN, Okla.—WNAD.
NORTHFIELD, Minn.—WCAL.
NORTH PLAINFIELD, N. J.—WEAM.

OAK, Neb.—KFEQ.
OAKLAND, Cal.—KLS.
OAKLAND, Cal.—KLX.
OAKLAND, Cal.—KZM.
OCEAN CITY, N. J.—WIAD.
OGDEN, Utah—KFCP.
OKLAHOMA CITY, Okla.—WMAB.
OKLAHOMA CIY, Okla.—WKY.
OKMULGEE, Okla.—WPAC.
OMAHA, Neb.—KFCZ.
OMAHA, Neb.—KFFX.
OMAHA, Neb.—WAAW.
OMAHA, Neb.—WIAK.
OMAHA, Neb.—WNAL.
OMAHA, Neb.—WOAW.
ORANGE, Texas—KFGX.
OSKALOOSA, Iowa—KFHL.

PADUCAH, Ky.—WIAR.
PARKESBURG, Pa.—WQAA.
PARSONS, Kan.—WOAJ.
PATERSON, N. J.—WBAN.
PENDLETON, Ore.—KFFE.
PENSACOLA, Fla.—WGAN.
PENSACOLA, Fla.—WLAV.
PEORIA, Ill.—WJAN.
PEORIA, Ill.—WQAX.
PHILADELPHIA, Pa.—WCAU.
PHILADELPHIA, Pa.—WDAR.
PHILADELPHIA, Pa.—WFI.
PHILADELPHIA, Pa.—WGL.
PHILADELPHIA, Pa.—WIP.
PHILADELPHIA, Pa.—WNAT.
PHILADELPHIA, Pa.—WOO.
PHILADELPHIA, Pa.—WWAD.
PHOENIX, Ariz.—KDYW.
PHOENIX, Ariz.—KFAD.
PINE BLUFF, Ark.—WOK.
PITTSBURG, Kan.—KFIV.
PITTSBURG, Pa.—KQV.
PITTSBURG, Pa.—WCAE.
PITTSBURG, Pa.—WJAS.
PLAINVIEW, Texas—WSAT.
PLATTE, S. D.—KFIJ.
PORT ARTHUR, Texas—WFAH.
PORTLAND, Ore.—KDYQ.
PORTLAND, Ore.—KFEC.
PORTLAND, Ore.—KFIF.
PORTLAND, Ore.—KGG.
PORTLAND, Ore.—KGN.
PORTLAND, Ore.—KGW.
PORTSMOUTH, Va.—WOAQ.
POUGHKEEPSIE, N. Y.—WFAF.
PROVIDENCE, R. I.—WEAN.
PROVIDENCE, R. I.—WJAR.
PROVIDENCE, R. I.—WRAH.
PROVIDENCE, R. I.—WSAD.
PROVIDENCE, R. I.—WTAG.
PULLMAN, Wash.—KFAE.

RALEIGH, N. C.—WLAC.
RAPID CITY, S. D.—WCAT.
READING, Pa.—WBBD.
READING, Pa.—WRAW.
REEDLEY, Cal.—KMC.
RENO, Nev.—KDZK.
RICHMOND, Cal.—KFCM.
RICHMOND, Va.—WQAT.
RIDGEWOOD, N. Y.—WHN.
ROCHESTER, N. Y.—WABO.
ROCHESTER, N. Y.—WHAM.
ROCKFORD, Ill.—WIAB.
ROCKPORT, Mo.—WMAD.
ROSWELL, N. M.—KNJ.

SACRAMENTO, Cal.—KFBK.
SAGINAW, Mich.—WABM.
SAGINAW, Mich.—WIAW.
S. CLOUD, Minn.—WFAM.
ST. CROIX FALLS, Wis.—WRAL.
ST. JOSEPH, Mo.—KFHD.
ST. JOSEPH, Mo.—WEAK.
ST. LOUIS, Mo.—KFEZ.
ST. LOUIS, Mo.—KFGJ.
ST. LOUIS, Mo.—KFIB.
ST. LOUIS, Mo.—KSD.
ST. LOUIS, Mo.—WCK.
ST. LOUIS, Mo.—WEB.
ST. LOUIS, Mo.—WEW.
ST. LOUIS, Mo.—WMAY.
ST. LOUIS, Mo.—WRAO.
ST. PAUL, Minn.—WAAH.
ST. PETERSBURG, Fla.—WSAG.
SALEM, Ore.—KFCD.
SALT LAKE CITY, Utah—KDYL.
SALT LAKE CITY, Utah—KZN.
SAN ANTONIO, Cal.—KFCL.
SAN ANTONIO, Texas—WCAR.
SAN ANTONIO, Texas—WOAI.
SAN DIEGO, Cal.—KDPT.
SAN DIEGO, Cal.—KDYM.
SAN DIEGO, Cal.—KFBC.
SAN DIEGO, Cal.—KFFA.
SANDUSKY, Ohio—WABH.
SANDUSKY, Ohio—WQAF.
SAN FRANCISCO, Cal.—KFDB.
SAN FRANCISCO, Cal.—KPO.
SAN FRANCISCO, Cal.—KUO.
SAN JOSE, Cal.—KFAQ.
SAN JOSE, Cal.—KQW.
SAN JOSE, Cal.—KSC.
SAN JUAN, P. R.—WKAQ.
SAN LUIS OBISPO, Cal.—KFBE
SANTA ANA, Cal.—KFAW.
SANTA BARBARA, Cal.—KFHJ.

Broadcasting Stations and Schedule of Programs

Continued from page 2.

company, 380 meters.
WHA—Madison, Wis., University of Wisconsin, 360 meters.
WHAA—Iowa City, Iowa, State University of Iowa, 283 meters.
WHAB—Galveston, Texas, Clark W. Thompson, 360 meters.
WHAC—Waterloo, Iowa, Cole Brothers Electric company, 360 meters.
WHAD—Milwaukee, Wis., Marquette university, 280 meters.
WHAG—Cincinnati, Ohio, University of Cincinnati, 222 meters.
WHAH—Joplin, Mo., Hafer Supply company, 360 meters.
WHAI—Davenport, Iowa, Radio Equipment and Manufacturing company, 360 meters.
WHAK—Clarksburg W. Va., Roberts Hardware company, 360 meters.
WHAL—Lansing, Mich., Lansing Capital News, 248 meters.
WHAM—Rochester, N. Y., University of Rochester (Eastman School of Music), 360 meters.
WHAP—Decatur, Ill., Otta & Kuhn, 360 meters.
WHAQ—Washington, D. C., Semmes Motor company, 360 meters.
WHAR—Atlantic City, N. J., Paramount Radio and Electric company (W. H. A. Paulus), 231 meters.
WHAS—Louisville, Ky., Courier-Journal and Louisville Times, 400 meters.
WHAV—Wilmington, Dela., Wilmington Electrical Special company, 360 meters.
WHAZ—Troy, N. Y., Rensselaer Polytechnic Institute, 380 meters.
WHB—Kansas City, Mo., Sweeney School company, 411 meters.
WHD—Morgantown, W. Va., West Virginia University, 360 meters.
WHK—Cleveland, Ohio, Radiovox company (Warren R. Cox), 360 meters.
WHN—Ridgewood, N. Y., George Schubel, 360 meters.
WIAB—Rockford, Ill., Joslyn Automobile company, 252 meters.
WIAC—Galveston, Texas, Galveston Tribune, 360 meters.
WIAD—Ocean City, N. J., Ocean City Yacht club (Howard R. Miller), 254 meters.
WIAF—New Orleans, La., 139 North Alexander street, Gustav A. DeCortin, 234 meters.
WIAH—Newton, Iowa, Continental Radio and Manufacturing company, 258 meters.
WIAI—Springfield, Mo., Heer Stores company, 360 meters.
WIAJ—Neenah, Wis., Fox River Valley Radio Supply company (Quinn Brothers), 224 meters.
WIAK—Omaha, Neb., Journal-Stockman company, 278 meters.
WIAO—Milwaukee, Wis., School of Engineering of Milwaukee, 360 meters.
WIAQ—Marion, Ind., Chronicle Publishing company, 226 meters.
WIAR—Paducah, Ky., Paducah Evening Sun, 360 meters.
WIAS—Burlington, Iowa, Home Electric company, 360 meters.
WIAT—Tarkio, Mo., Leon T. Noel, 360 meters.
WIAU—Le Mars, Iowa, American Trust and Savings bank, 360 meters.
WIK—McKeesport, Pa., K. & L. Electric company (Herbert F. Kelso and Hunter J. Lohman), 360 meters.
WIL—Washington, D. C., Continental Electric Supply company, 360 meters.
WIP—Philadelphia, Pa., Gimbel Brothers, 509 meters.
WJAB—Lincoln, Neb., American Electric company, 360 meters.
WJAD—Waco, Texas, Jackson's Radio Engineering laboratories, 360 meters.
WJAF—Muncie, Ind., Press Publishing company, 360 meters.
WJAG—Norfolk, Neb., Norfolk Daily News Times Publishing company, 360 meters.
WJAK—Greentown, Ind., Clifford L. White, 254 meters.
WJAM—Cedar Rapids, Iowa, 302 3d avenue, West, D. M. Perham, 268 meters.
WJAN—Peoria, Ill., Peoria Star, 280 meters.
WJAQ—Topeka, Kan, Capper Publications, 360 meters.
WJAR—Providence, R. I., The Outlet company (J. Samuels and Brother), 360 meters.
WJAS—Pittsburg, Pa., Pittsburg Radio Supply house, 360 meters.
WJAT—Marshall, Mo., Kelly-Vawter Jewelry company, 360 meters.
WJAX—Cleveland, Ohio, Union Trust company, 390 meters.
WJAZ—Chicago, Ill., Chicago Radio laboratory, 448 meters.
WJD—Granville, Ohio, Richahrd H. Howe, 229 meters.
WJH—Washington, D. C., White & Boyer company, 273 meters.
WJX—New York, N. Y., Deforest Radio Telephone and Telegraph company, 360 meters.
WJY—New York, N. Y., R. C. A. 405 meters.
WJZ—New 2York, N. Y., R. C. A., 455 meters.
WKAA—Cedar Rapids, Iowa, 1444 2d avenue, East, H. F. Paar, 268 meters.
WKAD—East Providence, R. I., Charles Loof (Cresent park), 240 meters.
WKAF—Wichita Falls, Texas, W. S. Radio Supply company, 360 meters.
WKAN—Montgomery, Ala., United Battery Service company, 226 meters.
WKAP—Cranston, R. I., Dutee W. Flint, 360 meters.
WKAQ—San Juan, P. R., Radio Corporation of Porto Rico, 360 meters.
WKAR—East Lansing, Mich., Michigan Agriculture college, 280 meters.
WKAS—Springfield, Mo., L. E. Lines Music company, 360 meters.
WKAV—Laconia, N. H., Laconia Radio club, 254 meters.
WKAW—Beloit, Wis., Turner Cycle company, 242 meters.
WKAX—Bridgeport, Conn., 1789 Park avenue, William A. MacFarlane, 231 meters.
WKAY—Gainesville, Ga., Brenau college, 280 meters.
WKC—Baltimore, Md., Joseph M. Zamoiski company, 360 meters.
WKY—Oklahoma, Okla., WKY Radio Shop, 360 meters.
WLAC—Raleigh, N. C., North Carolina State college, 360 meters.
WLAG—Minneapolis, Minn., Cutting and Washington Radio corporation, 417 meters.
WLAH—Syracuse, N. Y., 425 Brownell street, Samuel Woodworth, 234 meters.
WLAJ—Waco, Texas, Waco Electrical Supply company, 360 meters.
WLAK—Bellows Falls, Vt., Vermont Farm Machine corporation, 360 meters.
WLAL—Tulsa, Okla., Naylor Electric company, 360 meters.
WLAN—Houlton, Maine, Putnam Hardware company, 283 meters.
WLAP—Louisville, Ky., 306 West Breckenridge street, W. V. Jordon, 360 meters.
WLAQ—Kalamazoo, Mich., 108 Elm street, Arthur E. Schilling, 360 meters.
WLAT—Burlington, Iowa., Radio and Specialty company, 360 meters.
WLAV—Pensacola, Fla., Electric Shop, 254 meters.
WLAW—New York, N. Y., police department, City of New York, 360 meters.
WLAX—Greencastle, Ind., Putnam Electric company (Greencastle Community Broadcasting station), 231 meters.
WLB—Minneapolis, Minn., University of Minneosta, 360 meters.
WLW—Cincinnati, Ohio, Crosley Manufacturing company, 309 meters.
WMAB—Oklahoma, Okla., Radio Supply company, 360 meters.
WMAC—Cazenovia, N. Y., Ferrywood street.
J. Edw. Page (Olive B. Meredith), 261 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WMAH—Lincoln, Neb., General Supply company, 254 meters.
WMAJ—Kansas City, Mo., Drovers Telegram company, 275 meters.
WMAK—Lockport, N. Y., Norton Laboratories, 360 meters.
WMAL—Trenton, N. J., Trenton Hardware company, 256 meters.
WMAM—Beaumont, Texas, Beaumont Radio Equipment company, 360 meters.
WMAP—Easton, Pa., Utility Battery service, 246 meters.
WMAQ—Chicago, Ill., Chicago Daily News, 448 meters.
WMAV—Auburn Ala., Alabama Polytechnic institute, 250 meters.
WMAY—St. Louis, Mo., Kingshighway Presbyterian church, 280 meters.
WMAZ—Macon, Ga., Mercer university, 268 meters.
WMC—Memphis, Tenn., "Commercial Appeal" (Commercial Publishing company), 500 meters.
WMH—Cincinnati, Ohio, Precision Equipment company, 248 meters.
WMU—Washington, D. C., Doubleday-Hill Electric company, 261 meters.
WNAC—Boston, Mass., Shepard stores, 278 meters.
WNAD—Norman, Okla, University of Oklahoma, 360 meters.
WNAL—Omaha, Neb., 5019 Capitol avenue, R. J. Rockwell, 242 meters.
WNAM—Evansville, Ind., Ideal Apparatus company, 360 meters.
WNAN—Syracuse, N. Y., Syracuse Radio Telephone company, 286 meters.
WNAP—Springfield, Ohio, Wittenberg college, 231 meters.
WNAQ—Charleston, S. C., Charleston Radio Electric company, 360 meters.
WNAR—Butler, Mo., C. C. Rhodes, 231 meters.
WNAS—Austin, Texas, Texas Radio Corporation and Austin Statesman, 360 meters.
WNAT—Philadelphia, Pa., Lemmig Brothers company (Frederick Lennig), 360 meters.
WNAV—Knoxville, Tenn., Peoples Telephone and Telegraph company, 236 meters.
WNAW—Fort Monroe, Va., Peninsular Radio club (Henry Kunzmann), 360 meters.
WNAX—Yankton, S. D., Dakota Radio Apparatus company, 244 meters.
WNJ—Albany, N. Y., Shotton Radio Manufacturing company, 360 meters.
WOAA—Ardmore, Okla., Dr. Walter Hardy, 360 meters.
WOAC—Lima, Ohio, Maus Radio company, 266 meters.
WOAD—Sigourney, Iowa, Friday Battery and Electric corporation, 360 meters.
WOAE—Fremont, Neb., Midland college, 360 meters.
WOAF—Tyler, Texas, Tyler Commercial college, 360 meters.
WOAG—Belvidere, Ill., Apollo theater (Belvidere Amusement company), 224 meters.
WOAH—Charleston, S. C., Palmetto Radio corporation, 360 meters.
WOAI—San Antonio, Texas, Southern Equipment company, 385 meters.
WOAJ—Parsons, Kan., Ervins Electrical company, 258 meters.
WOAK—Frankfort, Ky., Collins Hardware company, 240 meters.
WOAL—Webster Groves, Mo., 4 Jefferson road, William E. Woods, 229 meters.
WOAN—Lawrenceburg, Tenn., Vaughn Conservatory of Music (James D. Vaughn), 360 meters.
WOAO—Mishawka, Ind., Lyradion Manufacturing company, 360 meters.
WOAP—Kalamazoo, Mich., Kalamazoo college, 240 meters.
WOAQ—Portsmouth, Va., Portsmouth Kiwanis club, 360 meters.
WOAT—Wilmington, Del., 215 Market street, Boyd M. Hamp, 360 meters.
WOAV—Erie, Pa., Pennsylvania National Guard, 2d Battalion, 112th Infantry, 242 meters.
WOAW—Omaha, Neb., Woodmen of the World, 526 meters.
WOAX—Trenton, N. J., 600 Ingham avenue, Franklyn J. Wolff, 240 meters.
WOAZ—Stamford, Texas, Penick Hughes company, 360 meters.
WOC—Davenport, Iowa, Palmer School of Chiropractic, 484 meters.
WOI—Ames, Iowa, Iowa State college, 360 meters.
WOK—Pine Bluff, Ark., Pine Bluff company, 360 meters.
WOO—Philadelphia, Pa., 13th and Market streets, John Wanamaker, 509 meters.
WOQ—Kansas City, Mo., Western Radio company, 360 meters.
WOR—Newark, N. J., L. Bamberger & Co., 405 meters.
WOS—Jefferson City, Mo., Missouri State Marketing bureau, 441 meters.
WPAB—State College, Pa., Pennsylvania State college, 360 meters.
WPAC—Okmulgee, Okla., Donaldson Radio company, 360 meters.
WPAD—Chicago, Ill., W. A. Wieboldt & Co., 360 meters.
WPAH—Waupaca, Wis., Wisconsin department of markets, 360 meters.
WPAJ—New Haven, Conn., Doolittle Radio corporation, 268 meters.
WPAK—Agricultural College, N. D., North Dakota Agricultural college, 360 meters.
WPAL—Columbus, Ohio, Superior Radio and Telegraph Equipment company, 286 meters.
WPAM—Topeka, Kan., Auerbach & Guettel, 360 meters.
WPAP—Winchester, Ky., 222 Lexington avenue, Theodore D. Phillips, 360 meters.
WPAQ—Frostburg, Md., General Sales and Engineering company, 360 meters.
WPAR—Beloit, Kan., Ward Battery and Radio company, 360 meters.
WPAT—El Paso, Texas, St. Patrick's cathedral, 360 meters.
WPAU—Moorhead, Minn., Concordia college, 360 meters.
WPAZ—Charleston, W. Va., Dr. John R. Koch, 273 meters.
WPG—New Lebannon, Ohio, Nushawg Poultry farm, 234 meters.
WQAA—Parkersburg, Pa., Horace A. Beale, Jr., 360 meters.
WQAB—Springfield, Mo., Southwest Missouri State Teachers' college, 236 meters.
WQAC—Amarillo, Texas, 108 East 8th street, E. B. Gish, 360 meters.
WQAD—Waterbury, Conn., Whitall Electric company, 242 meters.
WQAE—Springfield, Vt., Moore Radio News station (Edmund B. Moore), 275 meters.
WQAF—Sandusky, Ohio, Sandusky Register, 240 meters.
WQAH—Lexington, Ky., Brock-Anderson Electrical Engineering company, 254 meters.
WQAL—Mattoon, Ill., Coles County Telephone and Telegraph company, 258 meters.
WQAM—Miami, Fla., Electrical Equipment company, 360 meters.
WQAN—Scranton, Pa., Scranton Times, 280 meters.
WQAO—New York, N. Y., Calvary Baptist church, 360 meters.
WQAQ—Abilene, Texas, West Texas Radio company, 360 meters.
WQAS—Lowell, Mass., Prince-Walter company, 266 meters.
WQAV—Greenville, S. C., Huntington and Guerry (Inc.), 258 meters.
WQAW—Washington, D. C., Catholic university, 236 meters.
WQAX—Peoria, Ill., Radio Euipment company, 360 meters.
WQAZ—Greensboro, N. C., Greensboro Daily News, 360 meters.
WRAA—Houston, Texas, Rice institute, 360 meters.
WRAD—Marion, Kan., Taylor Radio shop (G. L. Taylor), 360 meters.
WRAF—Laporte, Ind., The Radio club (Inc.), 224 meters.
WRAH—Providence, R. I., Stanley N. Read, 231 meters.
WRAL—St. Croix Falls, Wis., Northern States Power company, 248 meters.
WRAN—Waterloo, Iowa, Black Hawk Electrical company, 236 meters.
WRAO—St. Louis, Mo., Radio Service company, 360 meters.
WRAP—Winter Park, Fla., Winter Park Electrical Construction company, 360 meters.
WRAU—Amarillo, Texas, Amarillo Daily News, 360 meters.
WRAV—Yellow Springs, Ohio, Antioch college, 360 meters.
WRAW—Reading, Pa., Avenue Radio shop (Horace D. Good), 238 meters.
WRAX—Gloucester City, N. J., Flaxon's garage, 268 meters.
WRAY—Scranton, Pa., Radio Sales corporation, 280 meters.
WRAZ—Newark, N. J., Radio Shop of Newark (Herman Lubinsky), 233 meters.
WRC—Washington, D. C., Radio Corporation of America.

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Today's Programs and Schedules

Continued from Page 3.

10:45 a. m., 12:30, 12:45, 3, 4:30 p. m.

WMAQ—Located on Hotel LaSalle; 447.5 meters. Miss Judith C. Waller, program director.

Day—4:30 p. m.—to be announced by radio.

Evening—6:30 to 7:30 p. m., talk by the Wheat Council on "Toast"; weekly Boy Scout talk, "The End of the Trail," by Gilbert Butler; weekly automobile talk by Rockwell Stephens, subject, "The Trail Hitters"; 7:45 p. m.: Mr. and Mrs. Max E. Oberndorfer introducing the opera, "Andrea Chenier"; 8 p. m., the opera, "Andrea Chenier," broadcast from the Auditorium over special sealed wire.

WJAZ—Located on Edgewater Beach hotel; 447.7 meters; E. Warren Howe, program director.

Day—This station has no regular day schedule.

Evening—10 p. m. to 2 a. m., musical program: 1. "Sunshine of Mine," "Marcheta," by Oriole orchestra; 2. soprano solos (selected), by Ethel Manning; 3. "Ballade" (Chopin), "Etude" (Chopin), by Clarence Welsh; 4. "I Hold Her Hands" (Russell). "You Will Not Forget" (Stickles), by Arthur C. Colby; 5. "Sobbing Blues," "Drifting Back to Dreamland," by Oriole orchestra; 6. soprano solos (selected), by Ethel Manning; 7. "Liebestraume" (Liszt), "March Militaire" (Schubert-Tausig), by Clarence Welsh; 8. "Obstination" (Fontanaillies), "Songs My Mother Taught Me" (Dvorak), by Arthur S. Colby; 9. "Dance and Keep Young," "Somebody Stole My Pal," by Oriole orchestra; 10. soprano solos (selected), by Ethel Manning; 11. "The Juggler" (Moszkowski), "Allegro" (Scott), by Clarence Welsh; 12. "The Bitterness of Love" (Dunn), "Tommy Lad" (Margetson), by Arthur C. Colby; 13. "That Radio Waltz," "Why Don't My Dreams Come True?" by Oriole orchestra.

WDAP—Located on Drake hotel; 360 meters. Jack Nelson, program director.

Day—1:40 p. m., Drake concert ensemble, market reports direct from Chicago board of trade on every half hour, beginning at 9:30 a. m., and continuing until 1:30 p. m.

Evening—7 p. m., Drake concert ensemble (direction Henry Selinger); Blackstone String quintet (direction Irving Margrath); 10 p. m., Louise Messenie, soprano; Esther Whittington, soprano; Jack Chapman's orchestra.

WPAD—Formerly on W. A. Wiebold & Co.'s School street and Ashland avenue.

Notice—This station has closed and is being moved to Armour institute where it will be operated by the radio department of that institution.

WSAH—Located at 4801 Woodlawn avenue; 248 meters.

WSAX—Located on Chicago Radio laboratory; 268 meters.

SUBURBAN STATIONS

(Central Time Is Shown.)

WCBD—Zion, Ill., 345 meters; J. H. Depew, station manager.

Note—This station broadcasts only on Monday and Friday evenings, Wednesday afternoons and on Sundays.

Wednesday—2:30 to 3:45 p. m., sacred solos and duets, and an address either by Wilbur Glenn Voliva, general overseer of the Christian Catholic Apostolic church in Zion, or one of his representatives.

Friday—From 2:30 to 3:45 p. m., sacred solos and duets, and an address either by Wilbur Glenn Voliva, general overseer of the Christian Catholic Apostolic church in Zion, or one of his representatives; 8 p. m. concert.

Sunday—9 to 10:45 a. m., Zion orchestra; 2:30 to 5:30 p. m., principal service of the entire week; special music by Zion band, organ (one of the largest in the world), and Zion white-robed choir; address by Wilbur Glenn Voliva, general overseer of the Christian Catholic Apostolic church in Zion.

OUT-OF-TOWN STATIONS

WCAY—Milwaukee, Wis., 261 meters; no silent nights.

Day—1 p. m. to 4:30 p. m., special concert; novelty and test programs as announced.

Evening—7:30 p. m., regular concert program.

WHAD—Marquette University, Milwaukee, Wis.; 280 meters:

Wednesdays—At 7:30 p. m. only.

WIAR—Rockford, Ill.; 252 meters: Wednesday and Friday evenings.

Evening—8 p. m.; musical selections.

WJAN—Peoria, Ill.; 280 meters: Daily except Sunday.

Day—9 a. m., live stock market; 9:15 a. m., weather; 11:30 a. m., Chicago, Peoria and St. Louis live stock and grain markets; 1:30 p. m., Chicago and Peoria grain and produce markets; U. S. agriograms.

Evening—Tuesdays and Thursday, special musical program to be announced by radiophone.

WRM—Urbana, Ill., University of Illinois; 360 meters: 8:50 to 9:30 p. m., lectures and news.

WTAS—Elgin, Ill.; 286 meters.

Evening—7:30 p. m.-12 midnight, musical program.

Eastern Programs.

(Central Time Is Shown.)

KDKA—East Pittsburg; 326 meters:

Day—9:45 a. m., Union live stock market reports from the National Stockman and Farmer; 10:55 a. m., Arlington time signals; 11 a. m., United States bureau of market reports furnished thru the National Stockman and Farmer; 11:10 a. m., music, weather forecast; 6:15 p. m., dinner concert by the Grand Symphony orchestra from the Million Dollar Grand theater, Pittsburg.

Evening—7:30 p. m., weekly chat with farmers by Frank E. Mullen, radio editor of the National Stockman and Farmer; 7:45 p. m., the children's period; 8 p. m., National Stockman and Farmer market reports; 8:15 p. m., address of interest to the farmers; 8:30 p. m., concert by artist students of the studio of Lyman Almy Perkins—Caroline Bracey, soprano; Arthur Ray Davis, tenor; E. Clair Anderson, basso; Mrs. L. Wallace Ohl, contralto; Lyman Almy Perkins, accompanist. Program—Contralto solos (a) "The Morning Wind," Branscombe; (b) "Slumber Song," Gretchaninoff; (c) "Dawn in the Desert," Ross. Quartet selections, "Flora's Holiday," Wilson (a cycle of old English melodies.) Soprano solos, (a) "Sundown," Woodman; (b) "Spring's Awakening," Sanderson. Tenor solos, (a) "The Morning Is Calling," Terry; (b) "Now Sleeps the Crimson Petal"; (c) "M'appair tutt' amor" ("Martha"), Flotow, Basso solos, Prologue ("Pagliaccia"), Leoncavallo; 9:55 p. m., Arlington time signals, weather forecast; 11:30 p. m., special late concert.

WBZ—Springfield, Mass.; 337 meters:

Day—10:55 a. m., noon (eastern) time signals, weather and Boston and Springfield markets.

Evening—7:30 p. m., twilight tales for the kiddies; letter from the New England Homestead; 7 p. m., concert by Miss Champagne, pianist; Beatrice Driscoll, pianist, pupils of Gustave Kriedte; 9 p. m., bedtime story for grown-ups by Orison S. Marden; 8:55 p. m., Arlington time signals.

WEAF—New York city; 495 meters: 5:30 to 8 p. m., concerts.

WGI—Medford Hillside, Mass.; 360 meters:

Evening—5:10 p. m., late news flashes, sports news, Boston American; 5:30 p. m., Boston police reports, Boston police headquarters; 5:40 p. m., code practice, lesson No. 181; 6 p. m., evening program: 1, evening musical by George Brinton Beal and friends; 2, bedtime stories for parents, prepared by the Children's Aid association, No. 4, read by Alfred F. Whitman, executive secretary; 3, continuation of musical by George Brinton Beal and friends.

WHAZ—Troy, N. Y.; 380 meters. This station broadcasts only on Monday evenings.

WYG—Schenectady, N. Y.; 380 meters:

Day—1 p. m., music and address, "The Child Adoption League," Mrs. Andrew Vogel, Schenectady Federation of Women's Organizations; 5:15 p. m., weekly report on conditions of roads in New York state.

Evening—6:45 p. m., radio drama, "The Thirteenth Chair," by WGY players; address, "Ship Propulsion," W. L. Wright, marine engineering department of the General Electric company; instrumental selection, "Reminiscences" (Roth), WGY orchestra; a few moments with new books, L. L. Hopkins, assistant librarian General Electric company; instrumental selection, "The Erlking" (Schubert), orchestra; a mystery play, "The Thirteenth Chair" (Veiller), WGY players; act 1, the Italian room in the home of Roscoe Crosby, time evening; instrumental selection, "Valse Triste" (Sibelius), orchestra; act 2, same scene, ten minutes later; instrumental selection, "King Manfred" (Reinecke), orchestra; act 3, same scene, half an hour later; instrumental selection, "Intermezzo Solenne" (Gounod), orchestra.

WGR—Buffalo; 319 meters.

Day—9:45 a. m. weather forecast for Lakes Erie and Ontario; Special report from Buffalo and Oswego, N. Y., for marine and aviation interests; weather forecast for western New York; 11 a. m., weather, produce and live stock market reports; 11:30 a. m., organ, dining-room Hotel Statler, George Albert Bouchard. Program: Walther's Prize Song from "Die Meistersingers," Wagner; "Air de Ballet," Cecil Chaminade; "Ave Maria," Bach-Gounod; Gavotte from "Mignonne," Thomas; "I'm Laughing at You," Ganley and Goldstein; 2:30 p. m., closing prices of Chicago Board of Trade; special recital by Mrs. Corinne Arthur of North Tonawanda, N. Y.; 3:30 p. m., closing prices of New York Stock exchange; 4 p. m., teatime music, Palm room, Hotel Statler; Miss Martha Gomph, harpist; Miss Elise de Grood, violinist; 5 p. m., second broadcasting of all daily reports; 6:30 p. m., dinner music, Vincent Lopez, Hotel Statler Dance orchestra; 7:30 p. m., digest of the day's news; Boy Scout radiograms; industrial employment bulletin; the American boy story; 8:30 p. m., ballroom, seventeenth annual convention of the National Society for Vocational Education; Erlenbach's Century orchestra; toastmaster, Prof. H. E. Bradford, university of Nebraska, Lincoln, Neb.; address, E. C. Hartwell, superintendent of schools, Buffalo; address, Francis G. Blair, state superintendent of public instruction, Illinois; address, L. W. Wallace, executive secretary Federated American Engineering societies, Washington, D. C.; address, George Berry, president International Association of Printing Pressmen, Indianapolis, Ind.; 10:45 p. m., weather forecast for Lakes Erie and Ontario; special report from Buffalo and Oswego, N. Y., for marine and aviation interests.

WJY—New York city; 405 meters:

This station broadcasts only on Sundays at 2:30 p. m. to 6 p. m.

WJZ—New York city; 455 meters: No silent night.

Day—2 p. m.: Christmas Music, direct from the rotunda of the Stewart building, courtesy of John Wanamaker Concert office. 3 p. m.: "Home Made Candies," by C. B. Vanderhill. 3:15 p. m.: Recital by Dollye Howard, soprano. 3:40 p. m.: Popular songs by Alexander James, tenor. 4 p. m.: "Voice Hygiene," by Dr. John Levborg. 4:15 p. m.: "Sidelights on Egypt," by Mrs. Grace Thompson Seton.

Evening—6 p. m.: "Jack Rabbit Stories," by David Cory. 6:35 p. m.: Recital by Sadie Tresonthick, soprano. 6:45 p. m.: The World's Work. 7 p. m.: Recital by Sadie Tresonthick, soprano. 8 p. m.: Dinner of the New York Railway club by direct wire from the Hotel Commodore. 9:30 p. m.: Dance program by the Hotel Commodore dance orchestra under the personal direction of Bernard Levitow.

WOO—Philadelphia; 509 meters: Silent Sunday, Tuesday, Thursday, Friday and Saturday.

Day—10 a. m., grand organ; 10:30 a. m., United States weather forecast; 10:55 a. m., United States naval observatory time signal; 11 a. m., luncheon music by the Tea-Room orchestra; 4:15 p. m., grand organ and trumpets; 4:30 p. m., sports results and police reports. 8:55 p. m., United Naval observatory time signal. 9:02 p. m., United States weather forecast.

WRC—Washington, D. C.,; 469 meters: Silent Tuesday, Thursday and Saturday.

Day—2 to 6 p. m., trade and financial reports; travel and fashion talks; vocal and instrumental music.

CKAC, La Presse, Montreal, 430 meters. 6:30 p. m.—Special broadcast of speeches by the Rt. Hon. Lyon MacKenzie King, prime minister of Canada; Sir Lomer Gouin, minister of justice; Hon. George P. Graham, minister of national defense; Hon. L. A. Taschereau, minister for the Province of Quebec; Hon. Mederic Martin, mayor of Montreal. This, on the occasion of the first public appearance of the three first speakers, upon their return from the imperial conference in London, England, and Geneva; there will be a number of bands in attendance; this broadcast will be relayed from the Craig Street armory, Montreal; important: Results of British elections given also.

Saturday, Dec. 8—French Canadian legal holiday. Silent.

Midwest Programs.

WCX—Detroit, Mich.; 517 meters: Silent Saturdays.

Day—2:20 p. m., Rev. Gaius Glenn Atkins, D. D., speaker; a twenty-minute exposition of the international Sunday school lesson.

Evening—6 p. m., dinner concert, Pete Bontsema's orchestra, broadcast from Hotel Tuller; 8:30 p. m., musical program.

WJAX—Cleveland; 390 meters: Silent every night except Tuesday and Thursday.

Day—11 a. m. to noon, special studio program.

Evening—8 p. m., concert furnished by the Al Koran shrine band. The program which they will present is as follows: 1. March, "The Plumed Knight" (F. J. St. Clair); 2. Selection, "Woodland" (Luders); 3. Vocal solos (a), "Gypsy Love Song" (De Koven); (b), "Laddie o' Mine" (Beebe), Hal S. Burr; 4. Cornet solos, (a), "Maid of the West" (Smith); (b) "A Dream" (Bartlet), A. L. Rudy; 5. Fox trot, "My Sweetie Went Away"; 6. Waltz, "Mighty Lak a Rose" (Nevin); 7. Piano solos (a), "The Lark" (Balakirew); (b) "Guitare" (Chaminade); (c) "Rhapsody No. 10" (Liszt), Miss Beatrice Vokoun; 8. Novelette, "There Once Was an Owl" (Herbert); 9. Operatic selection (Tobani); 10. "Eleanor" (Deppen); 11. Saxophone solo (selected), Fred Vokoun; 12. Selection, "The Prince of Pilsen" (Leslie); 13. Fox trot, "That Old Gang of Mine."

WLAG—Minneapolis, Minn.; 417 meters: No silent nights.

Day—9:30, 10 and 10:30 a. m., markets, news bulletins; 10:45 a. m., household hints; 11:30 a. m., markets, noon, lecture; 12:30 p. m., musical; 4 p. m., lecture; 4:30 p. m., markets; 5 p. m., address; 5:30 to 6 p. m., children's program.

Evening—9:15 p. m., address; 9:30 p. m., musical program.

WLW—Cincinnati; 309 meters: Silent Friday, Saturday and Sunday.

Day—4 p. m., current topics for women.

Evening—Modern Hungarian Radario night; Radario ("Lilliom"), presented by the Crosley Radarians, directed by Patia Power, of the Schuster-Martin dramatic school, with musical arrangements by the Cincinnati Conservatory of Music. 1. Violin solo by Freda Slauter, "Hejra Kati" (Hubay); 2. "Hungarian Rhapsody" (Liszt), Saidee McAllister; 3. "Lilliom," by Franz Molnar prologue and three scenes with Charles Reaume and Helen McCoy in the leading roles; prologue, an amusement park on the outskirts of Budapest; scene 1, a lonely place in the park; scene 4, a railroad embankment outside the city; scene 7, Julie's garden; brief story of the drama carried by descriptionist between scenes. Also movements, 1. Fantasie, 2. Scherzo, 3. Romance, 4. Finale from Kreisler quartet, to be played by string quartet from the Cincinnati Symphony orchestra. In the quartet: Schima Kaufman, first violin; Henry Borjes, second violin; Herman Gohlich, viola; Arthur Bowen, cello; violin solo by Freda Slauter, "Sarga Cserebogar" (Hubay); selected numbers by the string quartet. 11:15 p. m.: Popular entertainment by Ralph Long's Dance orchestra, playing "Rose of Sunny Italy"; "My Rose Is Only You"; "Somebody Stole My Gal"; "Waltz Me to Sleep," and other numbers. (Popular music on this program furnished by the National Association of Broadcasters, of which we are members.)

WOC—Davenport, Iowa; 484 meters: Silent Tuesdays.

Day—10 a. m., markets; 11 a. m., weather and river forecast; 11:05, markets; noon, chimes concert; 2 p. m., markets; 8:30 p. m., musical numbers to be announced. Lecture by Carl G. Stephan; subject, "Pathology of Bright's Disease."

Evening, 8 p. m.: Musical program (one hour), P. S. C. orchestra, Gerald M. Barrow director, featuring: "Waltz Me to Sleep in Your Arms," "My Rose Is Only You," "Sunbird," "Harmony Blues," "Junetime Is Spoontime," "Hawaiian Eyes," V. B. Rochte, barytone soloist.

WTAM—Cleveland; 390 meters: Broadcasts only Wednesday and Saturday evenings at 7 to 8 p. m.

WWJ—Detroit, Mich.; 517 meters: Silent Saturday.

Day—12 m., music by Jean Goldkette's orchestra, broadcast from the Graystone ballroom.

Evening—8:30 p. m., the Detroit News orchestra, Cathedral Male quartet; 10 p. m., dance music by Jeane Goldkette's orchestra, broadcast from the Graystone ballroom; 11 p. m., the Detroit News orchestra.

Southern Programs.

KSD—St. Louis, 546 meters: Silent Friday.

Evening—8 p. m., broadcasting the concert of the St. Louis Symphony orchestra, Rudolph Ganz conductor; Max Steindel, cellist, soloist, given at the Odeon.

WBAP—Fort Worth, Texas; 476 meters:

Day—10 a. m. to 4 p. m., markets and financial review.

Evening—7:30 to 8:30 p. m., concert by the Epworth League of Denton, Texas (E. L. O. announcing); 9:30 to 10:45 p. m., concert arranged by the Fort Worth Euterpean club (G. C. A. announcing).

WDAF—Kansas City, Mo.; 411 meters:

Day—3:30 to 4:30 p. m., musical matinee, The D. Ambert Haley Dance and Concert orchestra.

Evening—6 to 7 p. m., tuning-in piano number on the Duo-Art; market, weather forecast and road report; address, speaker from the William Jewell college, Liberty, Mo.; the children's story and information period; music, Fritz Hanlein's Trianon ensemble, Hotel Muehlebach; 11:45 p. m., to 1 a. m., the "Merry Old Chief" and the Coon-Sanders Novelty-Singing orchestra, Plantation Grill, Hotel Muehlebach.

WHAS — Louisville; 400 meters: Silent Mondays.

Day—4 to 5 p. m., four-minute talk on household economics; selections played on Alama theater organ.

Evening—7:30 to 9 p. m., concert by the Town club of Louisville Conservatory of Music, under the direction of Miss Helen Eichenberger; four-minute digest of International Sunday school lesson for Sunday, Dec. 9; four-minute radio forum talk; late important news bulletins; official central standard time announced at 9 o'clock.

WOS—Jefferson City, Mo.; 441 meters: Silent Tuesdays, Thursdays and Saturdays.

Evening—8 p. m., full musical program of vocal and instrumental features under the direction of Mrs. August Weigel of Jefferson City, Mo.

Pacific Coast Concerts.

KDZE—Seattle, Wash.; 455 meters: Silent nights Tuesdays, Thursdays and Sundays.

KFDB—San Francisco; 509 meters:

Evening—Musical program from midnight to 1:30 p. m.

KGW—Portland, Ore.; 492 meters:

Evening—Midnight to 1 a. m., vocal; 2 a. m., hoot owl frolic.

KHJ—Los Angeles; 395 meters:

Evening—10:45, 11:30 p. m., 1 a. m.

KPO—San Francisco; 423 meters:

Evening—Concert, midnight to 1 a. m.

BROADCASTING STATIONS AND SCHEDULE OF PROGRAMS

Continued from Page 14.

WRK—Hamilton, Ohio, Doron Bros. Electric company, 360 meters.

WRL—Schenectady, N. Y., Union college, 360 meters.

WRM—Urbana, Ill., University of Illinois, 360 meters.

WRR—Dallas, Texas, City of Dallas (police and fire signal department), 360 meters.

WRW—Tarrytown, N. Y., Tarrytown Radio Research laboratory, 273 meters.

WSAB—Cape Girardeau, Mo., Southeast Missouri State Teachers' college, 360 meters.

WSAC—Clemson College, S. C., Clemson Agricultural college, 360 meters.

WSAD—Providence, R. I., J. A. Foster company, 261 meters.

WSAG—St. Petersburg, Fla., City of St. Petersburg (Loren V. Davis), 244 meters.

WSAH—Chicago, Ill., 4801 Woodlawn avenue, A. J. Leonard, Jr., 248 meters.

WSAI—Cincinnati, Ohio, United States Playing Cards company, 309 meters.

WSAJ—Grove City, Pa., Grove City college, 360 meters.

ESAK—Middleport, Ohio, Foster Egner (Daily News, Pomeroy, Ohio), 258 meters.

WSAL—Brookville, Ind., Franklin Electric company, 246 meters.

WSAN—Allentown, Pa., Allentown Radio club, 229 meters.

WSAP—New York, N. Y., Seventh Day Adventist church, 360 meters.

WSAR—Fall River, Mass., Doughty & Welch Electrical company, 254 meters.

WSAT—Plainview, Texas, Donohoo-Ware Hardware company, 268 meters.

WSAU—Chesham, N. H., Camp Marienfeld, 229 meters.

WSAW—Canandaigua, N. Y., Curtice and McElwee, 275 meters.

WSAX—Chicago, Ill., Chicago Radio laboratory, 268 meters.

WSAY—Port Chester, N. Y., Port Chester Chamber of Commerce, 233 meters.

WSB—Atlanta, Ga., Atlanta Journal, 429 meters.

WSL—Utica, N. Y., J. and M. Electrical company, 273 meters.

WSY—Birmingham, Ala., Alabama Power company, 360 meters.

WTAB—Fall River, Mass., Fall River Daily Herald Publishing company, 248 meters.

WTAC—Johnstown, Pa., Penn Traffic company, 360 meters.

WTAD—Carthage, Ill., First Presbyterian church, 229 meters.

WTAF—New Orleans, La., Louis J. Gallo, 242 meters.

WTAH—Belvidere, Ill., Carmen Ferro, 236 meters.

WTAG—Providence, R. I., Kern Music company, 258 meters.

WTAJ—Portland, Me., The Radio shop, 236 meters.

WTAL—Toledo, Ohio, Toledo Radio and Electric company, wave length unrecorded.

WTAM—Cleveland, Ohio, Willard Storage Battery company, 390 meters.

WTAN—Mattoon, Ill., Orndorff Radio shop, 240 meters.

WTAP—Cambridge, Ill., Cambridge Radio and Electric company, 242 meters.

WTAQ—Osseo, Wis., S. H. Van Gordon and Son, 226 meters.

WTAR—Norfolk, Va., Reliance Electric company, 226 meters.

WTAS—Elgin, Ill., (near) R. F. D. 6, Box 75, Charles E. Erbstein, 275 meters.

WTAT—Boston, Mass., Edison Electric Illuminating company, portable, 244 meters.

WTAU—Tecumseh, Neb., Ruegg Battery and Electric company, 360 meters.

WTAW—College Station, Texas, Agricultural and Mechanical college of Texas, 280 meters.

WTAX—Streator, Ill., Williams Hardware company, 231 meters.

WTAY—Oak Park, Ill., Iodar-Oak Leaves Broadcasting station, 226 meters.

WTAZ—Lambertville, N. J., Thomas J. McGuire, 283 meters.

WTG—Manhattan, Kans., Kansas State Agricultural college, 485 meters.

WWAB—Trenton, N. J., Hoenig, Swern & Co., 226 meters.

WWAC—Waco, Texas, Sanger Brothers, 360 meters.

WWAD—Philadelphia, Pa., Wright & Wright, (Inc.), 360 meters.

WWAX—Laredo, Texas, Wormser Brothers, 360 meters.

WWB—Canton, Ohio, Daily News Printing company, 268 meters.

WWI—Dearborn, Mich., Ford Motor company, 273 meters.

WWJ—Detroit, Mich., Detroit News (Evening News association), 517 meters.

WWL—New Orleans, La., Loyola university, 280 meters.

WWZ—New York, N. Y., John Wanamaker, 360 meters.

WZAZ—Pomeroy, Ohio, Chase Electric, 258 meters.

May Link Chicago With Big Stations of East

The east no longer will monopolize the benefits to be derived from broadcasting of important events, athletic and otherwise. A plan has been devised by which large broadcasting stations may be linked up by direct line, so that both may broadcast an event at the same time.

At present WJZ in New York and WGY in Schenectady are joined by a land wire of 170 miles in length. The first test of this combination was made during the Princeton-Harvard game, when both stations sent out the reports of the tussle simultaneously.

This may be extended out toward Chicago and even farther, so that those who cannot get New York direct may derive the benefits of easterners, nevertheless.

Open Evenings Until 9 P. M.; Sunday 9:00 A. M. to 5 P. M.

Our Guarantee

Nothing but brand new radio parts—tested and approved by our qualified radio experts—guaranteed to give complete satisfaction in service—guaranteed to be the greatest value in merchandise that you can get for your money—that's what "Salvage" really means.

MAIL ORDERS SHIPPED TO YOU PROMPTLY—ADDRESS DEPT. P-6.

509 South State Street

Phone: Wabash 4183

CHICAGO SALVAGE STOCK STORE

509 South State Street

Phone: Wabash 4183

Our Guarantee

Nothing but brand new radio parts—tested and approved by our qualified radio experts—guaranteed to give complete satisfaction in service—guaranteed to be the greatest value in merchandise that you can get for your money—that's what "Salvage" really means.

MAIL ORDERS SHIPPED TO YOU PROMPTLY—ADDRESS DEPT. P-6.

for Everybody's Christmas
a RADIOLA No. 1

Complete With Murdoch Phones

Thousands of these splendid $25.00 Radio Receivers, built by the Radio Corporation of America, are bringing opera, jazz, news and entertainments nightly to enthusiastic audiences. A fortunate purchase of 3,000 sets enables us to offer you this identical $25.00 receiver for $9.45. While they last, only one to a customer. No batteries, no extra expense, quickly installed, easily operated—an ideal Christmas gift.

Only One to a Customer—

While They Last,

$9.45

(A $25.00 Value)

Complete Parts for ERLA SINGLE TUBE REFLEX

CONSISTING OF	Our Price
1 Variocoupler	$3.45
23-Plate Variable Condenser	1.15
2 Erla Sockets	1.30
1 Erla Reflex No. 1 Transformer	4.45
1 Erla A. F. Transformer	4.85
1 Erla .002 Mica Condenser	.30
1 Erla .001 Mica Condenser	.30
1 Erla .00025 Mica Condenser	.25
1 Erla Fixed Crystal Detector	1.00
1 Howard Rheostat	1.00
2 Bakelite Dials	.50
8 Binding Posts	.40
1 Dozen Switch Points and 4 Stops	.30
2 Switch Levers	.50
1 6½x14⅛ in. Formica Panel	1.37

Our Price **$20.90**

Complete Parts for 2-STAGE AMPLIFIER

To amplify Ultra-Audion, Reinartz, Flewelling, Knocked-Down Short-Wave Receiver, Crystal or any receiving set so that loud speaker or phonograph can be used in place of headset.

Reg. Price.	Consisting of	Our Price.
$1.05	7x9 Formica Panel (other suitable size)	$ .95
4.75	High Ratio All-American or Thordarson Transformer	3.95
4.50	Low-Ratio All-American or Thordarson	3.95
2.20	2 Howard Rheostats	2.00
2.00	2 Bakelite Sockets	.90
3.00	3 Double Pacent Jacks	1.50
1.30	13 Binding Posts	.65
.30	Baseboard	.15

$21.00 Value Our Price **$12.95**

R. C. Cabinets

Genuine 5-ply Veneer Mahogany Cabinets—the same Cabinet used in the R. C. Radiola set. These Cabinets cost the Radio Corp. $4.20 in thousand lots.

Size. 9¼x13¼.

Our Price **$2.95**

Coils for Cockaday Circuit

Special at **$1.95**

Variable Condensers

$7.00 value, 43-Plate Vernier	$3.95
$6.50 value, 23-Plate Vernier	3.45
$6.00 value, 11-Plate Vernier	2.95
$1.75 value, 3-Plate Vernier	1.15
$4.30 value, 43-Plate, NOW	1.75
$3.70 value, 23-Plate, NOW	1.45
$3.30 value, 11-Plate, NOW	1.35
$2.25 value, 5-Plate, NOW	1.25

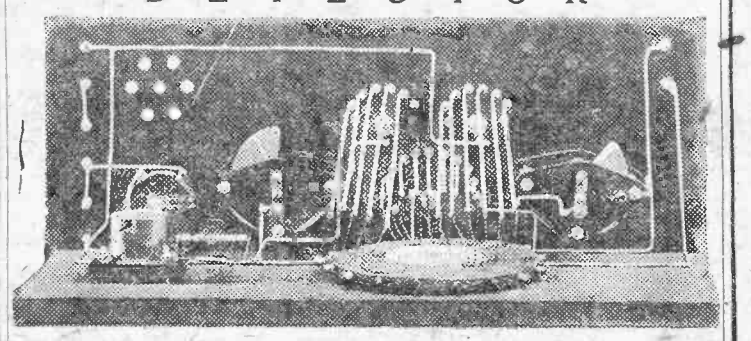
Complete Parts for AUTOPLEX

9½x13¼x⅛-inch Formica Panel, drilled and machined	$1.89
9½x13¼x⅝-inch Mahogany Cabinet with hinged top	2.95
1 John Firth Socket	.35
1 Frost Plain Rheostat	1.00
2 Moulded Autoplex Variometers	7.30
2 3-inch Bakelite Dials	.50
6 Binding Posts	.30
1 Single Circuit Pacent Jack	.35
1 1,250 or 1,500-Turn Honeycomb Coil	1.50
1 4x4x⅛-inch Formica sub base panel, drilled	.25
1 2¼x2¼x⅛-inch Formica Panel, Coil, clamp drilled	.07
1 Complete set of machine screws necessary for assembling the various parts	(no charge)
1 Hook-up for assembling and wiring	(no charge)
4 Lengths square bus bar wire for wiring	.10

Our Special Price **$16.45**

Build Your Own Sets with "Salvage" Parts

REINARTZ DETECTOR



Reg. Price.	Consisting of	Our Price.
$1.89	7x18 Formica Panel	$1.70
1.00	Bakelite Socket	.45
1.50	Howard Vernier Rheostat	1.35
3.30	23-Plate Variable Condenser	1.45
3.10	11-Plate Variable Condenser	1.35
1.50	3 Switch Levers	.75
.80	2 Dozen Switch Points	.40
3.00	1 Schoonhoven Reinartz Coil	1.95

Reg. Price.	Consisting of	Our Price.
1.00	Freshman Variable Grid Leak and Condenser combined	.75
.80	8 Binding Posts	.40
.30	25 Feet Tinned wire	.15
.50	Baseboard for mounting	.25
1.00	Blueprint with Complete Instructions for Assembly and Wiring	.50

Regular Price $21.69

Our Price **$11.45**

Complete parts for Detector and two-step with Vernier Condensers **$29.95**

Important!

Any individual part (except the drilled panels) in any of the six outfits above may be purchased separately at the special reduced prices listed under column headed "Our Price."

Panels Drilled FREE

Specially drilled panels are included with each of the sets illustrated and described below. We give this free service only on panels included with complete sets.

Easy to Build

Complete instructions for assembling and blueprints for wiring are included with each outfit. Instructions written so everyone can understand them. No special skill or technical knowledge required—a few hours and you're ready to tune-in New York, Los Angeles—any of 'em!

Honeycomb Coils

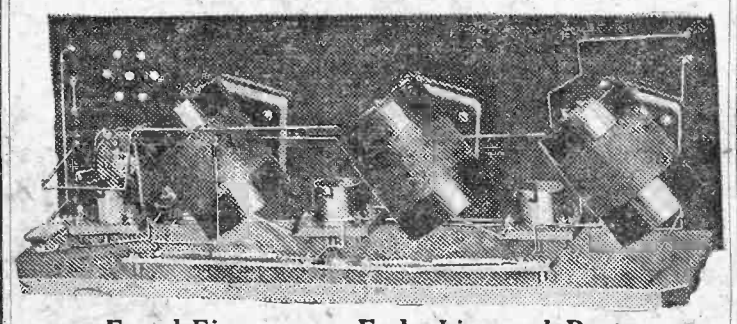
1,500 Turns	$1.50
1,250 Turns	1.50
1,000 Turns	1.25
750 Turns	1.00
250 Turns	.75
150 Turns	.60
100 Turns	.50
75 Turns	.40
50 Turns	.40
35 and 25 Turns	.40

Bradleystat or Bradleyleak

UNIVERSAL

New Type **$1.25** each

HAZELTINE NEUTRODYNE



Freed-Eiseman or Fada Licensed Parts

A UNIQUE method of tuning radio frequency amplification is employed in the Hazeltine Neutrodyne Receiver. This not only prevents tubes from oscillating, whistling and howling, but the tuning becomes so sharp that when once a station has been tuned-in, and the position of the numbers on the dial recorded, this identical position will again tune-in that particular station.

1	7x21x3-16 drilled Formica panel.
1	Howard rheostat.
3	4-inch Radion Dials.
3	John Firth bakelite sockets.
8	Binding posts.
3	23 plate variable condensers.
1	Wave control neutroformer.
2	Radio frequency amplifying neutroformers.
2	Grid neutralizing condensers.
1	.00025 micon grid condenser.
1	Marco variable grid leak.
1	Baseboard for mounting.
25	feet tinned copper bus bar wire and complete instructions for assembling and wiring.

4 Tube $44.65
5 Tube $46.25

3 Tube

Our Price **$28.60**

Complete Parts for WAVE TRAP

Consisting of	Our Price.
6x6½ Mission Finished Oak Cabinet	$ .95
6x6½ Formica Panel Drilled and Engraved	.50
Specially Wound Wave Trap Coil	1.95
23-Plate Variable Condenser	1.35
Bakelite Dial	.25
4 Binding Posts	.20

Construction Sheet FREE

Very Special **$5.25**

Complete Parts For HERALD-EXAMINER

Single Tube Hook-Up

Consisting of	Our Price.
6x10½ Drilled Panel	$ .95
23-Plate Condenser	1.35
Variocoupler	.95
Rheostat	.35
John Firth Socket	.35
Freshman Grid Leak and Condenser	.65
2 Bakelite Dials	.50
Switch Lever	.25
3 Binding Posts	.40
Switch Points and Stops	.15
Baseboard and Instructions and 25 feet Hook-Up Wire	.25

Our Price **$5.95**

Automatic Electric LONG RANGE HEADSETS

Formerly sold by the Automatic Electric Co., makers of telephone exchanges, at $10 each. We bought their entire stock—40,000 phones—paid spot cash, and because of this unequaled buying power, we are able to offer you a $10 headset for $3.65.

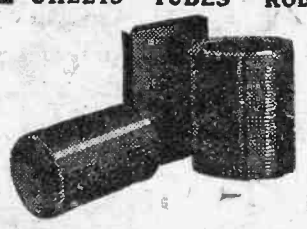
30 years of experience have produced the Automatic headset. Coil is wound with about 6,500 turns of No. 40 enamel-coated copper wire. DC resistance, 1,600 ohms. Impedance, at average music and voice frequency (800 cycles) is 21,000 ohms. (Effective impedance rather than DC resistance is the big factor in a good headset.)

$10.00 VALUE **$3.65**

FORMICA

Made from Anhydrous Redmanol Resins

SHEETS TUBES RODS



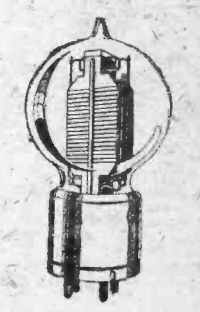
We are prepared to furnish promptly and saw Formica panels of any dimensions. Cutting charge is included in the following prices:

3-16-inch Formica, sq. in.	2c
⅛-inch Formica, sq. in.	1½c
Tubing (2 to 4 inch diameter), per running inch	10c

Western Electric VT-2 Tubes

5-Watt "E" Tubes Type CW-193

One of the big features of these brand new, genuine Western Electric VT-2 Tubes that we bought from the U. S. Signal Corps is that they have a higher amplification factor than any other 5-watt tube made! And almost half of our purchase consisting of 10,000 tubes have been sold. Radio men know that a genuine VT-2 Tube for $7.45 is an unusual opportunity—a real "find"! These tubes may be used for both RF and AF Amplification, and for CW and phone transmitting. These are not Navy defects; they have been sold only as a surplus.



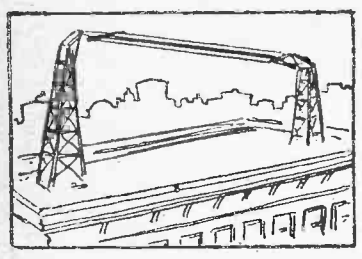
$12.00 Value **$7.45**

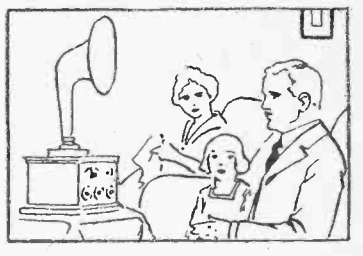
(All Other Tubes at Reduced Prices)

THE CHICAGO EVENING POST

RADIO MAGAZINE

Published Every Thursday





THURSDAY, DECEMBER 13, 1923.

Issued as a Supplement to
The Chicago Evening Post

BROADCASTING

HOME RADIO

RADIO SETS

HOOK-UPS

AMATEUR RECEPTION

HOME-WORKSHOP

RADIO SCIENCE-

RADIO PROGRAMS

LOCAL NEWS

U.S. RADIO NEWS

HOME LABORATORY

AMATEUR TRANSMISSION

RADIO STATIONS

INVENTIONS

D.X. RECORDS

RADIO PRACTICE-

COMMERCIAL

RADIO SANTA CLAUS—Old Kris Kringle is going to make this truly a Radio Christmas. Note that he has visited one of the big radio factories with two of his little assistants and is leaving his order for sets. (Photo courtesy Crosley Mfg. Co.)

FOREIGN RADIO NEWS

MANUFACTURERS NEWS

NEW EQUIPMENT

DEALERS NEWS

JOBBER NEWS

IN THIS ISSUE

The Editor Describes His Personal Set—How to Make a Push-and-Pull Amplifier—A New Circuit That Avoids All the Howls and Hisses—How to Tune a Single-Circuit Set—Wiring and Assembling of Receiver Sets—Long-Distance Records by Radiophans.

Broadcasting Stations and Schedules

Central, or Chicago time, is shown on all stations. If necessary to ascertain local time on any station deduct two hours from time shown for Pacific coast stations, one hour from time shown for the Rocky mountain stations and add one hour to those stations using eastern time. Hawaiian island time is four hours and a half slower than Chicago time. In the list the call number of the station is first given, followed by the location, the owner's name, wave length used and broadcasting schedule in order named. THE POST is making a thoro canvass of all stations in order that this directory may be complete and accurate. Changes are so frequent in stations and schedules that no list can be satisfactory which is not corrected frequently. Corrections and additions to this list will be made from week to week. Stations are urged to co-operate by sending information of changes in schedule to Radio Editor, The Chicago Evening Post.

KDKA—East Pittsburg, Westinghouse Electric and Manufacturing company, 326 meters.
KDPM—Cleveland, Ohio, Westinghouse Electric and Manufacturing company, 270 meters.
KDPT—San Diego, Calif., Southern Electrical company, 244 meters.
KDYL—Salt Lake City, Utah, Telegram Publishing company, 360 meters.
KDYM—San Diego, Calif., Savoy theater, 252 meters.
KDYQ—Portland, Ore., Oregon Institute of Technology, 360 meters.
KDYS—Great Falls, Mont., The Tribune, 360 meters.
KDYW—Phoenix, Ariz., Smith Hughes & Co., 360 meters.
KDYX—Honolulu, Hawaii, Star Bulletin, 360 meters.
KDZB—Bakersfield, Calif., 1402 20th street, Frank E. Siefert, 240 meters.
KDZE—Seattle, Wash., The Rhodes company, 455 meters.
KDZF—Los Angeles, Calif., Automobile Club of Southern California, 278 meters.
KDZI—Wenatchee, Wash., Electric Supply company, 360 meters.
KDZK—Reno, Nev., Nevada Machinery and Electric company, 360 meters.
KDZQ—Denver, Colo., Nichols Academy of Music, 360 meters.
KDZR—Bellingham, Wash., Bellingham Publishing company, 261 meters.
KDZT—Seattle, Wash., Seattle Radio association, 360 meters.
KFAD—Phoenix, Ariz., McArthur Bros. Mercantile company, 360 meters.
KFAE—Pullman, Wash., State College of Washington, 360 meters.
KFAF—Denver, Colo., Western Radio corporation, 360 meters.
KFAJ—Boulder, Colo., University of Colorado, 360 meters.
KFAN—Moscow, Idaho, The Electric shop, 360 meters.
KFAP—Butte, Mont., Standard Publishing company, 360 meters.
KFAR—Hollywood, Calif., Studio Lighting Service company (O. K. Olsen), 280 meters.
KFAU—Boise, Idaho, Independent School District of Boise City, Boise High school, 270 meters.
KFAV—Venice, Calif., Abbot Kinney company, 224 meters.
KFAW—Santa Ana, Calif., The Radio Den (W. B. Ashford and H. T. White), 280 meters.
KFAY—Medford, Ore., Virgin's Radio service, 283 meters.
KFBB—Havre, Mont., F. A. Buttrey & Co., 360 meters.
KFBC—San Diego, Calif., W. K. Azbill, 278 meters.
KFBE—San Luis Obispo, Calif., Reuben H. Horn, 360 meters.
KFBG—Tacoma, Wash., First Presbyterian church, 360 meters.
KFBK—Sacramento, Calif., Kimball-Upson company, 283 meters.
KFBL—Everett, Wash., Leese Bros., 224 meters.
KFBS—Trinidad, Colo., Trinidad Gas and Electric Supply company and the Chronicle News, 360 meters.
KFBU—Laramie, Wyo., The Cathedral (Bishop N. S. Thomas), 283 meters.
KFCB—Phoenix, Ariz., Nielsen Radio Supply company, 238 meters.
KFCD—Salem, Ore., Salem Electric company, 360 meters.
KFCF—Walla Walla, Wash., 707 Baker building, Frank A. Moore, 360 meters.
KFCH—Billings, Mont., Electric Service station (Inc.), 360 meters.
KFCK—Colorado Springs, Colo., Colorado Springs Radio company, 258 meters.
KFCL—San Antonio, Calif., Los Angeles Union Stock yards, 360 meters.
KFCM—Richmond, Calif., Richmond Radio shop (Frank T. Doeing), 360 meters.
KFCP—Ogden, Utah, 2421 Jefferson avenue, Ralph W. Flygare, 360 meters.
KFCV—Houston, Texas, Fred Mahaffey, Jr., 360 meters.
KFCY—Le Mars, Iowa, Western Union college, 252 meters.
KFCZ—Omaha, Neb., Omaha Central High school, 258 meters.
KFDA—Baker, Ore., Adler's Music store, 360 meters.
KFDD—Boise, Idaho, St. Michael's cathedral, 252 meters.
KFDH—Tucson, Ariz., University of Arizona, 360 meters.
KFDJ—Corvallis, Ore., Oregon Agricultural college, 360 meters.
KFDL—Denver, Colo., Knight-Campbell Music company, 360 meters.
KFDO—Bozeman, Mont., 420 West Koch street, H. Everett Cutting, 248 meters.
KFDP—Des Moines, Iowa, Hawkeye Radio and Supply Co., 278 meters.
KFDR—York, Neb., Bullock's Hardware and Sporting Goods (Robert G. Bullock), 360 meters.
KFDU—Lincoln, Neb., Nebraska Radio Electric company, 240 meters.
KFDV—Fayetteville, Ark., Gilbrech & Stinson, 360 meters.
KFDX—Shreveport, La., First Baptist church, 360 meters.
KFDY—Brookings, S. D., South Dakota State College of Agriculture and Mechanic Arts, 360 meters.
KFDZ—Minneapolis, Minn., 2510 South Thomas avenue, Harry O. Iverson, 360 meters.
KFEC—Portland, Ore., Meier & Frank company, 360 meters.
KFEJ—Tacoma, Wash., 1724 South Jay street, Guy Greason, 360 meters.
KFEL—Denver, Colo., Winner Radio corporation, 360 meters.
KFEP—Denver, Colo., Radio Equipment company (Joseph L. Turre), 240 meters.
KFEQ—Oak, Neb., Jw L. Scroggin, 360 meters.
KFER—Fort Dodge, Iowa, Auto Electric Service company, 231 meters.
KFEV—Douglas, Wyo., Radio Electric Shop, 263 meters.
KFEX—Minneapolis, Minn., Augsburg Seminary, 261 meters.
KFEY—Kellogg, Idaho, Bunker Hill and Sullivan Mining and Concentrating company, 360 meters.
KFEZ—St. Louis, Mo., American Society of Mechanical Engineers (F. H. Schubert), 360 meters.
KFFA—San Diego, Cal., 3443 5th street, Dr. R. O. Shelton, 242 meters.
KFFB—Boise, Idaho, Jenkins Furniture company, 240 meters.
KFFE—Pendleton, Ore., Eastern Oregon Radio company, 360 meters.
KFFO—Hillsboro, Ore., Dr. E. H. Smith, 229 meters.
KFFT—Moberly, Mo., First Baptist church, 275 meters.
KFFQ—Colorado Springs, Colo., Marksheffel Motor company, 360 meters.
KFFR—Sparks, Nev., Nevada State Journal (Jim Kirk), 226 meters.
KFFV—Lamoni, Iowa, Graceland college, 360 meters.
KFFX—Omaha, Neb., McGraw company, 278 meters.
KFFY—Alexandria, La., Pincus & Murphy, 275 meters.
KFFZ—Dallas, Tex. (portable), Al. G. Barnes Amusement company, 226 meters.
KFGG—Baton Rouge, La., Louisiana State university, 254 meters.
KFGD—Chickasha, Okla., Chickasha Radio and Electric company, 248 meters.
KFGH—Stanford University, Cal., Leland Stanford university, 360 meters.
KFGJ—St. Louis, Mo., Missouri National guard, 138th infantry, 266 meters.
KFGL—Arlington, Ore., Arlington garage, 234 meters.
KFGP—Cheney, Kan., Cheney Radio company, 278 meters.
KFGQ—Boone, Iowa, Crary Hardware company, 226 meters.
KFGV—Utica, Neb., Heidbreder Radio Supply company, 224 meters.
KFGX—Orange, Texas, First Presbyterian church, 250 meters.
KFGZ—Berrien Springs, Mich., Emmanuel Missionary college, 268 meters.
KFHA—Gunnison, Colo., Colorado State Normal school, 252 meters.
KFHB—Hood River, Ore., Rialto theater (P. L. Beardwell), 280 meters.
KFHD—St. Joseph, Mo., Utz Electric Shop company, 226 meters.
KFHF—Shreveport, La., Central Christian church, 266 meters.
KFHH—Neah Bay, Wis., Ambrose A. McCue, 283 meters.
KFHJ—Santa Barbara, Cal., Fallon & Co., 360 meters.
KFBQ—Los Gatos, Cal., Curtis Brothers Hardware store, 242 meters.
KFHR—Seattle, Wash., Star Electric and Radio company, 270 meters.
KFHS—Lihue, Hawaii, Clifford J. Dow, 275 meters.
KFHU—Mayville, N. D., M. G. Sateren, 261 meters.
KFHX—Hutchinson, Kan., 407 East 1st street, Robert W. Nelson, 220 meters.
KFI—Los Angeles, Cal., Earle C. Anthony (Inc.), 469 meters.
KFIB—St. Louis, Mo., 5666 Vernon avenue, Franklin W. Jenkins, 244 meters.
KFID—Iola, Kan., Ross Arbuckle's garage, 240 meters.
KFIF—Portland, Ore., Benson Polytechnic institute, 360 meters.
KFIK—Gladbrook, Iowa, Gladbrook Electric company, 234 meters.
KFIL—Louisburg, Kan., Windisch Electric Farm Equipment company, 234 meters.
KFIO—Spokane, Wash., North Central high school, 252 meters.
KFIQ—Yakima, Wash., Yakima Valley Radio Broadcasting association, 224 meters.
KFKZ—Colorado Springs, Colo., Nassour Bros. Radio company, 234 meters.
KFLA—Butte, Mont., Abner R. Wilson, 283 meters.
KFLB—Menominee, Mich., Signal Electric Manufacturing company, 248 meters.
KFLD—Franklinton, La., Paul E. Greenlaw, 234 meters.
KFLE—Denver, Colo., National Educational Service, 268 meters.
KFLH—Salt Lake City, Utah, Erickson Radio company, 261 meters.
KFLP—Cedar Rapids, Ohio, Everette M. Foster, 240 meters.
KFLQ—Little Rock, Ark., Bizzell Radio shop, 261 meters.
KFLR—Albuquerque, N. M., University of New Mexico, 254 meters.
KGB—Tacoma, Wash., Wm. A. Mullins Electric company, 360 meters.
KGG—Portland, Ore., Hallock & Watson Radio service, 360 meters.
KGN—Portland, Ore., Northwestern Radio Manufacturing company, 360 meters.
KGU—Honolulu, Hawaii, Waikiki Beach, Marion A. Mulrony, 360 meters.
KGW—Portland Ore., Portland Morning Oregonian, 492 meters.
KGY—Lacy, Wash., St. Martins college (Rev. Sebastian Ruth), 258 meters.
KHJ—Los Angeles, Cal., Times-Mirror company, 395 meters.
KHQ—Seattle, Wash, 419 13th avenue, Louis Wasmer, 360 meters.
KJQ—Stockton, Cal., 615 East Main street, C. O. Gould, 360 meters.
KJR—Seattle, Wash, Northwest Radio Service company, 270 meters.
KJS—Los Angeles, Cal., Bible Institute of Los Angeles, 360 meters.
KLN—Monterey, Cal., Monterey Electric Shop, 360 meters.
KLS—Oakland, Cal., 2201 Telegraph avenue, Warner Brothers, 360 meters.
KZY—Wenatchee, Wash, Wenatchee Battery and Motor company, 360 meters.
WAAB—New Orleans, La., 137 South St. Patrick street, Valdemar Jensen, 268 meters.
WAAC—New Orleans, La., Tulane university, 360 meters.
WAAD—Cincinnati, Ohio, Ohio Mechanics institute, 360 meters.
WAAF—Chicago, Ill., Chicago Daily Drovers Journal, 360 meters.
WAAH—St. Paul, Min., Commonwealth Electric company, 360 meters.
WAAK—Milwaukee, Wis., Gimbel Brothers, 280 meters.
WAAM—Newark, N. J., I. R. Nelson company, 263 meters.
WAAN—Columbia, Mo., University of Missouri, 254 meters.
WAAW—Omaha, Neb., Omaha Grain Exchange, 360 meters.
WAAZ—Emporia, Kans., Hollister-Miller Motor company, 360 meters.
WABB—Harrisburg, Pa., Dr. John B. Lawrence, 266 meters.
WABC—Anderson, Ind., Fulwider-Grimes Battery company, 229 meters.
WABD—Dayton, Ohio, Parker high school, 283 meters.
WABE—Washington, D. C., Young Men's Christian association, 283 meters.
WABF—Mount Vernon, Ill., Mount Vernon Register-News company, 234 meters.
WABG—Jacksonville, Fla., Arnold Edwards Piano company, 248 meters.
WABH—Sandusky, Ohio, Lake Shore Tire company, 240 meters.
WABI—Bangor, Me., Bangor Railway and Electric company, 240 meters.
WABA—Lake Forest, Ill., Lake Forest college, 266 meters.
WABJ—South Bend, Ind., The Radio Laboratories, 240 meters.
WABZ—New Orleans, La., 2813 Calhoun street, Clyde R. Randall, 268 meters.
WCAB—Columbus, Ohio, Entrekin Electric company, 286 meters.
WCAJ—University Place, Neb., Nebraska Wesleyan university, 360 meters.
WCAK—Houston, Texas, 2504 Bagby street, Alfred P. Daniel, 360 meters.
WCAL—Northfield, Minn., St. Olaf college, 360 meters.
WCAM—Villanova, Pa., Villanova college, 360 meters.
WCAO—Baltimore, Md., Sanders & Stayman company, 360 meters.
WCAP—Washington, D. C., Chesapeake & Potomac Telephone company, 469 meters.
WCAR—San Antonio, Texas, Alamo Radio Electric company, 360 meters.
WCAS—Minneapolis, Minn., William Hood Dunwoody Industrial institute, 360 meters.
WCAT—Rapid City, S. D., South Dakota State School of Mines, 240 meters.
WCAU—Philadelphia, Pa., Durham & Co., 286 meters.
WCAV—Little Rock, Ark., J. C. Dice Electric company, 360 meters.
WCAX—Burlington, Vt., University of Belmont, 360 meters.
WCAY—Milwaukee, Wis., Kesselman G'Driscoll company, 261 meters.
WCAZ—Carthage, Ill., Carthage college, 246 meters.
WCBA—Allentown, Pa., 1015 Allen street, Charles W. Heimbach, 280 meters.
WCBB—Greenville, Ohio, K. & K. Radio Supply company (Charles H. Katzenberger) 240 meters.
WCBD—Zion, Ill., Wilbur G. Voliva, 345 meters.
WCE—Minneapolis, Minn., Findley Electric company, 360 meters.
WCK—St. Louis, Mo., Stix, Baer & Fuller Dry Goods company, 360 meters.
WCM—Austin, Texas, University of Texas, 360 meters.
WCX—Detroit, Mich., Detroit Free Press, 517 meters.
WDAD—Lindsborg, Kans., Central Kansas Radio Supply company (Wm. L. Harrison), 360 meters.
WDAE—Tampa, Fla., Tampa Daily Times, 360 meters.
WDAF—Kansas City, Mo., Kansas City Star, 411 meters.
WDAG—Amarillo, Texas, J. Laurance Martin, 360 meters.
WDAH—El Paso, Texas, Trinity Methodist church (South), 360 meters.
WDAI—Syracuse, N. Y., Hughes Radio corporation, 246 meters.
WDAK—Hartford, Conn., The Courant, 261 meters.
WDAL—Jacksonville, Fla., Florida Times-Union, 360 meters.
WDAO—Dallas, Texas, Automotive Electric company, 360 meters.
WDAP—Chicago, Ill., Board of Trade, 360 meters.
WDAR—Philadelphia, Pa., Lit Brothers, 395 meters.
WDAS—Worcester, Mass., 692a Main street, Samuel A. Waite, 360 meters.
WDAU—New Bedford, Mass., Slocum Kilburn, 360 meters.
WDAX—Centerville, Iowa, First National bank, 360 meters.
WDAY—Fargo, N. D., Fargo Radio Service company, 244 meters.
WDBC—Lancaster, Pa., Kirk, Johnson & company, 258 meters.
WDBF—Youngstown, Ohio, 254 West Federal street, Robert G. Phillips, 261 meters.
WDM—Washington, D. C., Church of the Covenant, 360 meters.
WDT—Stapleton, N. Y., Ship Owners Radio Service, 405 meters.
WDZ—Tuscola, Ill., Star Store building, James L. Bush, 278 meters.
WEAA—Flint, Mich., Fallain & Lathrop, 280 meters.
WEAB—Fort Dodge, Iowa, Standard Radio Equipment company, 360 meters.
WEAF—New York, N. Y., American Telephone and Telegraph company, 492 meters.
WEAG—Edgewood, R. I., Nichols-Hineline-Bassett Laboratory, 231 meters.
WEAH—Wichita, Kans., Witchita Board of Trade, 244 meters.
WEAI—Ithaca, N. Y., Cornell university, 286 meters.
WEAJ—Vermilion, S. D., University of South Dakota, 360 meters.
WEAM—North Plainfield, N. J., Borough of North Plainfield (W. Gibson Buttfield), 250 meters.
WEAN—Providence, R. I., Shepard company, 273 meters.
WEAO—Columbus, Ohio, Ohio State University, 360 meters.
WEAP—Mobile, Ala., Mobile Radio company, 360 meters.
WEAR—Baltimore, Md., Baltimore American and News Publishing company, 360 meters.
WEAS—Washington, D. C., Hecht company, 360 meters.
WEAU—Sioux City, Iowa, Davidson Brothers company, 360 meters.
WEAY—Houston, Texas, Iris theater (Will Horowitz Jr.), 360 meters.
WEB—St. Louis, Mo., Benwood company, 360 meters.
WEV—Houston, Texas, Hurlburt-Still Electrical company, 360 meters.
WEW—St. Louis, Mo., St. Louis University, 261 meters.
WFAA—Dallas, Texas, Dallas News and Dallas Journal, 476 meters.
WFAB—Syracuse, N. Y., 802 McBride street, Carl F. Woese, 234 meters.
WFAF—Poughkeepsie, N. Y., H. C. Spratley Radio company, 360 meters.
WFAH—Port Arthur, Texas, Electric Supply company, 360 meters.
WFAJ—Asheville, N. C., Hi-Grade Wireless Instrument company, 360 meters.
WFAM—St. Cloud, Minn., Times Publishing company, 360 meters.
WFAN—Hutchinson, Minn., Hutchinson Electric Service company, 360 meters.
WFAQ—Cameron, Mo., Missouri Wesleyan college, 360 meters.
WFAT—Sioux Falls, S. D., Daily Argus-Leader, 360 meters.
WFAV—Lincoln, Neb., University of Nebraska, department of electrical engineering, 360 meters.
WFI—Philadelphia, Pa., Strawbridge & Clothier, 395 meters.
WGAI—Lancaster, Pa., Lancaster Electric Supply and Construction company, 248 meters.
WGAN—Pensacola, Fla., 216 West Romana street, Cecil E. Lloyd, 360 meters.
WGAQ—Shreveport, La., Glenwood Radio corporation (W. G. Patterson), 360 meters.
WGAR—Fort Smith, Ark., Southwest American, 360 meters.
WGAU—Wooster, Ohio, Radio Manufacturing and Service company (Marcus G. Limb), 226 meters.
WGAW—Altoona, Pa., 1918 West Chestnut street, Ernest C. Albright, 261 meters.
WGAX—Madison, Wis., Northwestern Radio company, 360 meters.
WGAZ—South Bend, Ind., South Bend Tribune, 360 meters.
WGI—Medford Hillside, Mass., American Radio and Research corporation, 360 meters.
WGL—Philadelphia, Pa., 2308 North Broad street, Thomas F. J. Howlett, 360 meters.
WGR—Buffalo, N. Y., Federal Telephone and Telegraph company, 319 meters.
WGV—New Orleans, La., Interstate Electric company, 360 meters.
WGY—Schenectady, N. Y., General Electric

THE CHICAGO EVENING POST TABLOID RADIO SCHEDULES

These stations are those most commonly tuned in evenings by the Chicago broadcast listeners. The time given is central standard. Pacific coast time is two hours earlier than that shown here. Mountain time is one hour earlier, and eastern time one hour later. Evening program schedules only are given. This list was compiled by The Chicago Evening Post Radio Department and is protected by copyright.

STATION	Miles	Met	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Chicago—									
KYW, Comm. Edison Bldg		536		6:30- 9:30	6:30-12:00	6:30- 9:30	6:30- 9:30	6:30-12 m.	6:30- 9:30
WAAF, Union Stock Yards		286	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00		
WMAQ, Hotel La Salle		448		7:00- 9:55	7:00- 9:55	7:00- 9:55	7:00- 9:55	8:00-10:00	
WDAP, Drake Hotel		360		7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	9:15-10:30
WJAZ, Edgewater Beach Hotel		448		10:00-12:30	10:00-12:30	10:00-12:30	10:00-12:30	10:00- 2:00	6:00- 9:00
Suburban—									
WCBD, Zion, Ill	39	345	8:00- 9:00				8:00- 9:00		
WIAB, Rockford, Ill	77	252			8:00- 9:00				
WRM, Urbana, Ill	120	360			8:50- 9:30				
WTAS, Elgin, Ill	37	275			7:30-10:00				
Eastern—									
KDKA, East Pittsburg	430	326	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WBZ, Springfield, Mass	802	337	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	
WEAF, New York City	733	495	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00
WGI, Medford Hillside, Mass	875	360	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	7:30- 9:00
WHAZ, Troy, N. Y	748	380	8:00- 9:30						
WGY, Schnectady, N. Y	698	280	6:45-11:30	6:45- 9:00	6:45- 9:00	6:45- 9:00	6:45-11:30	6:45- 9:00	
WGR, Buffalo	472	319	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	
WJY, New York City	733	405							2:30- 6:00
WJZ, New York City	733	455	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	
WOO, Philadelphia	677	509	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	
WRC, Washington, D. C	612	469	8:00-10:00		8:00-10:00		8:00-10:00		
Midwest—									
WCX, Detroit	245	517	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00		
WJAX, Cleveland	323	390		7:30- 9:30		8:00-10:30			
WLAG, Minneapolis	358	417	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	
WLW, Cincinnati	262	309	8:00-10:00	10:00-12:00	8:00-10:00	10:00-12:00			
WOC, Davenport	105	481	7:00-11:00		7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WTAM, Cleveland	323	300	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30
WWJ, Detroit	245	517	8:30-10:00	8:30-10:00	8:30-10:00	8:30-12 m.	8:30-10:00		
Southern—									
KSD, St. Louis	270	546	8:00-11:00	8:00-11:00	8:00-11:00		8:00-11:00	8:00-11:00	
WBAP, Fort Worth, Texas	855	476	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00		
WDAF, Kansas City, Mo	430	411	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	
WFAA, Dallas, Texas	853	476	6:45- 9:30	6:45- 9:30	6:45- 9:30	6:45- 7:30	6:45- 9:30	6:45- 9:30	9:30-11:00
WGV, New Orleans	858	350	7:00- 8:00		7:00- 8:00			7:00- 8:00	
WHAS, Louisville	271	400			7:30- 9:00				4:00- 5:00
WHB, Kansas City, Mo	430	411		7:00- 9:00		7:00- 9:00	7:00- 9:00		8:00-10:00
WMC, Memphis	480	500		11:00-12:00			11:00-12:00	8:00-10:00	8:00-10:00
WOAI, San Antonio, Texas	1,080	385		9:30-10:30				9:30-10:30	
WOS, Jefferson City, Mo	337	441	8:00- 9:30		8:00- 9:30		8:00- 9:30		
WSB, Atlanta, Ga	605	428	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	7:30- 9:00
Pacific Coast—									
KFDB, San Francisco	1,910	509	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30
KGW, Portland, Ore	1,895	492	1:00-2 a.m.	10:00-11:00	10:00-11:00	10:00 11:00	1:00-2 a.m.	10:00-11:00	9:00-10:00
KHJ, Los Angeles	1,795	395	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	10:00-12:00
KPO, San Francisco	1,910	423	6:30-12 m.	6:30-12 m.		6:30-12 m.		6:30-12 m.	10:30-12 m.

KFIU—Juneau, Alaska, Alaska Electric Light and Power company, 226 meters.
KFIV—Pittsburg, Kan., 706 East 10th street, V. H. Broyles, 240 meters.
KFIX—Independence, Mo., Reorganized Church of Jesus Christ of Latter Day Saints, 240 meters.
KFIY—Seattle, Wash., Brott laboratories, 236 meters.
KFIZ—Fond du Lac, Wis., Daily Commonwealth, 237 meters.
KFJA—Grand Island, Neb., Central Power company, 244 meters.
KFJB—Marshalltown, Iowa, Marshalltown Electrical company, 248 meters.
KFJC—Seattle, Wash., Post Intelligencer, 293 meters.
KFJD—Greeley, Colo., Weld County Printing and Publishing company, 236 meters.
KFJF—Oklahoma City, Okla., National Radio Manufacturing company, 252 meters.
KFJM—Selma, Cal., The Sugar Bowl (H. R. Shaw), 273 meters.
KFJI—Astoria, Oreg., Liberty theater (E. E. Marsh), 252 meters.
KFJJ—Carrollton, Mo., Carrollton Radio shop, 236 meters.
KFJK—Bristow, Okla., Delano Radion and Electric company, 233 meters.
KFJL—Ottumwa, Iowa, Hardsacg Manufacturing company, 242 meters.
KFJM—Grand Forks, N. D., University of North Dakota, 229 meters.
KFJQ—Grand Forks, N. D., Electric Construction company (portable), 252 meters.
KFJR—Stevensville, Mont., Ashley C. Dixon and Son, 256 meters.
KFJV—Dexter, Iowa, Thomas H. Warren, 224 meters.
KFJW—Tewanda, Kan., La Grand Radio company, 226 meters.
KFJX—Cedar Falls, Iowa, State Teachers' college, 229 meters.
KFJY—Fort Dodge, Iowa, Tunwall Radio company, 240 meters.
KFJZ—Fort Worth, Texas, Texas National Guard, 112th Cavalry, 254 meters.
KFKA—Greeley, Colo., Colorado State Teachers' college, 248 meters.
KFKB—Milford, Kas., Brinkley-Jones Hospital association, 286 meters.
KFKH—Lakeside, Colo., Denver Park and Amusement company, 248 meters.
KFKQ—Conway, Ark., Conway Radio laboratories, 224 meters.
KFKV—Butte, Mont., E. F. Gray, 283 meters.
KFKX—Hastings, Neb., Westinghouse Electric and Manufacturing company, 286 meters.
KLX—Oakland, Cal., Tribune Publishing company, 360 meters.
KLZ—Denver, Colo., Reynolds Radio company, 360 meters.
KMJ—Fresno, Cal., San Joaquin Light and Power corporation, 360 meters.
KMO—Tacoma, Wash., Love Electric company, 360 meters.
KNJ—Roswell, New Mexico, Roswell Public Service company, 250 meters.
KNT—Aberdeen, Wash., Grays Harbor Radio company (Walter Hemrich), 263 meters.
KNV—Los Angeles, Cal., Radio Supply company, 360 meters.
KNX—Los Angeles, Cal., Electric Lighting Supply company, 360 meters.
KOB—State College, New Mexico, New Mexico College of Agriculture and Mechanic Arts, 360 meters.
KOP—Detroit, Mich, Detroit Police department, 286 meters.
KPO—San Francisco, Cal., Hale Brothers, 423 meters.
KQL—Berkeley, Cal., University of California, 360 meters.
KQP—Hood River, Ore., Apple City Radio club, 360 meters.
KQV—Pittsburg, Pa., Doubleday-Hill Electric company, 360 meters.
KQW—San Jose, Cal., 467 1st street, Charles D. Herrold, 360 meters.
KRE—Berkeley, Cal., Berkeley Daily Gazette, 278 meters.
KSD—St. Louis, Mo., Post Dispatch (Pulitzer Publishing company), 546 meters.
KSS—Long Beach, Cal., Prest & Dean Radio company and Radio Research Society of Long Beach, Cal., 360 meters.
KTW—Seattle, Wash., First Presbyterian church, 360 meters.
KUO—San Francisco, Cal., Examiner Printing company, 360 meters.
KUS—Los Angeles, Cal., City Dye Works and Laundry company, 360 meters.
KUY—El Monte, Cal., Coast Radio company, 360 meters.
KWG—Stockton, Cal., Portable Wireless Telephone company, 360 meters.
KWH—Los Angeles, Cal., Los Angeles Examiner, 360 meters.
KXD—Modesto, Cal., Modesto Herald Publishing company, 360 meters.
KYQ—Honolulu, Hawaii, Electric Shop, 360 meters.
KYW—Chicago, Ill., Westinghouse Electric and Manufacturing company, 345 meters.
KZM—Oakland, Cal., 13th and Harrison streets, Preston D. Allen, 360 meters.
KZN—Salt Lake City, Utah, The Deseret News, 360 meters.
WABK—Worcester, Mass., First Baptist church, 252 meters.
WABL—Storrs, Conn., Connecticut Agricultural college, 283 meters.
WABM—Saginaw, Mich., F. E. Doherty Automotive and Radio Supply company, 254 meters.
WABN—La Crosse, Wis., Waldo C. Grover, 234 meters.
WABO—Rochester, N. Y., Lake Avenue Baptist church, 252 meters.
WBAA—West Lafayette, Ind., Purdue university, 360 meters.
WBAD—Minneapolis, Minn., Sterling Electric company, 360 meters.
WBAH—Minneapolis, Minn., The Dayton company, 360 meters.
WBAN—Paterson, N. J., Wireless Phone corporation, 244 meters.
WBAO—Decatur, Ill., James Millikin university, 360 meters.
WBAP—Fort Worth, Texas, Wortham-Carter Publishing company (Star-Telegram), 476 meters.
WBAV—Columbus, Ohio, Erner & Hopkins company, 390 meters.
WBAW—Marietta, Ohio, Marietta college, 246 meters.
WBAX—Wilkesbarre, Pa., 66 Gildersleeve street, John H. Stenger Jr., 360 meters.
WBAY—New York, N. Y., Western Electric company, 492 meters.
WBBA—Newark, Ohio, Newark Radio Laboratories, 240 meters.
WBBC—Sterling, Ill., Sterling Radio Equipment company, 229 meters.
WBBD—Reading, Pa., Barbey Battery Service, 234 meters.
WBL—Anthony, Kan., T & H. Radio company, 261 meters.
WBS—Newark, N. J., D. W. May, Inc., 360 meters.
WBT—Charlotte, N. C., Southern Radio corporation, 360 meters.
WBU—Chicago, Ill., City of Chicago, 286 meters.
WBZ—Springfield, Mass., Westinghouse Electric and Manufacturing company, 337 meters.
WCAD—Canton, N. Y., St. Lawrence university, 280 meters.
WCAE—Pittsburg, Pa., Kaufmann & Baer company, 462 meters.
WCAG—New Orleans, La., 2813 Calhoun street, Clyde R. Randall, 268 meters.

Continued on Page 14.

IVERSON C. WELLS
EDITOR

Assisted by a Staff of Regular and Special Contributing Writers.

The RADIO MAGAZINE Section is edited with the view of giving authentic news of the radio broadcasting field and authoritative information on the subjects of home construction of receiving and transmission sets, of the operation and maintenance of apparatus, and as an exchange of opinion for its readers.

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THURSDAY, DECEMBER 13, 1923.

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Opera on Radio for Tonight by KYW

By THE NIGHT PROWLER.

Grand opera is on tonight by KYW. It is the opera "Othello." Muzio is in the stellar role. It ought to be a corking good evening for all who like good music and who doesn't do that, even in these days of jazz?

Haven't heard any reports from you long-distance fellows on last night's PWZ program. That's the Cuban station, you know, whose program we published yesterday. What's the matter? Didn't any of you get it? Expected to have a score of letters from you in today's first mail.

Of course, Cuba is a long piece away. That may account for the delay in getting your reports.

There has been a sort of a lull in you DX-ers, all along the line. Last week we had oceans of reports from fellow-night prowlers. They have been scarce as hen's teeth this week. What's the matter?

How do you expect us fellows here in The Post Radio Magazine section to conduct a DX department, unless you furnish the fuel to keep the steam up at full pressure? Get out your pencil and let's have your loggings. There's a prize offered in the DX department today for the best list of long-distance stations. Look over in that page and take a squint at the chance you have.

Radio Programs

Below are given the complete schedules of all the Chicago and suburban broadcasting stations and those of the out-of-town stations which are most commonly tuned by local radiophans.

These schedules are a regular daily feature in The Chicago Evening Post.

On Thursday of each week a complete list and schedule of every broadcasting station in the United States is published in The Chicago Evening Post's sixteen-page Radio Magazine section.

CHICAGO STATIONS

(Central Time Is Shown.)

KYW—Located in Commonwealth Edison building; 536 meters; Wilson J. Wetherbee, director.

Day—9:30 a. m., news and markets; 10 a. m., market reports; 10:30 a. m., financial news and comment; 10:58 a. m., naval observatory time signals; 11 a. m., market reports; 11:05 a. m., weather report; 11:30 a. m., news and comment of the financial and commercial market; 11:35 a. m., table talk by Mrs. Anna J. Peterson; 12 m., market reports; 12:30 p. m., late market reports; 1:20 p. m., closing market quotations; 2:15 p. m., late financial comment and news bulletin; 2:30 p. m., closing stock quotations, Chicago Stock exchange; 3 p. m., late news and sport bulletin; 4 p. m., late news and sport bulletins; 5 p. m., latest news of the day; 5:30 p. m., late news, financial and final market and sport summary; financial summary furnished by the Union Trust company; 6:50 p. m., children's bedtime story.

Evening—The opera, "Othello," first time this season, with Rosa Raisa and Charles Marshall, Claessens, Rimini, Condr., Panizza. Broadcast from the Auditorium theater over special sealed wire.

WAAF—Located at Union Stock yards; 280 meters.

Day—Live stock reports at 8:40, 10:30, 10:45 a. m., 12:30, 12:45, 3, 4:30 p. m.

WMAQ—Located on Hotel LaSalle; 447.5 meters. Miss Judith C. Waller, station director.

Day—4:30 p. m.: Pupils of Lyceum Arts conservatory.

Evening—7 o'clock: Talk by Herbert Askowith. Talk to Boy Scouts by D. S. Wentworth. Talk on auto trails by Rockwell B. Stephens, auto editor of the Daily News. 8 p. m.: Silent after 8 o'clock account of KYW broadcasting opera.

WJAZ—Located on Edgewater Beach notel; 447.7 meters. E. Warren Howe, program director.

Day—This station has no regular day schedule.

Evening—10 p. m. to 2 a. m.: Musical program: (1) "Zoe" and "My Own;" by Oriole orchestra; (2) "Spirit of Spring" (Cadman) and "Sweet and Low" (Barnby), by Chicago Concert company; (3) "La Donna e'Mobile" ("Rigoletto"), by Floyd Jones; (4) "Deep River," arranged by Fisher (Burleigh) and "As Torrents in Summer" (Elgar), by Chicago Concert company; (5) "Silvery Moon" and "Chansonette," by Oriole orchestra; (6) "Thou Art to Me" (Chadwick), by Kathleen Ryan; (7) "The Singing Lesson" (Squire), by Edith Begley and Frank Bennett; (8) "Faded Love Letters" and "So This Is Venice," by Oriole orchestra; (9) "Spinning Wheel Quartet" from "Martha" (Flotow), by Chicago Concert company; (10) "Slow, Horses, Slow" (Jalowicz), by Frank Bennett; (11) "Dance and Keep Young" and "Sobbing Blues," by Oriole orchestra; (12) "Solenne in Questrata," from "La Forza del Destino" (Verdi), by Frank Bennett and Floyd Jones; (13) "Estudiantina" (Lacome), by Chicago Concert company.

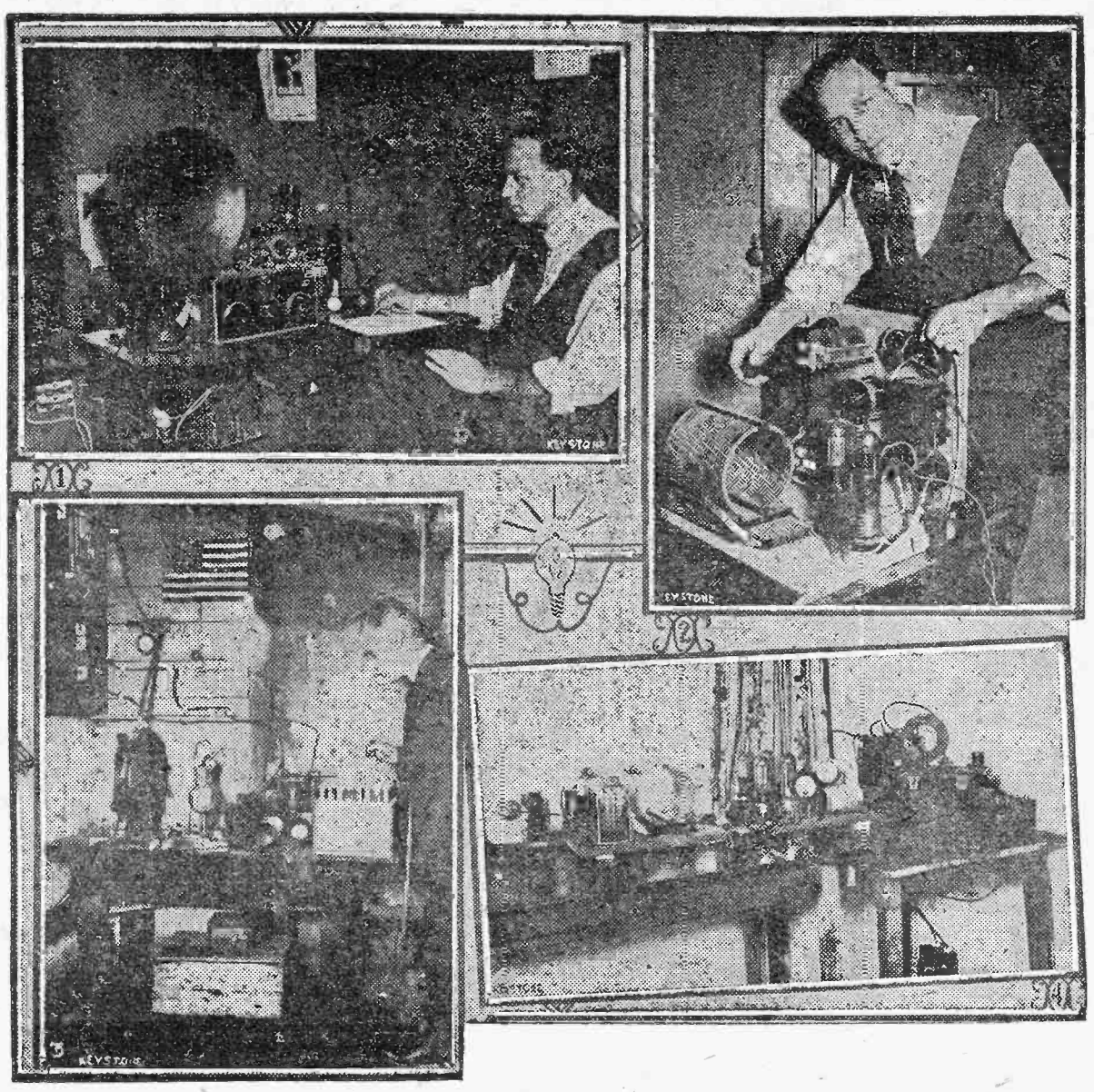

FIG. 1—The latest photo made of John L. Reinartz, the inventor of the Reinartz circuit, at the control table of his station IXAM and IQP, at South Manchester Conn. In the photo are seen his receiver, detector and two audio loud speaker, and at extreme right can be seen his sending key. This is the original and first Reinartz set made, with which he worked station 8AB, Nice, France. He conversed for two hours with the French station, in charge of Leon de Ploy, on a 100-meter wave length. This is the first time in radio history that the continents have been joined by an amateur. FIG. 2—Mr. Reinartz, station IXAM and IQP, Hartford, Conn., at his transmitter, made up of two 50-watt tubes, chemical rectifier, developing 1,800 volts. FIG. 3—An exclusive photo of Hiram Percy Maxim, president of the American Radio Relay league, Hartford, Conn. He is shown in the cellar of his home, station LAW, scraping salts from his chemical rectifier of 120 tubes, which develops 2,500 volts. This is the smallest rectifier of its power in the world. In the center are two 250-watt transmitting tubes (behind each other), while his general hook-up may be seen around the room. He uses a Zenith three-tube receiver for finding wave length, and then a Tuska for selectivity, the two combined bringing extremely good results. FIG. 4—Here is the radio receiving set of F. A. Schnell, member and traffic manager of the American Radio league of Hartford, Conn. He recently received 8AB, Nice, France, a station handled by a friend of his, Leon de Ploy. This station, IMO, has a transmitter consisting of four 50-watt tubes, self-rectified C. W. transmitter, normal wave length of 192 meters, ranging from 60 to 260 meters. Mr. Schnell develops approximately 1,700 volts.

WPAD—formerly on W. A. Wiebold & Co.'s School street and Ashland avenue.

Notice—This station has closed and is being moved to Armour Institute, where it will be operated by the radio department of that institution.

WSAH—Located at 4801 Woodlawn avenue; 248 meters.

WSAX—Located on Chicago Radio laboratory; 268 meters.

SUBURBAN STATIONS

(Central Time Is Shown.)

WCBD—Zion, Ill., 345 meters; J. H. Depew, station manager.

Note—This station broadcasts only on Monday and Friday evenings, Wednesday afternoons and on Sundays.

Regular weekly schedule:

Wednesday—2:30 to 3:45 p. m., sacred solos and duets, and an address either by Wilbur Glenn Voliva, general overseer of the Christian Catholic Apostolic church in Zion, or one of his representatives.

Friday—From 2:30 to 3:45 p. m., sacred solos and duets, and an address either by Wilbur Glenn Voliva, general overseer of the Christian Catholic Apostolic church in Zion, or one of his reresentatives; 8 p. m., concert.

Sunday—9 to 10:45 a. m., Zion orchestra; 2:30 to 5:30 p. m., principal service of the entire week; special music by Zion band, organ (one of the largest in the world), and Zion white-robed choir; address by Wilbur Glenn Voliva, general overseer of the Christian Catholic Apostolic church in Zion.

WCAY—Milwaukee, Wis., 261 meters; no silent nights.

Day—1 p. m. to 4:30 p. m., special concert; novelty and test programs as announced.

Evening—7:30 p. m., regular concert program.

WHAD—Marquette University, Milwaukee, Wis.; 280 meters.

Wednesdays—At 7:30 p. m. only.

WIAB—Rockford, Ill.; 252 meters; Wednesday and Friday evenings.

Evening—8 p. m., musical selections.

WJAN—Peoria, Ill.; 280 meters; daily except Sunday.

Day—9 a. m., live stock market; 9:15 a. m., weather; 11:30 a. m., Chicago, Peoria and St. Louis live stock and grain markets; 1:30 p. m., Chicago and Peoria grain and produce markets; United States agriograms.

Evening—Tuesdays and Thursday, special musical program to be announced by radiophone.

WRM—Urbana, Ill., University of Illinois; 360 meters; 8:50 to 9:30 p. m., lectures and news.

WTAS—Elgin, Ill.; 389 meters.

Evening—7:30 p. m., 12 minutes; mixed program.

FOREIGN STATIONS

CKAC—Montreal, Canada; 430 meters.

Note—This station broadcasts only on Sundays, Tuesdays, Thursdays and Saturdays.

Evening—6 p. m., kiddies' stories; 6:30 p. m. to 8:30, Leo Feist singers and orchestra; 7:30 to 9:30 p. m., classics.

OUT-OF-TOWN STATIONS

Eastern Programs.

(Central Time Is Shown.)

KDKA—East Pittsburg; 326 meters:

Day—8:45 a. m., Union live stock market reports from the National Stockman and Farmer; 10:55 a. m., Arlington time signals; 11 a. m., United States bureau of market reports furnished thru the National Stockman and Farmer; 11:10 a. m., music, weather forecast; 5:15 p. m., organ recital by Lucile Hale from the Cameo Motion Picture theater, Pittsburg, Pa.

Evening—5:15 p. m., dinner concert by the Grand Symphony concert, from the Million-dollar Grand theater, Pittsburg, Pa. 6:30 p. m., "Weekly Chat with the Farmers," by Frank E. Mullen, radio editor of the National Stockman and Farmer. 7:15 p. m., address for the farmers. 7:30 p. m., concert by the KDKA Little Symphony orchestra, Victor Saudek director, assisted by Will A. Rhodes, tenor. Program: Orchestra selections, "The Force of Destiny" (Verdi). a. "Dondo d'Amour" (Westerhent); b. "Love's Dream After the Ball," requested (Czbulka). Suite, "Espagnole" (La Peria-Lacome). "At an Old Trysting Place," for strings ensemble (MacDowell). "The Village Blacksmith" (Puerner). "Scarf Dance" (Chaminade). "March a la Turca" (Mozart). Tenor solos; "Celeste Aida" (Verdi); "La donna e mobile," from "Rigoletto" (Verdi); Ariso "Pagliacci" (Leoncanallo). Group of folksongs (accompanied by orchestra). 10:30 p. m., special late concert.

WBZ—Springfield, Mass.; 337 meters:

Day—10:55 a. m., Arlington time signals; weather reports; Boston and Springfield market reports.

Evening—6:30 p. m., twilight tales for the kiddies; letter from the New England homestead; 7 p. m., concert by Ruth Avery Ray, violinist; Mrs. Elizabeth Nims Hoover, pianist and accompanist. Piano solo, "Scherzo E Major" (Chopin), by Mrs. Hoover; violin solo, "The Son of Pusgta" (Hungarian) (Keler Bela), by Miss Ray; piano solo, "Polonaise" (MacDowell), by Mrs. Hoover; violin solo, "Andante Cantabile," by Miss Ray; piano solo, "March Wind" (MacDowell), by Mrs. Hoover; violin group—(a) "Souvenir" (Drdla), (b) "Espanola" (Hagelle), by Miss Ray; piano solo, "Prelude" (MacDowell) by Mrs. Hoover; violin solo, "Ave Maria" (Schubert-Wilhelmj), by Miss Ray; piano group—Sonata (Beethoven), "Minuet," "Allegro," by Mrs. Hoover; violin group—(a) "Orientale" (Cui), (b) "Menuet" (Popora-Kreisler), by Miss Ray; 8 p. m., bedtime story for grown-ups by Orison S. Marden; 8:55 p. m., Arlington time signals.

WEAF—New York city; 495 meters: 5:30 to 8 p. m., concerts.

WGI—Medford Hillside, Mass.; 360 meters:

Evening—5:10 p. m.: Late news flashes; sports news; Boston American. 6:30 p. m.: Boston police reports, Boston police headquarters. 5:40 p. m.: Code practice lesson No. 187. 6 p. m.: Evening program—1. "Bits of Wisdom," by George Brinton Beal, prominent newspaper man. 2. Bedtime stories for parents, prepared by the Children's Aid association, No. 5, read by Alfred F. Whitman executive secretary. 3. Dr. Tehyi Hsieh (pronounced See), China's foremost statesman, but America's foremost friend, known as the "Teddy Roosevelt of China," because of his forcefulness and his similarity, will give one of his interesting talks on "China." Accompanying him will be a Chinese orchestra.

WHAZ—Troy, N. Y.; 330 meters. This station broadcasts only on Monday evenings.

WGY—Schenectady, N. Y.; 380 meters:

Day—10:55 a. m., time signals; 11:30 a. m., stock market report; 11:40 a. m., produce market report; 11:45 a. m., weather report; 1 p. m., music and address, "What Kind of Literature Do Our Young Folks Read?" Mrs. Hubert Hadlock, Schenectady Federation of Women's organizations.

Evening—5:15 p. m., weekly report on conditions of roads in New York state; 6:45 p. m., program by the publicity department, General Electric company, C. H Lang announcing; march, "United Liberty" (Losey), publicity department orchestra; soprano solos, (a) "Little Boy Blue" (Joyce); (b) "Dreaming" (Keltman), Ethel Thomas, Theodore Schermerhorn accompanist; cello solos, (a) "Romance" (Ondricek), (b) "Danish Song" (Sanby), H M. Mott-Smith; barytone solo, "In Happy Moments," from "Maritana" (Wallace), J. F. Quinlan; orchestra selection, "Prelude" (Kistler), orchestra; address, "The Press, the Screen and Radio," Martin P. Rice; quartet selections, (a) "How Can I Leave Thee" (James), (b) "My Bonnie" (Brown), publicity department male quartet, Walter Reagles, Carl Jester, J. F. Quinlan; A. O. Coggleshall; soprano and barytone duet, "Barcarolle," from "Tales of Hoffman" (Offenbach), Ethel Thomas and J. F. Quinlan; tenor solos, (a) "Inter Nos" (MacFayden), (b) "If Thou Wert Blind" Johnson), Walter Reagles; violin solo, "Chanson Meditation" (Cottenet), Edward Rice; address, "The G-E Girl," Ellen Neilson; orchestra selection, "The Forge in the Forest" (Michaelis), orchestra; clarinet solo, "Long, Long Ago" (Ritter), Peter

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Two-Way Phone in Overseas Test O. K.

HARTFORD, Conn.—While the ether hummed with its usual bedlam of CW notes and broadcast music the night of Nov. 27, two Connecticut amateurs, seated in their private homes, exchanged messages with an amateur in France across 3,500 miles of the Atlantic ocean for two hours and accomplished the goal for which the brass-pounders long have striven—namely, two-way communication between North America and Europe.

F. H. Schnell, traffic manager of the American Radio Relay league, operating his station IMO in Hartford, and John Reinartz, 1XAM of South Manchester, whose tuner circuit is famous in many lands, slid underneath the noisy bands and worked M. Leon Deloy, 8AB, of Nice, France, on a wave length of 100 meters, breaking another world record.

Altho the radio fan has ceased to be surprised at radio transmission which keeps distant countries within a few minutes of each other, he cannot help but marvel at the fact that this feat proves that international private citizen communication is now possible. It represents another rung in the ladder from the time that amateurs in the United States were content to land their station calls in Europe.

Inspires American "Hams."

The two-way contact ushers in a new era when not an American "ham" will be satisfied until he has made friends in France and England with the same ease that he has picked up radio friendships in neighboring states.

Both of the United States amateurs were on the air at the same time straining their transmitters to the limit of power and keeping their ears alert to catch the first word from over the water. However, Schnell won the laurels by a short space, since he was the first to transmit the reply to the French amateur's greeting, "GM OM," which, in the radio man's vernacular, means "Good morning, old man." Reinartz won a technical victory, since he designed and suggested the circuit which was used on all three transoceanic transmitters.

Tests Carefully Planned.

The tests did not start that night, as some have assumed, but were the result of weeks of planning, which began when Deloy made his recent visit to this country to study amateur radio conditions. At this time he and Schnell agreed that they would make a determined effort to transmit both ways from their homes on 100 meters. With many new ideas which he had gathered in his rounds of amateur stations, Deloy went back to Nice vowing that the first two-way communication over the Atlantic would be with a French station at one end.

For two nights previous to the final success Schnell listening on the 100-meter wavelength heard Deloy's signals and on the night before he had copied two complete messages. Even this required careful tuning of both stations and not a little precision as to the exact time when each should be on the air. Receiving a special permit to transmit on a wavelength of 100 meters from the radio inspector of the first district, Schnell was ready finally to test the power of his station and make the much-sought for contact.

Hears Deloy's Call.

He sat down in front of the transmitter and ran his fingers nimbly over the set, tuning it down to the 100-meter wavelength. This was at 9:25, and he listened for fully fifteen minutes before he heard the French amateur's note calling "A1MO (the prefix A being for America) de F8AB, GM, OM, hear messages." No. 3 read:

"Your cable establishing midnight schedule received this morning. I consider it as canceled by your agreement to my message No. 2, sig. F8AB." At 9:38 this message was ended and Deloy sent:

"No. 4 A1MO, tomorrow will not be on at this time, pse listen at 0500 and transmit at 0515, sig. F8AB."

The figures given represent the transmitting time schedule in Greenwich mean time. Not knowing of course whether these messages had been received in the United States, Deloy went on and repeated both of them over a second time, after which he stood by for about ten minutes and repeated them a third time. At ex-

Continued on Next Page

2-Way Phone Oversea O. K. in New Tests

(Continued from Preceding Page.

actly 10:27 he signed off, calling "A1MO, A2BY CQ de FSAB."

At the moment that the lid went off the amateur quiet period for the benefit of broadcasting at 10:30, Schnell threw over his antenna switch and grasped the key to test the result of many months of planning. Thousands of amateurs could understand his emotions.

Two-Way Messages Achieved.

"SAB fu 1MO" clicked out into the air and traveled across to France, where it struck and vibrated at Deloy's receiving antenna at Nice.

"RRR," he went on, "messages received signals QSA." He called and repeated until 10:37, and a moment later the silence broke with:

"A1MO de FSAB rr QRK your signals QSA vy one foot from phones on Grebe. FB OM hearty congratulations."

Two way communication between the continents had been established, but to the great surprise of both operators it was not for a brief second or two, giving them credit for the accomplishment and nothing more, but steady and reliable communication that was continued for two hours.

"This is a fine day," called Deloy joyously, it appeared. "Pse QSL No. 1 and No. 2."

"O. K. FB QSA (meaning signals loud) I have messages. Are you ready to receive them?"

This was 10:50 and the French amateur came back: "Sure; go ahead with message; words twice." As he was signing off, Schnell heard him call AIXAM, the station operated by John Reinartz at South Manchester, Conn., only a few miles away, saying: "Pse QRX until after A1MO."

League Sends Greetings.

"8AB fu IMO" called Schnell and he transmitted message No. 1 from America, addressed to Gen. Ferrie, director of telegraphs for the French government, which was acknowledged at 11:06 and read as follows:

"America greets you for the first time by amateur radio across the ocean on 100 meters." The message was signed A. R. R. L.

By this time Kenneth B. Warner, secretary of the A. R. R. L. and joint owner of IMO, had come in at Schnell's request and the latter told Deloy that KBW wanted to talk with him. Warner took the key and talked with the French amateur for several minutes, then he sent a formal message, No. 2, addressed to Dr. Corret of France.

Transmission Not "Spotty."

It was considered remarkable that the transmission was not fleeting and "spotty," as might be supposed with the first two-way code "talks" across the ocean, but wholly reliable as tho the two stations engaged in the tests were not more than a few blocks away. In fact, Schnell and Warner both were amazed at the consistency with which the conversations were being carried on, and they believed it gave every indication that two-way amateur radio talks would not only become a common thing in a very short time, but that operators on either continent could maintain very satisfactory communication.

No one was more astonished by the result than Schnell, who had been working with Deloy for weeks to make this hour possible. Highly enthusiastic, he was determined to carry on the conversation as long as he could. With visions of a great amateur radio "loop" by which messages might be sent from France to Hartford, Catalina island on the Pacific coast and finally over the Canadian mountains to the MacMillan arctic expedition at Refuge Harbor, Greenland, he grasped the key once more and asked Deloy to send a message to WNP. F8AB promptly complied with this request, but IMO's operator failed to copy two words of the North Pole radio message.

Arranges New Schedule.

Deloy then called IXAM and asked for his location as apparently he did not know, or had forgotten it was Reinartz's station. Then Schnell stood by for a few minutes while IXAM worked the French amateur.

At 12:22 Schnell sent Deloy's' call, signing his own, and when he had received an acknowledgment he said that he had missed part of the last message and asked whether he could get it from IXAM or if Deloy would repeat the text of the message again. F8AB repeated as requested, and apparently he was having trouble, for he added quickly "QSL k" and finished at 12:35 a. m., after making a schedule for the next night.

Static Interference

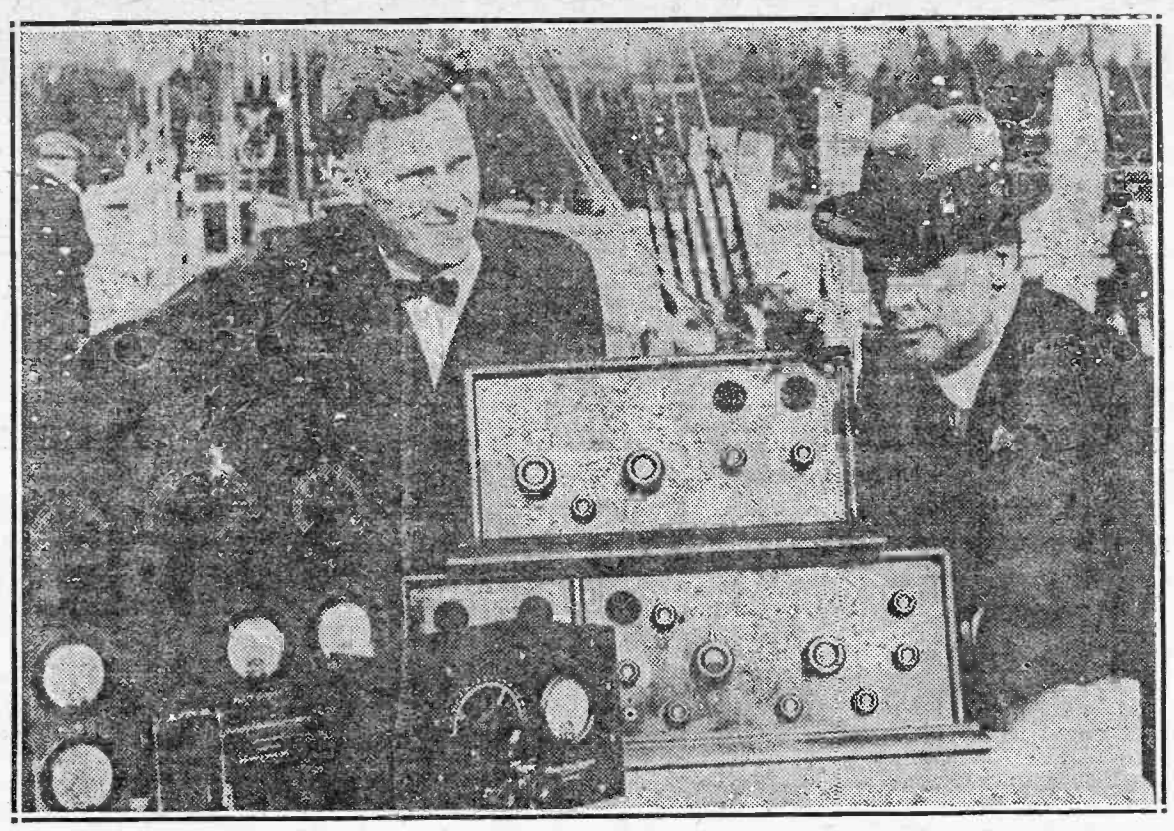
A great deal of interference is caused by static. This may be determined by disconnecting the antenna and ground. If static is the cause the noise will have disappeared. Poorly constructed grid leaks or a defective "B" battery will give almost the identical sound of static.

Hooking Up a Set

In mounting and wiring a set from a diagram check off each lead with a colored pencil, tracing the same as you proceed with the pencil. This prevents mistakes.

Keep Wires Apart

It is very important that all wiring, especially in the radio-frequency circuit, be kept as far apart as possible —at least three inches. Do not run any wires parallel.



KEEPING IN TOUCH WITH THE WORLD—Left to right, Donald Mix and Dr. Donald B. MacMillan, with their radio apparatus, on board the little ship taking them poleward. Donald Mix is an expert radio engineer, and when the ship reached its winter quarters at Refuge harbor, 750 miles from the north pole, he began to get in regular touch with "home." In addition to messages to Capt. MacMillan's secretary in Boston, Mix has been able to tune in many of the big broadcasting stations and receive music, speeches and other radio events regularly. Dr. MacMillan is shown here with his Zenith receivers, with which he brings in all the news of the outside world.

Characteristics of Tubes

ALL vacuum tubes are not identical nor are they interchangeable. They may look alike to most people, especially if they are of the same size and kind, but there may be slight differences in the internal dimensions and degree of vacuum or gas contents which are not apparent upon close examination.

First there is the dry cell tube classed as the WD-11 and 12, followed by the three-volt tube called the UV-199 or C-299. Among the tubes referred to as six-volt tubes are the UV-200 or C-300 and the UV-201-A or C-301-A. Many radio fans believe that the dry cell tubes are as good as the storage battery tubes. Is there any theory in this?

Quality Makes Up for Size.

For an experiment take the UV-199 tube. Every one knows who has used this tube that its elements are smaller than those in the larger tubes, therefore it cannot be expected that the output from such tubes can be equal. Its filament, supported between two uprights, is short compared to that of the larger storage battery tubes. What is lacking in its filament is made up in efficiency by the materials employed in its construction.

For its filament the UV-199 tube employs thoriated tungsten, which gives off a maximum amount of energy applied to its filament.

This tube is a good radio-frequency tube. If one looks at the bottom of this tube it will be seen that the studs are short compared to other tubes on the market. This is an important factor, especially for radio-frequency amplification, since it eliminates a great amount of capacity. Then, too, the grid and plate studs are not adjacent, as in other tubes, but are opposite each other. This feature tends to reduce capacity effect between them.

Makes Good RF Tube.

The UV-199 tube is satisfactory for audio-frequency amplication, but it will not give an output comparable with UV-201-A or other six-volt tubes. If, however, sufficient precautions are taken enough volume can be had from the UV-199 or C-299 to operate a loud talker.

Another type of tube is the WD-11 or the WD-12. The WD-12 tube, with prongs not quite as short as the UV-199, constitutes a good radio-frequency amplifier, but when used as an audio-frequency amplifier it is well to add a C-battery in the second stage.

When using dry cell tubes in combination with other tubes care must be taken to get the proper filament voltage on the tube. It is not advisable to employ a dry cell tube as a R. F. tube, a UV-199 as a detector and two six-volt tubes as amplifiers all drawing voltage from the one battery. Unless the beginner be conversant with the requirements of all the tubes it is best to use the same type thruout the set.

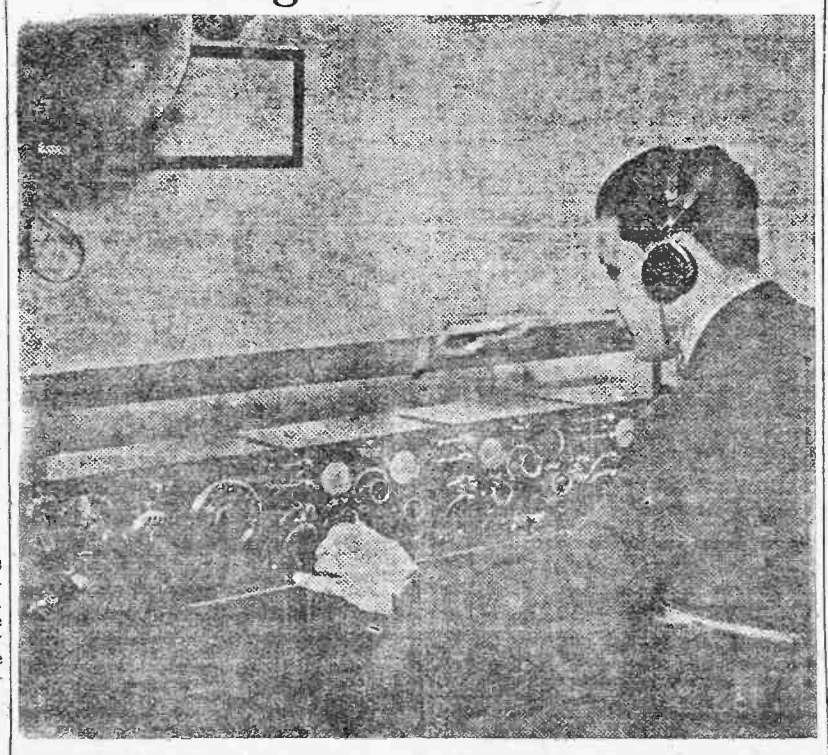
Soft Tubes Best Detectors.

The best tube for a detector is classed as a soft tube and requires a critical adjustment on both A and B batteries. Tubes of this type are extremely sensitive. The variation of the filament current is accomplished by means of a variable resistance or rheostat placed in series with the filament lighting battery.

The majority of vacuum tube detectors operate best on B batteries between sixteen and twenty-two volts.

Amplifier tubes look like detector tubes and cannot easily be distinguished except by examining their electrical characteristics. Amplifiers are not critical in adjustment when compared with the detector tubes. They will operate successfully on voltages of 45 to 100. Where a detector tube together with two stages of amplification are used three or four twenty-two-bolt B batteries may be connected together in series. Where extremely loud signals are desired the plate voltage may be raised to 100 volts without damaging the tubes. However, the use of such high voltages increases tube noises and is therefore not to be recommended.

Hears English Voice in Buffalo



One of the very first and among the few who were lucky enough to hear the English radiophones in the trans-Atlantic tests just concluded, was Armand Weill, 266 Ashland avenue, Buffalo, N. Y. He has written for confirmation of the signals which he so distinctly heard. Mr. Weill says:

"At about 10 o'clock on Sunday night I was tuning my radio audio-amplifier receiver between 360 and 400 meters and listening for unfamiliar signals, without much success, until about 10:18 p. m., at which time I heard music—rather weak, but the tune was recognizable. It sounded very much like either an orchestra or a large organ, and while the static and other interfering noises made close identification of the type of music rather difficult, when the music ceased I could hear most distinctly the announcement, '51T Birmingham' repeated five times."

His receiving these signals is extraordinary because he uses for an aerial a few wires strung in the attic.

MacMillan Offers U. S. Radio Aid

Radio may perform an important part in shaping the course of the proposed arctic expedition of the United States navy, as a consequence of an offer of assistance from the expedition of Dr. Donald B. MacMillan, now icebound in the far north, according to E. F. McDonald Jr., president of the National Association of Broadcasters.

Dr. MacMillan, Mr. McDonald has informed Admiral Moffett, director of naval aeronautics, has offered the navy explorers the benefit of his experience, thru radio communication. Both the MacMillan expedition and the Shenandoah, giant dirigible in which the navy party expects to visit the north, are equipped with radio sending and receiving facilities.

Communication has been had with the MacMillan expedition by wireless telegraph, Mr. McDonald said, with the result that he has agreed to give what helpful information he can to the navy.

The fact that stations in this country are able to keep in touch with the MacMillan ship, altho it is now on the other side of the globe, shows the effectiveness of radio, the statement of Mr. McDonald said.

As to Ground Resistance.

Receiving stations located near water or good moist or grassy grounds have a lower ground resistance than stations located on sandy or rocky ground.

Phone Condensers.

Sometimes a smaller sized condenser placed across the phone terminals will cure the "muffled" effect in reception. A capacity of .001 to .002 is most commonly employed.

This Broadcasting Station Is One of the Most Powerful in all the Land

THE broadcasting station selected this week for illustration is WJAZ (Chicago), which is very much in the public eye just now. It fills the eye and the mind and the ears, too, for that matter, of Chicagoans because it is such a powerful station that only a small percentage of receiver sets can tune it out and pull in other stations while it is on the air. It is in the public eye, ear and mind of the great outside world for the very reason that makes it a subject of much adverse comment locally—because it can be heard anywhere and everywhere, when other stations refuse to "come in."—The Editor.

PERHAPS one of the most abused and most praised radio broadcasting stations for many miles around is WJAZ, the Zenith-Edgewater Beach station, Chicago. It is abused thru ignorance and praised thru intelligence.

The abuse comes from those who live on the north side of Chicago, and whose receiving sets are not sufficiently selective to unscramble themselves from the tangled net of the incoming signals from this station, which, figuratively speaking, and from the viewpoint of its critics, spreads over the entire world like a dark, sinister plague.

The praise comes from those whose sets are sufficiently sensitive to pick out whatever and whichever station they may elect to pick, whether they be local or foreign.

From all of which one would draw the conclusion that WJAZ is some powerful station. And it is.

WJAZ is heard the land over, as well as in Chicago. There is no question about Chicagoans being in a position to hear it. Most of them do so without choice or design. Judging from the communications Station Manager George B. Smith receives from every nook and corner of these United States of America, and all of its neighboring borderlands, including even Dr. MacMillan in far-away Arctic zone, the whole world listens in on WJAZ.

Heard Across the Seas.

WJAZ is a powerful station—one of the most powerful of the popular broadcasting stations in the world. It has been heard across the seas. It has been heard in the South Americas. It has been heard wherever good receiving sets are located, it would seem.

The great amount of energy it radiates seems to paralyze receiving sets almost all over Chicago. Unless these are scientifically built and of a type that is selective it is useless for them to try to "get away from it."

It is customary for Chicago radiophans, when they are operating their sets, to say along about 10 p. m., "Well, here comes WJAZ!" Then they either sit back resignedly and listen to the program or hang up the receiver or turn off the loud speaker, knowing that "It is all off for the night."

WDAP, the other north side station, located on the Drake hotel, once held the laurel wreath for being the great smotherer, but had to retire in favor of WJAZ when that station came on the air along about a year ago. Old timers now smile when they think how they used to "cuss" WDAP. Its output, so far as the effect it has on local near-by receivers is concerned, is an infant in force alongside of WJAZ.

Wonder Studio Ascribed.

This article is not a treatise on how to tune out WJAZ. Neither is it a scientific discussion on how WJAZ can please everyone by lowering its potential without jeopardizing its broadcasting range. Both of these subjects are to be left for some o better versed to handle them.

What is proposed here is to t the readers of The Post Radio Mag zine section something about this won der station and something about the wonderful folks that make it a won der station. This laudable ambition comes from the great popular interest in WJAZ.

WJAZ is owned and operated by the Zenith Radio Manufacturing company, makers of "Zenith" receiving and transmitting apparatus. It is located in the Edgewater Beach hotel, some eight or nine miles north of Chicago's loop district, and on the shore of Lake Michigan.

The location is ideal. There is no mass of steel or mountains of absorbing iron which the downtown skyscrapers present to the other Chicago broadcasting stations, and from whose energy-robbing grasp they must struggle to escape.

No expense or labor was spared in equipment or installation of this equipment. President McDonald of the Zenith company saw to this.

The studio is located in a specially built-in room—a compartment on the first or main floor of the hotel. It is walled in by glass, and because of this feature has been named the "Crystal Studio." This idea was a novel one. It gave the public an opportunity to see and hear, and yet not be heard.

Look Thru Sound Shields.

Every movement of the artists and participants in the programs can be seen thru this sound-proof shield. Visitors get full opportunity of "seeing the scenes behind the stage." Special receiving apparatus and loud speakers enable these same visitors to enjoy the programs while watching the artists.

And yet the artists are not disturbed by applause or comment, as they are in the usual studio. Inside the crystal room, with every provision made to exclude outside sound, absolute quietness reigns, except when some one is before the microphone and music or voice pours forth to be sent upon the ethereal waves to the outside world.

The walls and ceiling of the studio are finished with beautiful heavy drapes of red velvet, which, with the indirect lighting system and wealth of color combinations hidden behind the billowed ceiling, gives the room an atmosphere of refinement and dignity.

The microphones are cleverly concealed from the view of the performing artists thereby lessening the consciousness that they are singing or playing "into" an instrument of cold steel.

A wall of heavy triple plate glass separates the studio from the operating-room from which the entire operation of the station and studio are controlled. This enables the operator at all times to be aware of the position of the artist performing, insuring the maximum in perfection for the listeners.

The transmitter, located 500 feet north of the studio, is under direct control of the operator by means of an intercommunicating system. A standard Zenith radio receiving set is used to listen in so that the various selections may be heard just as the distant listener hears them.

Tests Prove WJAZ Can Be Tuned Out.

This receiver is very selective, and it is possible to listen in on any other station while WJAZ is in operation. A practical demonstration of this to the audience of WJAZ was recently made, when the signals from KYW were "tuned in" while grand opera was being broadcast by the latter station.

The signals were passed on into the amplifiers of the transmitter by means of a suitable transformer and then rebroadcast on a wave length of 448 meters from the WJAZ transmitter. Telegrams from various parts of the United States were immediately received confirming the strength and clarity of the retransmitted signals.

To the left of the receiver, shown in the illustration on this page, in the same cabinet, is the control panel, where connections are made with the various microphones, and the transmitter amplifier. It is here, also, where the receiver is connected to the transmitter for rebroadcasting. On the next desk immediately to the left of the control panel is the line amplifier, where the output of the microphones or the receiver is amplified several thousand times before it enters the line to the powerful transmitting station to be radiated into space by the 130-foot antenna which is supported by two well-insulated masts.

In the center of the amplifier is the special indicator meter which indicates the strength of the sound entering the microphone. Whenever the strength is below or exceeds a certain value, compensation is made by means of the two controls also located on this panel.

Broadcasts Only in Evenings.

WJAZ broadcasts every evening except Monday, which is "silent" night in Chicago. No day programs are rendered, nor is a day schedule of any sort followed, unless some special occasion warrants.

The evening programs, except for Sundays, begin at 10 o'clock and continue until as late as 2 a. m., especially on Saturdays. These consist of popular dance music, popular songs and instrumental pieces. On Sundays there is an earlier evening program of classic and semiclassic music. These are called the "Artists' programs."

The programs are arranged to give the greatest possible variety of music. From the Marine dining-room are broadcast the popular and jazz music played by the Oriole orchestra, one of the smoothest-playing dance orchestras in the country, headed by Dan Russo and Ted Fiorito. The classics, semiclassics and the ballad type of music are "put on the air" from the Crystal studio, using only the best artists available.

Honor De Forest for Discovery of Audion Tube

The many honors that have been visited upon Dr. Lee de Forest on account of his invention of the three electrode vacuum tube—or audion, as he prefers to call it—was added to Wednesday evening when he was presented with the 1922 medal of honor awarded by the Institute of Radio Engineers.

The presentation speech was made by Gen. George O. Squier. The ceremony took place at the Engineering societies in New York.

Dr. de Forest called his invention the audion after the Latin word "audio," to hear, and the Greek word "ion," meaning wanderer, thus suggesting tiny carriers of the electrical current passing at an enormous speed between the electrodes of the lamp.

The audion has been deemed by many scientific historians to be the greatest contribution to a great scientific era. It has revolutionized communication: it made possible long distance telephony and is the basis on which the entire art of radio broadcast and reception rests.

Big Antenna at Koko Head

A new radio antenna system, six and one-half miles long, with the object of protecting messages from interference, and to maintain them in absolute secrecy, has just been installed by the Radio Corporation of America at Koko Head. The antennae are strung in a direct mathematical line with the company's station near San Francisco, and will receive signals on a wavelength of approximately 12,000 meters.

How to Construct a Push-and-Pull Transformer from Ordinary Apparatus

THIS is the second of a series of articles on "push and pull," or, power amplification, begun last week by Mr. Freund. The first article gave the theory of this means of amplification. Today's article gives the application of this theory. —The Editor.

BENJAMIN E. FREUND.

By BENJAMIN E. FREUND.
(Radio Construction Engineer.)

In last week's article I endeavored to explain, in a non-technical manner, the theory of the push-and-pull amplifier and how it differed from the standard amplification hook-up generally used in its method of intensifying signals.

As different type transformers are necessary I will deal in this article with the construction of push-and-pull transformers and the use of the ordinary variety.

An ordinary transformer has four terminals. Two are the ends of the primary winding. The other two are the secondary terminals.

In the push-pull circuit we find there is a difference in the input transformer. The secondary has three terminals in place of two. This third terminal is a tap from the center of the winding.

How to Use Standard Devices.

Now, if we take two ordinary transformers and connect their secondaries in series and a lead is taken from the wire which joins the secondaries, we have a tap which is midpoint of the combined transformers. This is shown in Figure 1 where the grid terminal of transformer No. 1 is connected to the terminal marked "Neg. Fil." on transformer No. 2. The terminal marked F-1 is the tap. We now find that in combining these two transformers in this manner we have three terminals. This was our aim.

By connecting the three terminals, G-1, F-1 and G-2, respectively, to terminals G-1, F-1 and G-2 of Figure "A", we have the secondary of the input transformer complete.

Now we have left four terminals of the primaries. We need only two. We must use both primaries, for if we should neglect to use the primary, the secondary of that transformer will not receive transference of energy and thus the tube to which that particular secondary was connected will be rendered lifeless.

Energizing the Primaries.

In order to have the secondaries of both transformers induce energy from the primaries we must use, or energize, the primaries. This is accomplished by connecting the primaries as illustrated in Figures 1 and 2.

The terminals marked "Pos. B" are joined together and those marked "Plate" are connected. A lead is taken from each of these connections and joined respectively from "Pos. B" terminals of transformers to "Pos. B" common terminal, and plate terminal of transformers to plate lead of the common terminal marked "Plate."

These two terminals marked "Plate" and "Pos. B" form the primary connection of the input transformer and are connected to the plate and "Pos. B" battery of the output of the preceding tube.

This means of connecting the primaries is called "connecting in parallel." It differs from the method in which the secondaries are joined, "connecting in series." By connecting the terminals in parallel the energy which enters the input is divided, half going thru transformer No. 1 and half thru transformer No. 2. This division of energy allows the input of the divided push-and-pull transformer to carry double the power for which it is designed.

Explains Meaning of Terms.

By this it is meant that if the primaries can stand the energy delivered from a potential of 100 volts in series or connection alone, then by connecting two windings in parallel it is possible to vary twice the amount of energy because it is divided in two, half going thru each transformer.

This word "potential" is another term for voltage and is often used. It is my aim to gradually familiarize my reader with technical terms so that a partial education may be derived from the contents of these articles which will detail mostly construction hints.

The word "voltage" or "potential" is the name that has been applied to the unit of pressure as realized in electrical terms. For example, if the power of a tube is five watts at a pressure of 100 volts, the current flowing would be .05 of an ampere. By this little example it can be seen easily that the ampere is the unit of current; the volt is the unit of pressure, and the product of both give you the unit of power which is a watt.

By "the product of both" it is meant that the current multiplied by the voltage applied will give the power of elecrical unit of power. There are 746 watts to one horsepower. This information will enable the reader to understand just how much power there is delivered from a radio set.

The Best Arrangement.

Now to return to our subject:

With a transformer of very low ratio, the arrangement shown in Figure 1 was found to work best. On transformers of higher ratio it was found that the arrangement illustrated in Figure 2 was better. In Figure 2 you will notice the difference existing lies in the fact that the primaries have been connected in series and the two end terminals used for connection to the output of the preceding tube.

The reason the higher ratio transformer works best when connected in series is apparent. When the primaries of the transformers are connected in series the turns ratio from primary to secondary has been doubled.

That is, if the primary of each transformer had a ratio from secondary to primary of 3½ turns of wire to 1, the ratio of the combined input push-and-pull unit, as illustrated in Figure 1, would be 7 to 1 because the primaries were connected in parallel, thus leaving the same amount of turns while the secondaries were connected in series which doubled the amount of turns of the unit as a whole.

Now, if the 10 to 1 transformers were connected in parallel the ratio of the combined transformers as a push-and-pull input unit would be 20 to 1. This ratio would be too high for the tubes as designed and on the market at present, and would cause great distortion. In the experiments made by the writer it was found that the lower ratio transformer produced clearer results without any noticeable loss of volume. The arrangement as shown in Figure 2 was found to work exceptionally well on low ratio transformers.

Making An Output Transformer.

Now, that I have explained the different methods of connecting to make an input transformer for the push-pull amplifier, we will turn our attention to the arrangements necessary to form an output transformer as illustrated in both Figures 3 and 4.

It will be noticed that the secondaries were connected in series and a center tap to form the primary of the output transformer. It may also be noticed that in both Figures 1 and 2 the secondaries of the transformers were connected alike and formed the secondary of the input transformer. In Figures 3 and 4 the secondaries also were connected in like manner, forming the primary of the output transformer. The three leads, P-6, B-1 and P-2, comprising the terminals of the primary, were connected to P-1, B-1 and P-2 of Figure "A".

The primaries of the individual transformers were connected as shown in both Figures 3 and 4, as the secondary of the output transformer depends upon the transformer characteristic. It was found in some instances that if the use of the conditions were reversed, as shown in Figure 3, a noticeable improvement resulted.

Low Ratio Works Best.

By "being reversed" I mean that terminals L-1 as shown by dotted line and L-2 were used as the primary of the output transformer and were connected to terminals P-1, B-1 and P-2, respectively. In this case P-1 and P-2 of Figure 3 form the secondary of the output transformer and are to be connected to the loud speaker or whatever may be used. It was also found that low ratio transformers worked better in conjunction as output transformers as shown in Figures 3 and 4.

The push-pull amplifier is primarily designed for power tubes such as the VT-2, 216-A C-302 or UV-202. It was found to work as well on 6-301-A or UV-201-A. The UV-199 or 6-299 were found to work well in conjunction with a two-tap audio-frequency amplifier, which was using either UV-199 or 6-299 tube. The same results were attained when WD-12 or C-12 tubes were used tho the writer does not indorse the use of such low power tubes for a push-pull circuit.

On the various tubes the full amount of plate voltage was used for best results. On the UV-209-A or C-301-A as high as 150 volts were used with excellent results. On the VT-2 higher plate voltage up to 290 volts was used with enormous volume.

Bias Battery Necessary.

When high voltage is used a "C" or bias battery must be used in the grid return circuit with the negative lead connecting with the grid return and the positive connected to the negative of the "A" or filament lighting battery, as shown in Figure "A".

This is essential to give the grid the potential that is necessary to keep the grid biased perfectly in relation to the plate and the potential being applied to it.

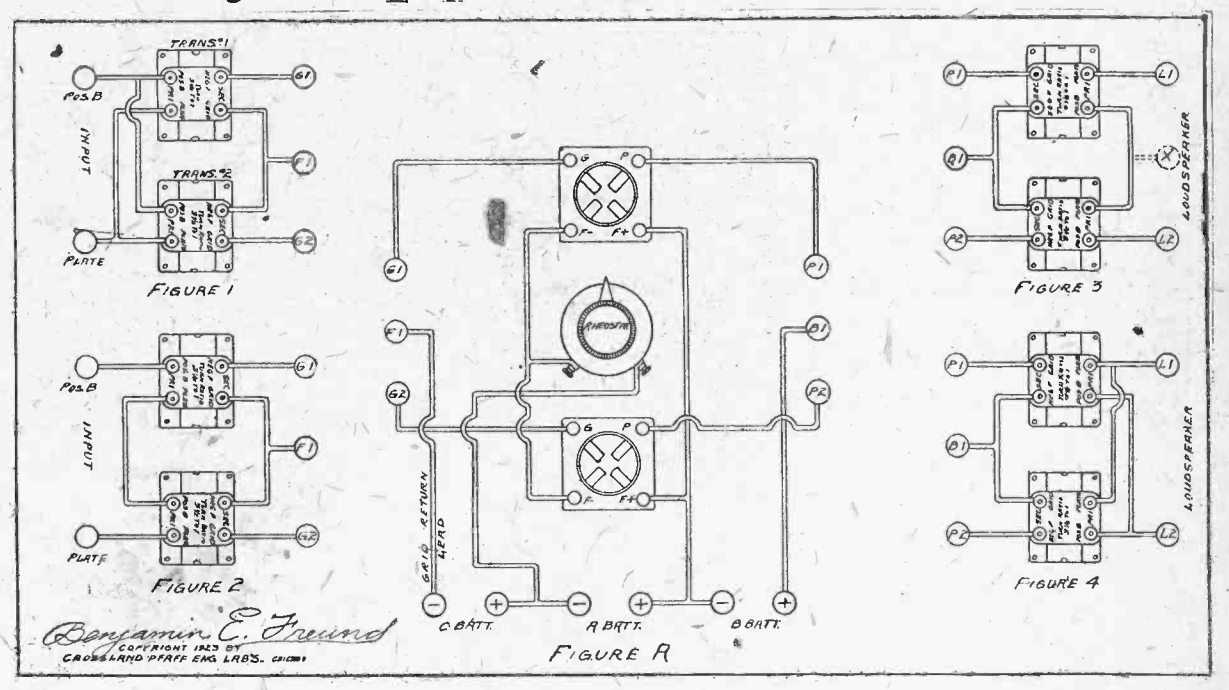
A power rheostat is recommended for controlling the filaments of the tubes. As both tubes are controlled by a single rheostat this absolutely is essential if VT-2 or 216-A tubes are to be used. The standard 6-ohm rheostat can be used. As a power rheostat is a difficult thing to obtain in most radio supply stores the writer found the Carter 6-ohm rheostat to carry the load nicely with either C-301-A and UV-201-A or the VT-2 and 216-A tubes without overheating in the least.

From 3 to 35 volts were used as a "C" or bias battery in a comparative rise using from 60 to 290 volts on the plate or from the "B" battery.

Assembled Set to Be Shown.

The form layout or details of assembling the various parts of the circuit is left to the reader, as he generally likes to match it in appearance with his other receiving and amplifying units. It was for this reason that only the wiring of the various parts was illustrated.

However, next week's article will give complete data on the construction of a push-pull amplifier using a conventional size panel and regular push-pull transformers which are on the market and are especialy designed for push-pull circuits. Photographs of a completely built amplifier with working drawings in detail for drilling the panel and arrangement of apparatus will be shown.



Sketches showing various combinations of push-and-pull, or power transformers, used in amplification of audio-frequency.

Marconi to Test Radio Projecting

Sig. Marconi announces that within the next few weeks he plans to begin tests between London and New York of his system of projecting radio waves in a desired direction.

In these new experiments with radio-activity the inventor is applying to radio waves the principle that man applied to light beams when first he put a reflector in his lamps and lanterns to prevent the rays spreading in all directions and to concentrate them in the line desired.

"You see that lamp there," said Signor Marconi, pointing to the electric light over the desk in his office in the Strand. "Its light rays spread all over the room in every direction, but if you put a reflector behind it the rays shoot out in only one direction. That's what we are doing with radio rays. Our experiment is putting a reflector behind them. Heretofore we have been unable to keep radio rays from going thru a reflector, but now we finally have got a sort of screen which stops them."

The phrase, "sort of screen," was as far as the inventor would go in describing his new appliance, which is erected behind and at the sides of the wireless-sending apparatus. So far, he said, he had been able to keep the waves within a radius of two or three degrees dissemination, instead of the usual 360 degrees.

Under the new system the radio rays would spread but slightly from their point of origin. Thus, if London was sending to New York, stations in Connecticut would perhaps be able to listen in, but, in the words of Signor Marconi, "Spain couldn't nor could Sweden."

Less power will be required to send radio waves in one direction, and, therefore, transmission costs will be lessened.

Signor Marconi said he contemplated making a trip to the United States during the winter.

Radio Enlightens Town

Residents of McCall, Idaho, are among the most enthusiastic boosters in America. The town is four days from a railroad and receives mail but once every six weeks. Radio is depended upon almost exclusively for contact with the outside world.

Gives Radio Kiddies Party

Mrs. Peterson, who broadcasts the recipes and home service hints daily over KYW, is holding a radio Christmas party, Saturday afternoon from 2 to 4 for radiophans, and especially radiophans' kiddies at the home service headquarters in the Peoples Gas, Light and Coke company, 112 South Michigan avenue. It is promised that none of the kiddies will regret having been there.

Loading Coils

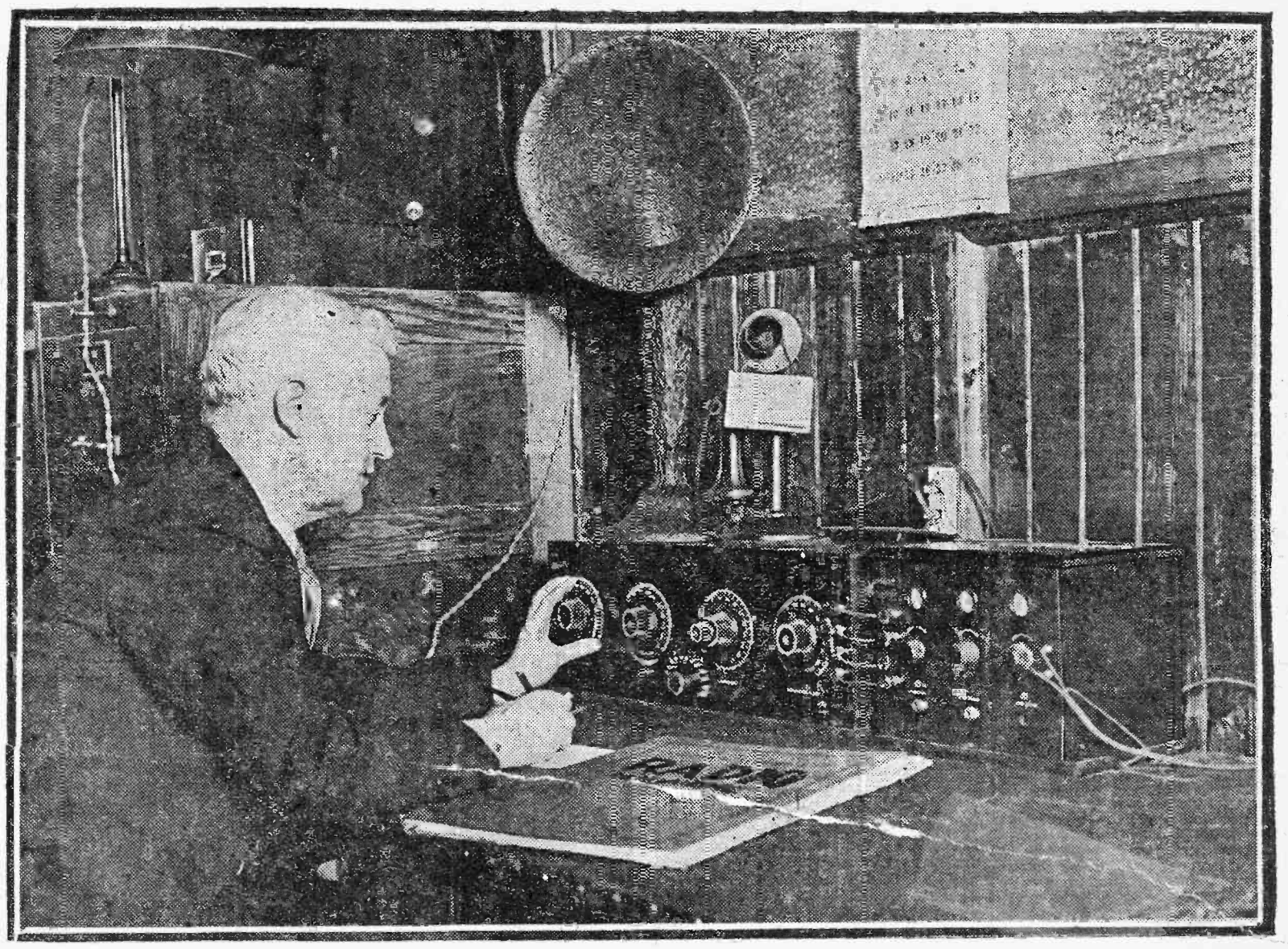
In the Paragon circuit or any of the Armstrong three-circuit regenerative circuits, of which the Paragon is a type, a loading coil may be inserted in both the primary and secondary circuits to raise the natural wave length of the set. These coils can be cut in and out by a switch located on the panel. Two 35-turn honeycomb or plain coils will serve.

One-Stage Radio

One stage of radio-frequency amplification is not sufficient in its results to warrant its expense or trouble.

This Is "Old Reliable," Which Ye Editor Uses as His Personal Receiving Set

NUMEROUS requests have been made by readers for the hook-up of the personal set of the editor. Since the editor probably had a dozen or more circuits in use the last week and since these same dozen or more were preceded by almost as varied an assortment and variety the week previous and no one week finds him working with exactly the same combination, the task is rather a difficult one. However, the circuit which might be termed the one personal set of the editor is given on this page, and with it some observations.



This is the editor's personal set, just as it appears on his laboratory table. It isn't a beauty set by any means, because the cabinets are mismated and bear marks of many a night's battle. However, the boxes house precision parts which deliver the goods under the most exacting conditions. This is a good chance to get acquainted with the editor, because he was prevailed upon to pose for this picture.

By IVERSON C. WELLS.
Radio Editor, The Post.

THE Armstrong three-circuit regenerative circuit, in my opinion, is the most dependable, all-the-year-round, summer or winter circuit for the broadcast listener. Circuits and modifications of circuits may come and may go, but the "Old Reliable" weathers all the storms and is doing business at the same old stand when the clouds roll by.

When you want to sit back in your big Morris chair, light the old jimmie pipe, stretch your legs up among the gentle folds of the lace curtains and turn on the juice for an evening of genuine pleasure, the "Old Reliable" is the boy to use.

I have hooked up practically all of the standard circuits, from the simple nonregenerative and single-circuit regenerative, thru the various forms of the audion, supers and super-supers, with the variations of radio-frequency, reflexes and come-backs and kick-backs. They all have their good points.

The three-circuit regenerative, employing three tubes and with a forty-three-plate vernier variable condenser in the grid circuit instead of the usual variometer, is my favorite. For a little better control of the aerial circuit I tip in another forty-three plate variable condenser in series with the antenna.

If precision parts are used thruout, the set is selective, covers a wide range—farther than most of the five-tubers, and, what is more to my satisfaction, performs one night as well as the next.

There are circuits that are more spectacular in their performance. However, you cannot count on them. Your set may be working fine for a week and you invite in a company of friends to hear you "bring in Cuba or California" and the darn thing fails you utterly.

With the "Old Reliable" you don't have to offer alibis. You know just what you can expect, promise and get.

It is this dependability that makes the circuit such a pleasure to have around the house.

I am showing on this page today a picture of my own set—the one that occupies a favorite place on my laboratory table. It remains there day in and day out. Next week I will tell you of some of its performances and will give you a few details on construction, because there are a few kinks in the way I use the circuit which greatly improve it over the usual hook-up.

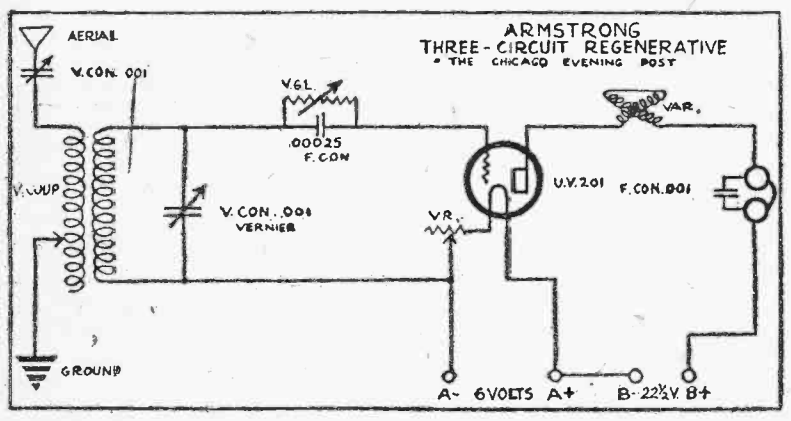


FIG. 1—This is the Armstrong standard three-circuit tickler feed-back circuit, employing a forty-three plate variable condenser shunted across the inductance (varicoupler) instead of the usual variometer in the grid circuit. The variable condenser in the antenna circuit increases the sharpness of the tuning and improves the control of the wavelength of the aerial.

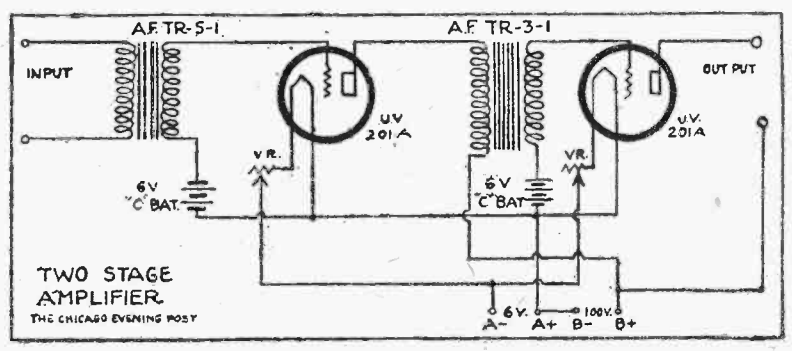


FIG. 2—This is the usual type of two-stage audio-frequency amplification. Note the "C," or bias battery. This reduces distortion and increases the efficiency of the transformers.

Charge Battery Often

Remember that your storage battery needs frequent charging. If it is the usual 6-60 type that is, 6-volt, 60 ampere hours, and your tubes use one ampere an hour, in theory it would be good for sixty hours of reception or something less than a month if set is operated every night. Practically, it will not operate as well when half charged or less, so that the battery should be charged every two or three weeks to give efficient service. It is better to give it a partial charge every week.

Poor Socket Contacts

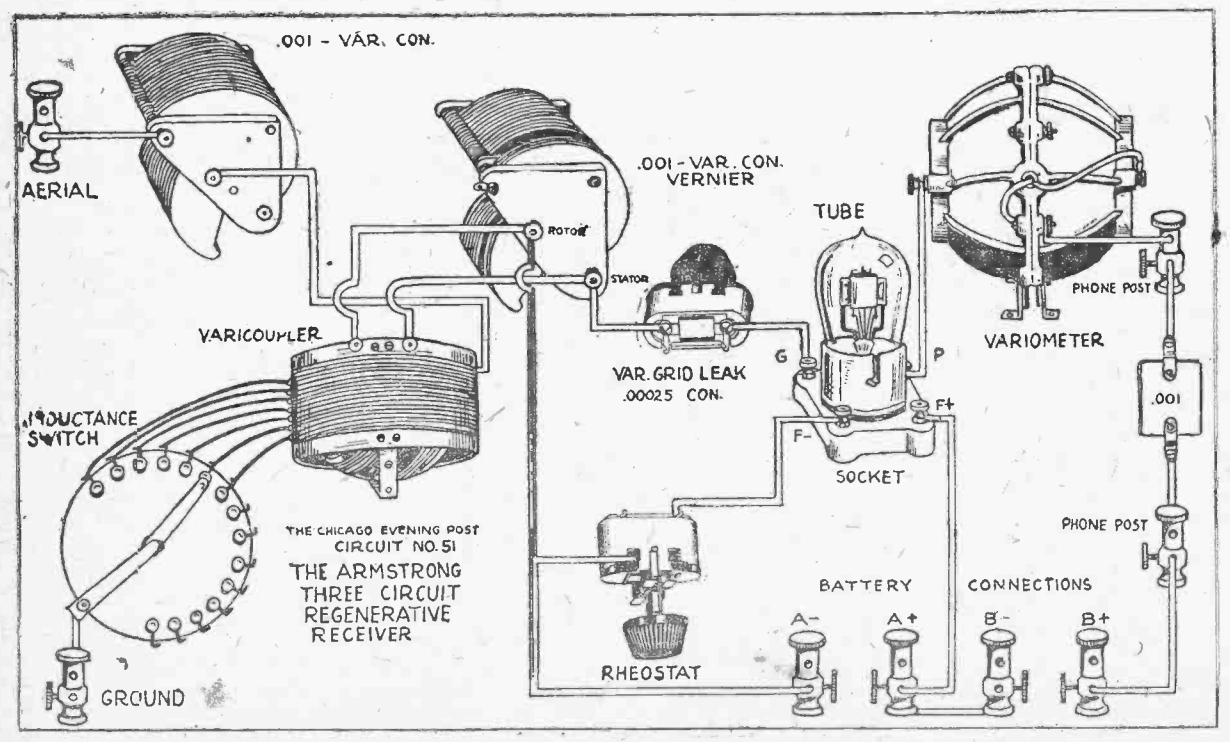
Silent tubes sometimes are due to poor contacts in the sockets. When all other tests fail pry up the metal spring contacts to insure a positive connection between the socket and tube terminals.

Installs Radio in Sing Sing

A radio set has been installed in the death house of Sing Sing prison, New York. The idea was suggested by the prison electrician and supported by the Salvation Army. The outfit was presented to the death house by David Sarnoff, general manager of the Radio Corporation of America.

Variometer in Ground Lead

A variometer placed in series on the ground lead of your set will make a fair wave trap and greatly improve volume and selectivity. It does not change the natural wave length of your set to any appreciable extent.



PICTORIAL DIAGRAM of Armstrong three-circuit regenerative or feed-back circuit. The variable condenser in the antenna circuit is a forty-three plate plain condenser. The one in the grid circuit is a forty-three plate vernier. The varicoupler is of the standard 180 degrees. The variometer is of low distributed capacity and high ratio of inductance. The other constants and values are shown in the diagram.

How to Tune Single-Circuit Sets to Avoid Interfering with Your Neighbor

IT is said that seventy per cent of single circuit owners tune so imperfectly they not only annoy owners of neighboring sets for blocks around, but also cheat themselves of good reception. This article is one of a series that will be run in the Radio Magazine section to help teach the art of tuning.

—THE EDITOR.

WITH so many types of receiving sets now on the market, it is an impossible task to give precise directions for the operation of each set. However, it happens that vacuum tube receivers fall into a few general classes, so that broad instructions on each class are certain to fit every individual case, with due allowance for the peculiarities of each particular set.

One of the most popular types of receivers in use today is the single circuit type, in which a loose coupler or varicoupler is the tuning unit. Such a set makes use of the well-known regenerative principle. The use of regeneration complicates the operation of a set, but makes for louder signals than could be attained with a straight single circuit set.

Regeneration is obtained by means of the tickler coil, which controls the amount of energy fed back from plate to grid. First the detector tube is adjusted until it is as near silent as possible, yet responds to spark signals. This is just before the point where the tube becomes noisy. Then the dials on the tuning unit are adjusted to bring in the desired signals.

By the tickler coil the quality of reception can be improved if necessary. If too much tickler action is used the signals are apt to be mushy and distorted. If the circuit is a critical one, this final adjustment of quality is made easier if the set is equipped with a vernier on the rheostat.

A vernier on any device is merely a means of compensating for the relative crudeness of the action of the hand in manipulating dials. In the case of the rheostat it is not possible for the hand to alter the resistance the required infinitesimal amount, hence a vernier is added.

Ordinarily when using the regenerative method of reception a radiophone broadcast station makes known its presence by a whistling sound as the tuning dials are varied. By moving the dials over the entire scale whistling sounds may be detected at various points. The tuner is then finally adjusted so as to get in between these sounds where there is a silent zone. It is there that a station will be heard.

A regenerative receiver, once adjusted, will maintain its adjustment fairly well. Occasionally the vernier or the tuner may have to be readjusted, especially if the character of the music is changed materially. The rheostat on the filament may also be altered at times to improve the strength or the clarity of the music.

With the two or three circuit receiver, tuning requires more skill, otherwise the operation is practically the same. The tickler coil is again adjusted, starting at zero and gradually increasing until a position is reached just below the oscillating point. The oscillating condition is indicated by a hissing sound in the telephones. The final adjustments are made with the vernier or verniers.

Sometimes it may be found necessary to adjust the tuner and tickler coil in order to maintain the proportion necessary to keep the receiver on the verge of the oscillating condition, which is the most sensitive point. The adjustment of the variocoupler also will be found to be important, especially when the operator is endeavoring to cut down the interference from neighboring stations.

All regenerative sets radiate or act as small transmitting stations, when the tubes are allowed to vacillate. The single-circuit tuner is the worst offender.

When a novice at tuning tries to bring in a station signal his tendency to allow the detector tube to oscillate not only causes serious interference in other receiving sets for many blocks around, but also means that as long as it continues the operator's own set is not giving satisfactory reception.

The accompanying illustration shows a single-circuit regenerative receiver. It employs a tickler coil for obtaining regeneration. The dial for this usually is located at the right and just to the left of the rheostat or filament center and usually controls a variocoupler, the secondary, or rotary coil, being the tickler in this instance, and the primary or stator coil, acting as the tuning coil. A variable condenser is the other part of the tuning element.

In operating a receiver of this type the filament of the vacuum tube should be turned up until it burns brightly when a six-volt tube is employed, such as C-300 or UV-200. If the newer tubes, such as WD-12, WD-11, UV-199, UV-201A, etc., are used until the filament burns a cherry red.

Move the tickler coil knob from zero toward the 180 degrees until a click is heard in the phones. If this does not materialize brighten up the tube slightly. Should this fail to bring the required click, reverse the leads to the tickler coil.

When the click is heard the set may be said to be "working." Turn the tickler dial back to zero. The desired station now is tuned in by use of the variable condenser and the coil or inductance switch.

When station signal or whistle is heard, turn the condenser dial until the signal reaches at its highest pitch. Now turn to the tickler dial and turn it slowly until the volume of the signal reaches its maximum, which should be a high-pitched whistle. Turn once more to the condenser and reverse the dial slowly until the whistle reaches its lowest pitch. This usually is found at a point where on either side the pitch begins to ascend. Now turn the tickler dial a little farther, moving it very slowly. If proper adjustments have been made the music or voice should come in.

Care is to be exercised at this point in handling the regeneration. If too much regeneration is obtained the signal will be "mushy" and the music or voice distorted. If carried too far the tube will "spill."

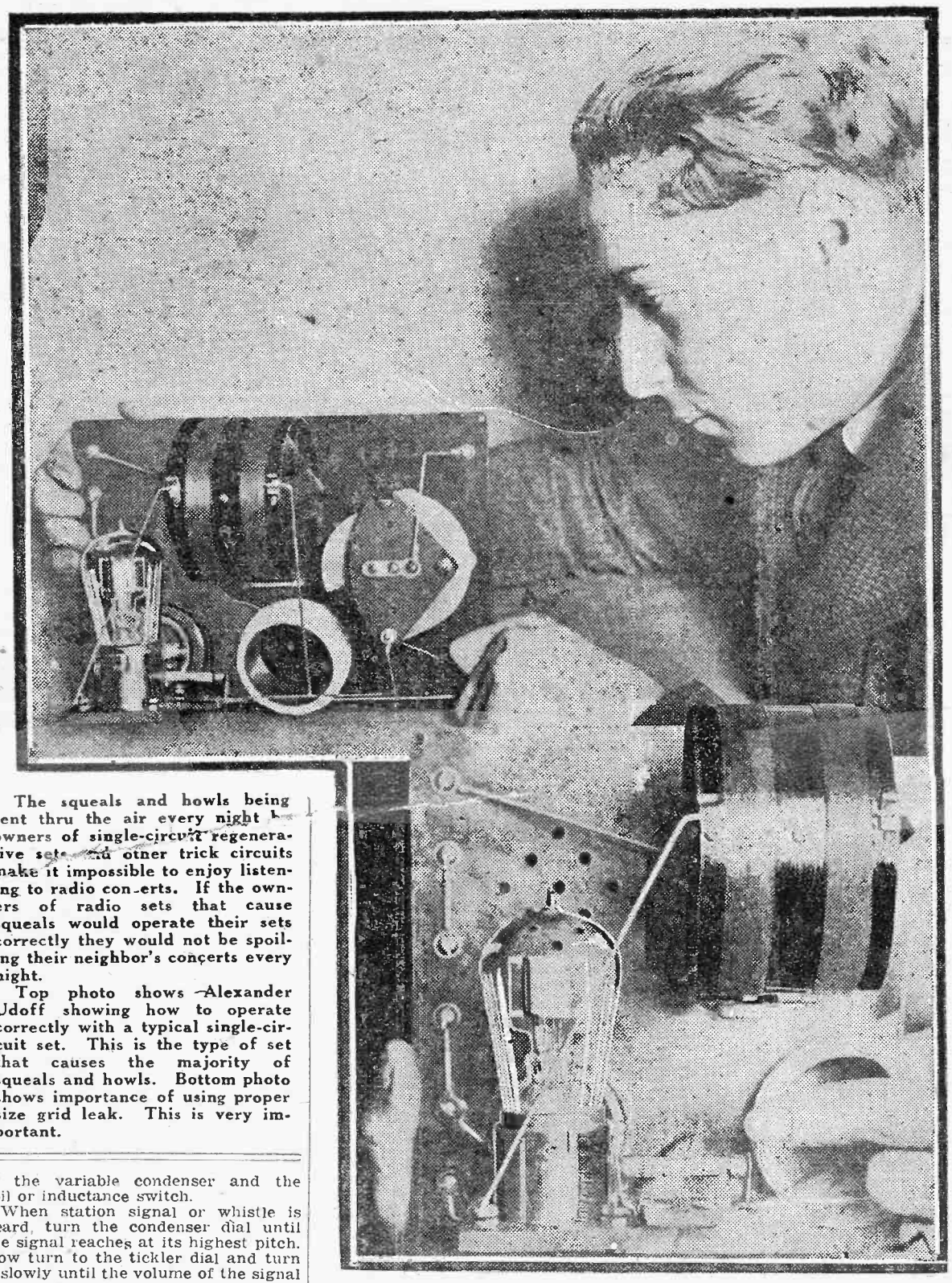
Turn the tickler up to the point where the tube almost is at the point of oscillation. It is at that point the loudest reception is received.

Should you find it difficult to clear up the signal with the tickler dial, turn down the filament control of rheostat slightly.

Quite often the voice or music, while clean, will not come in with sufficient volume. The strength of the incoming signal can be materially increased if "nursed" along. To do this move the main tuning central and the tickler dial simultaneously. This may cause the music or voice to disappear in the whistles and shrieks of increased regeneration. It will be necessary in that case to readjust the condenser and the rheostat until the music and voice come back in clear and loud.

Whenever the tube howls and squawks it is then acting as a small transmitting apparatus and is disturbing your neighbors, keeping them from tuning in a station as long as you persist.

When you note these howls and squawks the tickler dial should be turned back until the noises cease. Movement of the rheostat also will help.



The squeals and howls being sent thru the air every night by owners of single-circuit regenerative sets and other trick circuits make it impossible to enjoy listening to radio concerts. If the owners of radio sets that cause squeals would operate their sets correctly they would not be spoiling their neighbor's concerts every night.

Top photo shows Alexander Udoff showing how to operate correctly with a typical single-circuit set. This is the type of set that causes the majority of squeals and howls. Bottom photo shows importance of using proper size grid leak. This is very important.

Making Vernier Condenser

If you have a plain variable condenser and wish to convert it into a vernier for closer adjustment and tuning, shunt across it a three-plate variable condenser. This will answer every requirement and save you the trouble of dismounting the old condenser and the expense of a new vernier condenser.

Ringing Vacuum Tubes

When a receiving set is jarred by striking the table suddenly, or even by heavy footfalls on a floor, quite often there is a ringing noise in the earphones. This is caused by the tubes, whose elements are set into vibrations by the jar. Mount the sockets on sponge rubber or heavy felt. This will absorb the shock.

Speaks Kindly for Amateurs

By BEVERLY DUDLEY.
(9BR. A. R. R. L.)

Radio broadcasting has become one of the most important public utilities and deserves an important place in the lives of American citizens. There is, however, another angle of radio, which is just as important as broadcasting, known as amateur radio.

Few broadcast listeners know much about amateur radio or about the thousands of "hams" that nightly transmit, receive and relay messages, which are often of utmost importance.

The amateur, like the radiophan, is interested intensely in radio, but where the broadcast listener is interested in receiving broadcast programs, the amateur is interested in communication with other amateur stations, and the development of this means of communication.

Being in the game for the mere love of it, the amateur puts his best efforts into developing his receiver and transmitter to a higher degree of efficiency. In developing his station, the amateur has contributed remarkably to the efficiency of radio broadcasting; in fact it was the amateur who developed short wave communication to such a degree that broadcasting is at all possible at the present time.

This may sound like an extravagant claim, but it is true. The amateur always has worked on short waves, 200 meters or lower. Naturally, apparatus sufficiently sensitive to be used by him in handling radio traffic would be suited for the reception of broadcast programs. Without the aid given by such experimenters and amateurs as DeForest, Armstrong, Reinartz, Godley, and scores of others, short wave communication probably would be developed only to the class of crystal detectors and spark coils!

Think this over, and try to appreciate the amateur's efforts, rather than to condemn him for possibly spoiling your broadcast program.

A New Foreign Tube

A Holland manufacturer is making vacuum tubes filled with argon, which, at a pressure of 30 volts, works as well as the present tube at 100 volts. Its life is about 1,000 hours without change in its characteristics. One of these used for transmitting does the work of four, with only 200 volts on the plate.

OWNERS of double or three-circuit regenerative sets are not free from the evils of over-regeneration. They, too, are guilty quite often of tuning their receivers into small transmitting stations. They may remedy their faulty tuning by following the instructions given here for the single circuit set.

Radio Language Disguises Voice

Just how accurate is the reproduction of the human voice when transmitted with suitable transmitting apparatus and received with quality receivers was emphasized in several instances which occurred recently at station WEAF (New York).

One day during this last week a new announcer handled his first program from that station. On returning to his home later in the evening he asked the members of his household if they had heard the program. The answers were in the affirmative but with no comments. When queried as to their opinion of the announcing their answers again were a simple, "All right."

Finally, after more questioning the announcer neophyte learned that not a member of the listening family had recognized his voice, so carefully had he applied the art of correct enunciation and tone production in his "radio voice."

On the other hand, not many days previous, another new announcer had been heard for the first time thru WEAF for a few brief special announcements. Later in the evening, a friend who had not seen or heard of the announcer for more than three years telephoned a message of congratulation. He had not questioned for a moment but that the announcing voice was that of his friend, so perfect and convincing was its reproduction.

Picture Diagrams

In hooking up and wiring a set, the novice home builder will find it an advantage to make a picture diagram of the circuit, such as is shown on page 5 of this issue. This will save confusion if you are not familiar with reading of schematic diagrams such as generally are furnished.

Faulty Tube Sockets

Partial leaks across the face of faulty tube sockets are sometimes encountered. It pays to buy the best quality of tube sockets.

Here's a New Circuit That Refuses to Howl and Yet Has Super's Volume

A RADIO set that refuses to howl and hiss, which comes in as quiet as a sleeping kitten with its station, which has a super's loud-speaker volume on all out-of-town stations, which is free from body capacity and which has many other good features is one built from a new circuit invented by a Chicago man and described in this article. This descriptive article is to be followed next week with full construction details.

—The Editor.

IF ALL the claims of its inventor are backed up by actual practice, Chicago has produced a radio circuit for broadcasting reception that is going to make some of the standard circuits sit up and take notice. It is a nonregenerative circuit, and in tests made before representatives of The Chicago Evening Post seems to fulfill all the claims made for it.

Capt. Anatol Gollos, 6337 Magnolia avenue, is the inventor. "The Sun" Counter Electro Motive Force receiver is the name of the circuit. Here is what Capt. Gollos claims for the "Sun":

It is nonregenerative.
It gives coast-to-coast range.
It is extremely selective.
It has exceptional volume.
It has great purity of tone.
It has unusual clarity.
It is immune from body capacity.
It logs its stations with the positiveness of bank safe combination lock.
It can be operated on a loop.
It will produce as good results with dry cell tubes as with the others.
It is equal in efficiency to any five or eight tube set.

Inventor Proves His Claims.

The tests made for The Post representatives did not cover all the ground made by the eleven claims in the foregoing statement because of lack of time and opportunity. As far as they went Capt. Gollos proved each and every one completely and satisfactorily.

The circuit is nonregenerative, employing standard radio-frequency in connection with his patented tuner and balanced counter feature. It gave a wide range on the night in question and proved its selectivity by tuning out WJAZ (Chicago), which is located within four or five blocks of Capt. Gollos' home, where the test was being operated, and picking up the usual eastern, southern and western stations.

The volume was exceptionally strong. All the tuning was done on a loud speaker. Capt. Gollos disdaining the head set. The tone of the received signal not only was smooth, but as clear as the original. The signals came in without the customary regenerative whistle and was as quiet and peaceful as a kitten.

Has No Body Capacity.

One of the striking features was the total indifference of the set to the proximity of the human body. Capt. Gollos placed his hands on all the coils, surrounded the entire set with his arms, placed his hands and entire body close to the dials and there was no perceptible effect on the tuning. No shields are used whatsoever.

Capt. Gollos keeps a log of every station tuned in. He employed this in bringing in the signals for the test. It was necessary only for him to set each dial at a certain number to bring in the various signals. The precision of this logging feature was that of a combination lock on a bank safe.

No loop was used in the tests. An outside aerial of usual type was employed. No dry cells were used in the test, only 201A being at hand. The volume was equal to that of many circuits employing more than the four tubes which were used by Capt. Gollos.

Tuner Unit Heart of Set.

The principal unit in the "Sun" circuit is the counter-electro motive force tuner, feeding the grid of the first tube. This consists of five inductance coils shunted by an equal number of condensers of a fixed capacity. Capt. Gollis maintains it is the accurate balancing of the capacity of the coils in this tuning unit which produces whatever efficiency in broadcasting reception he may gain with his set.

A definite fixed capacity is required for stabilizing the circuit. Variation of these capacities brings about poor results. Proper windings on the coils are necessary to maintain the balance of the circuit.

The Post experimental laboratory is engaged in further tests of the circuit. These will be completed by next week and will be given publication in The Post Radio magazine section. Schematic and pictorial diagrams of the circuit will be printed at the same time, together with complete construction details, list of parts and working plans for panel and hook-up.

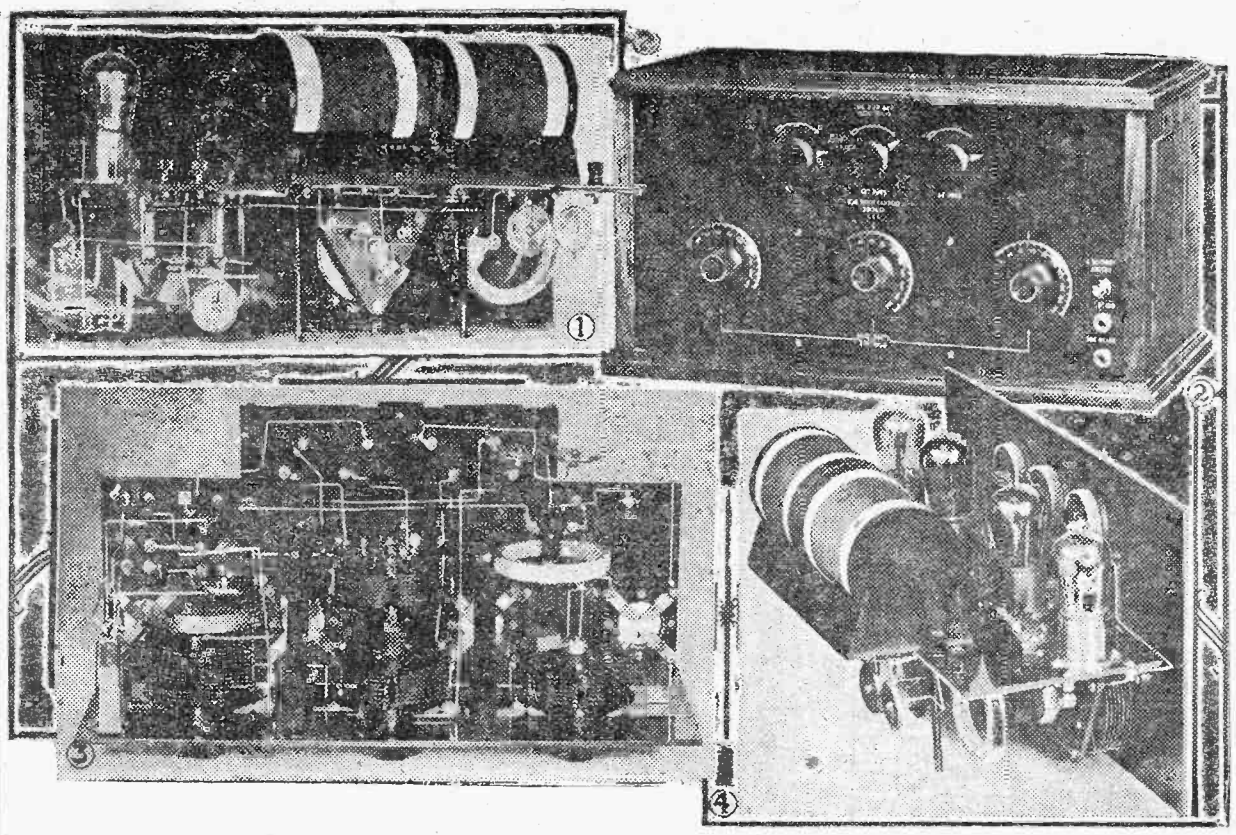


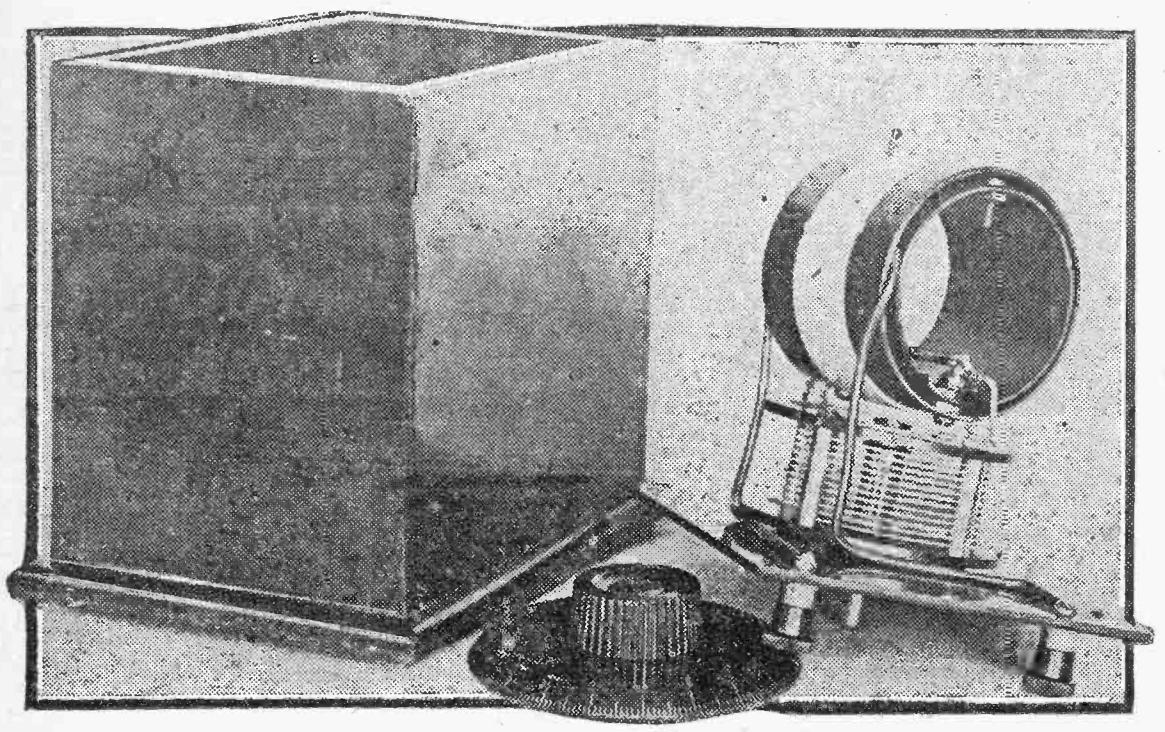
FIG. 1—Back view of panel mounting. FIG. 2—Front panel view. FIG. 3—Looking at set from bottom. FIG. 4—From the input end.

Public Buys $150,000,000 Worth of Radio in 1923

The Radio Corporation of America has ordered from the General Electric company $4,000,000 of equipment.

David Saranoff, vice president of the corporation, says the public spent $75,000,000 to $100,000,000 on radio in 1922, and it is estimated that in 1923 expeditures will amount to $150,000,000. "For the next few years the industry will virtually double each year, so it is reasonable to expect that in three years it will be worth $500,000,000," he added.

Hook-up of Post Wave Trap Republished



Many requests have come into this office for republication of the diagram and list of parts used in The Post wave trap. These requests are complied with.

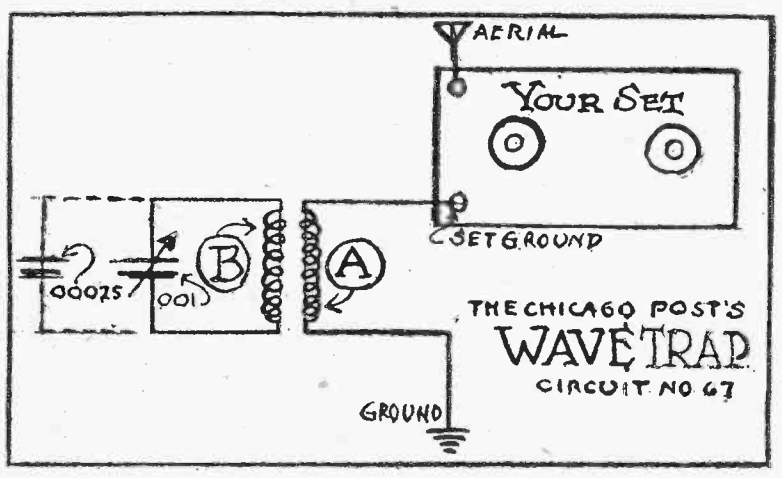
The Post wave trap was designed to cut out local interference and enable the owners of receivers not sufficiently sensitive to operate when local stations are broadcasting.

This hook-up has accomplished all that was required of it. However, there are many who have had failures. Almost invariably these failures have been traced to two sources. One is that the connections of the various parts were not followed. The other is in the employment of improper coils.

Some of the local dealers, in an effort to meet the great demand for the coils and condensers, have substituted other coils in the belief that these would answer. Most of these substitutions were coils made for the Hazeltine neutrodyne circuit. These will not answer. Their ratio of winding is incorrect.

The proper winding of the coil is necessary for results. Coil "A," which is wound on a tube two and a half inches in diameter, has thirty turns of No. 32 DDC wire. Coil "B" has thirty turns of No. 22 DCC wire wound on a three-inch tube. Coil "A" fits inside of coil "B." A forty-three plate condenser shunts coil "B." One of the terminals of coil "A" goes to the ground post of your receiver. The other is attached direct to your ground.

With sets that are somewhat selective it may be necessary to use a vernier on the condenser, as the addition of the trap will produce an exceptionally sharp tuning.



View shows mounting of wave trap parts. Note the construction of the coils. Lower picture is the schematic diagram of the wave trap. Most failures reported on this wave trap are due to improper connections of coils.

Here are some letters received from those who have tried out The Post wave trap;

IT'S A "BEAR" TRAP.

RADIO EDITOR: Just to let you know that the wave trap printed in your radio section Wednesday, Nov. 28, is a "bear." I am referring to the trap with forty-three plate condenser and two coils. Before I made this trap I had trouble with WJAZ and KYW when I had WMAQ, but now I am able to tune them out. Your radio section sure is some help to the radiophan.—HOWARD W. LEARN, 2126 Giddings Street, Chicago.

MISSES WAVE TRAP HOOK-UP.

RADIO EDITOR: I was so unfortunate as to miss the issues of the Radio Magazine for Nov. 15, 22 and 28 and so missed descriptions of the wave trap, in which I am interested. Can you supply these? I inclose stamp for reply, and will be glad to remit for the magazines if I can get them. —E. L. BOWMAN, Berrien Springs, Mich.

WAVE TRAP WORKS FINE.

RADIO EDITOR: A friend of mine sent me a copy of The Post Radio Magazine some

Continued on Page 12.

Long-Distance Records of Phans

Irving C. Johnson, 4551 North Clark street, is after the long-distance laurel wreath, which Roy J. Blum, 309 Deyo street, Congress Park, Ill., is trying to wear as a permanent fixture.

Mr. Blum, you will recall, made a phenomenal record on stations received, an account of which appeared in this department, page 10, last week. Today Mr. Johnson comes to bat with the following report:

Knocks Out Blum's Record.

Radio Editor.—Last night, Dec. 10, being silent night, I lit up the old pipe, went into the operating room of Listening-Inn station, CJ, and turned on the red light, which meant a silent night for those present as well. Soon after lighting up the WD-12's, I spent fifteen minutes listening to the Detroit News orchestra. From then on I covered more territory than a traveling salesman does in a year. I heard a speech by a man who never ran for president, yet became president. I also listened to a talk by a man who ran many times for president, yet never became president.

About 9:40, after visiting about thirty cities, I turned off the juice and lit my pipe. Then I lit my tubes again, and who should I tune in but Litt Brothers of Philadelphia, with a dandy program of dance music.

All told, last night thirty-seven long-distance stations came in clear. I missed WBZ, as I am sure I had them when WMAQ came on about 7:30. I was enjoying a tenor solo when the interruption came. With the WDAP, KYW and WMAQ added to the thirty-seven it makes forty stations for the evening, which equals Mr. Blum's record, which was printed in last week's radio section.

On Thursday, Dec. 6, I tuned in twenty-three stations while the locals were on. I repeated the performance the next night, Thursday night, after the locals signed off. I hooked KPO, KGW, KHJ, KFI, WDAF and WHAH. This makes fifty-two stations for the two nights, which is my best record for other than Monday nights.

My DX report for Monday, Dec. 10, 1923, is as follows:

6:15—WWJ, Detroit, Detroit News orchestra.
6:20—WCAE, Pittsburg, Hotel William Penn orchestra.
6:32—WOC, Davenport, Sandman story.
6:35—KDKA, East Pittsburg, Girl Scout talk.
6:46—WGY, Schenectady, March by WGY orchestra.
6:55—WFAA, Dallas, Announcements and news.
7:00—WLAG, Minneapolis, Signing off until 7:30.
7:03—WHB, Kansas City, Talk, "Book of Knowledge."
7:12—WOR, Newark, Contralto solo.
7:25—WCK, St. Louis, Orchestra.
7:28—WOO, Philadelphia, Announcing broadcasting of president's speech.
Intermission—Listening to WMAQ.
7:50—WRAC, Washington, Talk.
7:55—WBAP, Fort Worth, Piano solo.
7:59—WEAF, New York, Violin, Shubert number.
8:05—KSD, St. Louis, Organ, musical composition.
8:30—WCX, Detroit, Announcing.
8:35—WTAS, Elgin, Orchestra.
8:40—WCBD, Zion, Zion choir.
8:43—WPAH, Waupaca, Announcing prize contest:
8:48—WJAD, Waco, Orchestra, "No! No! Nora."
8:55—WOS, Jefferson City, "Honolulu Blues."
8:57—WDAF, Kansas City, University of Kansas orchestra.
8:58—WSB, Atlanta, Announcing.
9:02—WOAW, Omaha, Overture, 17th Infantry band.
9:10—WMC, Memphis, Orchestra, "Sitting in the Corner."
9:15—WHAZ, Troy, "A Little Bit of Honey."
9:20—WJZ, New York, Talk by William J. Bryan.
9:23—WBAH, Minneapolis, Selection from "Bohemian Girl."
9:40—WDAR, Philadelphia, Orchestra.
9:45—WLW, Cincinnati, Dancing lesson.
10:15—WGR, Buffalo, "In An Old-Fashion Town."
11:00—KGW, Portland, Announcing request for phone calls.
11:05—KFI, Los Angeles, Announcing.
11:15—CKCK, Regina, Orchestra.
11:55—CFCN, Calgary, Announcing.
12:15—WAAW, Omaha, Testing.
12:35—KDZE, Seattle, "Rose of the Rio Grande."—IRVING C. JOHNSON, 4551 North Clark street, Chicago.

JUST AS A "STARTER."

RADIO EDITOR: As a starter will give you my DX record for Monday night, Dec. 3, as follows:

WGY (Schenectady), vocal, "You are Like A Baby," 6:39 p. m.; WLAG (Minneapolis), talk by Athletic club, 6:59 p. m.; KDKA (Pittsburg), literary talk, 7 p. m.; WCAE (Pittsburg), vocal, "Dreamy Melody," 7:45 p. m.; WOC (Davenport), band, "National Emblem March," 8:08 p. m.; WTAS (Elgin), "Blue Hoosier Blues," 8:12 p. m.; WDAF (Kansas City), saxo solo, 8:15 p. m.; WWJ (Detroit), barytone solo, 8:24 p. m.; WHAZ (Troy), violin solo by Lawrence, 8:27 p. m.; WGR (Buffalo), English song, "Mary," 8:29 p. m.; WOAW (Omaha), talk by Mr. Collett, 9:35 p. m.; WOO (Philadelphia), 8:35 p. m.; WPBA (Fort Worth), Abilene S. S. orchestra, later Trib. march, 9:45 p. m.; WCBD (Zion), choir, 10:25 p. m.; KFKX (Hastings, Neb.), announcing talk on King Tut for next Thursday and signing off at 10:57 p. m.; WLW (Cincinnati), signing off, 10:59 p. m.; WFI (Philadelphia), music by Phila Trio, 11:05 p. m.; WSB (Atlanta), announcing Nightingale Musicians for Wednesday, 11:35 p. m.; KSD (St. Louis), barytone solo by Jackson, 11:50 p. m.; WRC (Washington), announcing A. R. R. L. contest.

Not so bad for a beginner, what? Have had this set about three weeks. It is a five-tube "Lyradion."—L. L. GRAHAM, 1367 East 62d street, Chicago.

GETS 44 IN ONE NIGHT. WHEW!

RADIO EDITOR: Here is my list of stations heard on silent night, Dec. 10, 1923. All the stations within 1,500 miles were heard on a one-tube regenerative receiver, while the stations beyond that limit were brought in with the help of a two-step amplifier.

I have received KHJ (Los Angeles), KFJ (Astoria, Ore.) and KXD (Modesta, Cal.) on one tube at different times. My list of forty-four stations for Dec. 10 follows:

WDAP, Chicago, Ill.; WWJ, Detroit, Mich.; WCAK, Houston, Texas; WSY, Birmingham, Ala.; WDAF, Kansas City, Mo.; WRC, Washington, D. C.; WCAE, Pittsburg, Pa.; WJZ, New York, N. Y.; WOO, Philadelphia, Pa.; KDKA, Pittsburg, Pa.; WLW, Cincinnati, Ohio; WGY, Schenectady, N. Y.; WCK, St. Louis, Mo.; WHA, Madison, Wis.; WCAP, Washington, D. C.; WEAF, New York, N. Y.; WJAR, Providence, R. I.; WMAQ, Chicago, Ill.; WTAM, Cleveland, Ohio; WOC, Davenport, Iowa; WBAP, Fort Worth, Texas; WOS, Jefferson City, Mo.; WFAA, Dallas, Texas; WOR, Newark, N. J.; WDAR, Philadelphia, Pa.; WHAZ, Troy, N. Y.; WTAS, Elgin, Ill.; WPAH, Waupaca, Wis.; WHN, Ridgewood, N. Y.; WEAI, Ithaca, N. Y.; WGR, Buffalo, N. Y.; KFKX, Hastings, Neb.; WOAW, Omaha, Neb.; CKCK, Regina, Sask.; WBAH, Minneapolis, Minn.; WSB, Atlanta, Ga.; KIDL, Denver, Colo.; 5OJ, Jefferson, Texas; KFI, Los Angeles, Cal.; WBAV, Columbus, Ohio; KSD, St. Louis, Mo.; KGW, Portland, Ore.; KYW, Chicago, Ill.; KPO, San Francisco, Cal.

I do not believe this is so bad for one night.—THOS. F. NEWETT, Park Ridge, Ill.

HOW ABOUT IT, MR. BLUM?

RADIO EDITOR: I was interested in reading Roy J. Blum's long-distance record in last Thursday's Radio Magazine. I have found that it is usually necessary to hold a station more than two minutes to get the call letters. However, this man got stations a minute apart in many cases. I should say it would be impossible to get the call letters of four stations in five minutes. He got nineteen stations two minutes apart, and six one minute apart. How do they do it? C. W. MARTY, Lakota Hotel.

GETS THEM REGULAR.

RADIO EDITOR: I am enclosing a list of stations that I have received on a one-tube set made of Kellogg parts. It consists of two variometers and a variocoupler, with a 6-volt 201-A tube as a detector. They are as follows: KFR, Los Angeles; KDKA, East Pittsburg; KFKB, Milford, Kan.; WNAS, Nashville, Tenn.; WDAA, Nashville, Tenn.; WGY, Schenectady, N. Y.; WHAZ, Troy, N. Y.; WPA, Forth Worth, Texas; WFAA, Dallas, Texas; WTAS, Elgin, Ill.; WCBD, Zion, Ill.; WOO Davenport, Iowa; WOQ, Ames, Iowa; WLW, WSAQ, Cincinnati, Ohio; WMAQ, KYW, WAAF, WPAD, WDAP, WJAZ, Chicago; WJAT, Marshall, Mo.; WCAE, Pittsburg, Pa.; WKOH, Fond du Lac, Wis.; WFAV, Lincoln, Neb.; KFKX, Hastings, Neb.; 9CD, Toronto, Canada; KOP, Detroit, Mich.; WGR, Buffalo, N. Y.; WHK, Detroit, Mich.; WLAG, Minneapolis, Minn.; WCAS, Minneapolis, Minn.; WWX, Washington, D. C.; WJY, New York city; WWAE, Joliet, Ill. I get these stations regularly.
GEORGE KENOSZT,
537 North Albany avenue.

GOOD WORK, RAYMOND.

RADIO EDITOR: The following are the stations I picked up Monday evening, Dec. 10. My set is an Armstrong, one-tube simple regenerative hook-up: WOC, Davenport, Iowa; WGY, Schenectady, N. Y.; WWJ, Detroit, Mich.; WBAP, Fort Worth, Texas; WHAZ, Troy, N. Y.; WCAE, Pittsburg, Pa.; WTAS, Elgin, Ill.; KSD, St. Louis, Mo.; KOP, Detroit, Mich.; WOO, Philadelphia, Pa.; WBAH, Minneapolis, Minn.; WRC, Washington, D. C.; WOAW, Omaha, Neb.; KDKA, Pittsburg, Pa.; WOR, Newark, N. J.; WOS, Jefferson City, Mo.; WCBD, Zion, Ill.; WPAH, Waupaca, Wis.; WSB, Atlanta, Ga.; WFAA, Dallas, Texas; WLW, Cincinnati, Ohio; WMC, Memphis, Tenn.; KFKX, Hastings, Neb. Your new radio section is the best I have ever seen, and I enjoy it each Thursday evening.
RAYMOND BERNHARDT,
5449 Michigan Avenue.

A CRYSTAL RECORD.

RADIO EDITOR: How is this for logging with Hagerman's long distance crystal set, and an inside antenna?

Monday, Dec. 23, 7:30 to 10:30 p. m.: Pittsburg, Elgin, Davenport, Jefferson City, and Zion City. Stations came in just as clear, without a ground wire. You sure have the radio magazine of Chicago.—J. A. MONTGOMERY, 5255 North Bernard street.

RADIO EDITOR: Last evening, Thursday, Dec. 6, among the many stations, I heard one, KFKX, Hastings, Neb., about 10:30, and I heard it distinctly announce the station, "KFKX, Hastings, Neb.," and asked people from various parts of the country to write in. He also mentioned several people that had written in from various parts of the country. Then the program continued and I switched off and got some other stations. About an hour later I happened to run on to them again, but in calling the station, he called, "KFKX, Hastings, Neb., relayed thru KDKA., East Pittsburg." I would like to know whether the first announcement was also relayed, or whether I heard that direct from Hastings. Could you tell me?—FRED GRUENHOFF, Aurora, Ill.

(Note: The first reception was a relay from KDKA (Pittsburg). See article on the Hastings station on page 6, Nov. 22 issue of this magazine.—THE EDITOR.)

CRYSTAL HOOK-UP GREAT.

RADIO EDITOR: Congratulations upon your speculative venture, The Post Radio Magazine. It fills a long felt need. I have built several sets and have had successful results using them. I owe it all to keeping posted up on radio by reading The Post. That crystal set hook-up published in last week's magazine was a wonder and lived up to its history. I made one, using spare parts, using one stage of audio. Heard it all over the house and back lots, crystal alone heard on the loud speaker, local stations, aerial sixty feet and direct ground.—G. F. CHAPMAN, 4210 West 20th street, Chicago.

CONFIRMATION FOR MR. MARR.

RADIO EDITOR: In regard to J. C. Marr's request in The Post will state that Nov. 27 at 9:32 p. m., a few minutes after KDKA signed off, I heard the following: "This is station 5X3, London, 5X3." I did not pay much attention to this as some of the Chicago boys like to fool us BCL's. I am using a Grimes inverse duplex three-tube reflex. Hope this will satisfy Mr. Marr.—S. H. POLASKY, 1152 North Ashland Avenue, Chicago.

Letter Box

A NEW YEAR'S SUGGESTION.

RADIO EDITOR: It has occurred to me that New Year's evening falls on a Monday, and I am wondering if the Chicago stations will observe silent night.

There are many of us who would like to hear the programs from the Chicago broadcasting stations that night, and I was wondering if you could not bring a little pressure to bear so that Monday, Dec. 31, will not be observed as a silent night.

Have been very interested in your radio columns and your special editions on Thursdays, which I believe is way ahead of anything else put out here in Chicago, and may I at this time extend my congratulations and wishes for a most successful career for those who are in charge of this section.—A. B. SOUTHWORTH, 1322 Wabash avenue, Chicago.

A CRITIC CRITICIZES.

RADIO EDITOR: In behalf of the radio public may I call on you to ascertain the result of the recent program vote propagated by the three large stations of Chicago?

Why this reticence regarding same? Is it because the vote was overwhelmingly in favor of popular music? Do they think we never tire of hearing "Nocturne" in A flat and other tiresome numbers? Why must we prowl the ether each night to hear music which is entertaining, and who will say that popular music, accompanied by "wise cracks" of announcers is not more interesting and entertaining than some number or other in G minor, of which we certainly have been glutted since last spring? And have you noticed the tired voices and lack of ambition of announcers of "non-copyrighted music" stations in comparison with the others?

I believe I am voicing the opinions of thousands of listeners in emitting this long wail of anguish. If I could not get out-of-town stations I would throw my set in the alley, having heard every composition from ten to fifty years old at least fifty times—enough to sicken anyone.

Now that that is off my mind, why can't we have popular music, which everyone wants? Why, even if the composers and publishers must be paid, why can that not be done? Why should not the manufacturers of sets and parts be made to foot the bill. Does not one of the local stations continually impress on our minds the efficiency of the particular set in which it is interested? Is this advertising not worth a few hundreds of dollars? Again, does not every manufacturer charge exorbitant prices for parts and sets, and could not some of this surplus charge be diverted to a fund for the paying of the royalties demanded? Of course, and if they all refuse to support the stations there would be no market for sets. Why should they not butter their own bread? Additional charges on sets and parts would not be necessary, as they already overcharge the users from 100 to 500 per cent.

Just imagine how they soak us for parts to listen to "junk" night after night. As I write I am listening to an Etude in "A" flat. I already know it by heart.

Briefly summarizing: since the manufacturers derive the most benefit from broadcasting, on our weakness for music, let them pay for it, but give us what we want.

I am writing to you because my friends and myself want publication in Chicago thru which the radio public may express their frank opinions without fear of hurting the radio industry, and because you have such a jump on the other Chicago papers regarding this.

I sincerely hope you will publish this letter, that other fans may see it, and that they will air their views so that in time we will not be forced to listen to music foisted upon us because of a refusal to "come across" with a few dollars.

With best wishes and hoping you will grow (and you will by being unbiased) to be the foremost radio magazine in the country.—CHARLES A. KUNCITZ, 1846 West 13th Street, Chicago.

RADIO EDITOR: A suggestion that I think will please the radiophans would be for you to place opposite the wavelength in your daily program the distance of each station from Chicago.—S. J. GARTNER, Chicago.

We have done this in the tabloid list of stations published each Thursday in the Radio Magazine section. Later we may carry out the suggestion in the complete list. Thanks.

WE STAND CORRECTED.

RADIO EDITOR: I want to take exception to something in The Post Radio magazine. You have said that Miss Eleanor Poehler of WLAG is the only woman managing director of a radio station in the United States. I am not fond of talking about myself, but I am the managing director of WMAQ. I started the station and it has been under my direction ever since. I do all the hiring and firing of our staff, both for the studio and the station itself. You have been listing me as "program director," which is one of my duties. I acknowledge—but not the only one. Mr. Hedges is radio editor, but the editorial end is entirely divorced from the radio station. I do not want to be written up, but I would appreciate it very much if you would correct my title under your list of stations daily.—JUDITH C. WALLER, Station WMAQ, Chicago.

HAS A "SECRET HOOK-UP.

RADIO EDITOR: I have been reading your Radio Magazine. The different hook-ups are interesting. It may be of interest to you and the radiophans to know that I do not use any aerial with my set. I get WGY and San Antonio, Texas, when the conditions are good almost as loud as KSD. While the inventors have been working for several years on the detector, I have been working seven years on the other end—the aerial. I find a radio set does not need an aerial any more than an auto needs five wheels, if it is hooked up right. I do not let anyone look into my box to see what I am using, but a welcome invitation is extended to anyone to come and listen to my set.—JAMES F. WERT, Auburn, Ill.

"ROUNDS OUT" THE POST.

RADIO EDITOR: I wish to tell you how much I appreciate your radio department. It is very complete and rounds our your splendid paper. I have long been a reader of The Post and have wished for a year you would give us some advice to radio.—Roscoe L. Stout, 7423 Coles Avenue, Chicago.

BEST OF MAGAZINES.

RADIO EDITOR: Several of your radio magazine supplements have been forwarded to me, and I wish to take this opportunity to express my thoro satisfaction with this section. Please accept my congratulations upon bringing out such a good publication. It is my opinion that this is one of the best current magazines dealing with the subject that is now published. Many of my friends to whom I have shown it share the same opinion as I. In order to keep my file up to date, would kindly request that you forward me the issue of Nov. 22 as I am short this one.—A. E. WILLIAMS, Research Engineer, 1839 Mount Union Street, East Cleveland, Ohio.

COULDN'T DO WITHOUT IT.

RADIO EDITOR: Would you kindly send me the Radio Magazine of Wednesday, Nov. 28th, as I mislaid mine and cannot find it. I would not be without it, if possible. What I want most is the hook-up of Hagerman long-distance crystal receiver.—PETER KILBASSA, 1431 South Springfield Avenue, Chicago.

BEST IN UNITED STATES.

RADIO EDITOR: It may be of some interest to you to learn that in St. Louis you have a regular reader of your Radio Magazine, and if any United States newspaper has better radio news than yours, then will simply say "I'm from Missouri." Congratulating you and any others that are responsible for this good work and also thanking you for the pleasure I've received from same.—RUSSELL MEAD, 4128 Westminster Place, St. Louis, Mo.

Here Are Four Star Announcers at KDKA

N. C. PEARCY.

C. C. WYLAM.

H. W. ARLIN.

T. F. HARNACK.

MANY thousands of people hear the following announcement: "This is KDKA, the world's pioneer broadcasting station, operated by the Westinghouse Electric and Manufacturing company at East Pittsburg, Pa.," by radio each evening.

A voice makes the announcement and at different periods the voice changes. It is not the same voice. Therefore, there must be more than one announcer.

This is true. KDKA, the world's pioneer broadcaster, has no less than six announcers, four of whom might be called the principal announcers, the remaining two, substitutes.

The announcers are chosen for their ability to make friends by means of the voice. There are voices that make a wrong impression and again there are voices that are harsh and there are also flat voices that are boring to the listeners.

Friend-Maker Chosen.

Because of the fact that a radio audience judges the station thru the voice of its announcers, KDKA's announcers are chosen for their ability to make the impression so necessary to a radio audience.

Of the KDKA announcers, H. A. Arlin is the oldest in service. He is also the announcer having the longest service record of any such man in the United States or for that matter the world. He first started telling radiophans about KDKA soon after the station began operating and has been continuously in service ever since. Since KDKA was started Nov. 2, 1920, this makes Mr. Arlin the world's veteran radio announcer.

Mr. Arlin, tho a veteran in radio service, is a young man and far from the period in life when youngsters will run along after him crying "beaver." This reference to the famous English game is made so that the readers will know that Mr. Arlin wears no beard.

The Arlin voice is strong and powerful. His diction is perfect.

Take Daily Training.

The announcer second in length of service is T. F. Harnack, who has been continuously before the KDKA microphone for more than two years. Mr. Harnack has had considerable training as an announcer and is one of the world's best.

N. C. Pearcy is a comparative newcomer to the field of radio. His voice tho is one of the best. It is pleasant, well modulated and is friendly. It is stated by radiophans that Mr. Pearcy's voice is the most pleasant on the air.

C. C. Wylam is the fourth member of the quartet. Mr. Wylam is an employe of the Westinghouse company, as are all the other announcers—that is, they have jobs during the day and do the announcing as a bit of extra work at night—but Wylam is the only one employed in the radio engineering department. Perhaps this is because radio engineers cannot talk about their work as easily as they can design new apparatus.

All KDKA'S announcers have taken a course in voice training and are drilled daily under the direction of a competent critic. It is the constant endeavor of the Westinghouse company to perfect its radio announcing so that KDKA will stand as the best in the world.

Loudspeakers for Neighbor

Loud speakers may be operated a considerable distance from the set without losing much of the volume. Simply use an extension wire for the required distance. Loud speakers may be operated in different rooms or even in a neighbor's house. Cut-out switches should be used to throw in and out the attachment.

Soft Tubes and Leaks

Some tubes are so "soft" they do not require a grid leak.

How to Wire and Assemble Your Receiver Set, with Notes on Home-Builders' Pitfalls

THIS is the fifth of Mr. Cardwell's series of articles on "Everyday Engineering for the Home Builder." Like the preceding installments, this one takes up its subject, "Wiring and Assembly of Receiver Sets," in a manner in which every novice may understand. These articles were written especially by Mr. Cardwell for The Chicago Evening Post Radio Magazine section and are protected by copyright.—The Editor.

By ALLEN D. CARDWELL.

SIMPLE as the assembly of a set may be it often leads the novice into difficulties due to inadequate tools, carelessness or lack of craftsmanship.

If you have not had manual training or acquired the knack of laying out accurate measurements, the panel drilling will mean your first waterloo. The best system is to secure a quarter-inch whitewood board and practice on this before you attempt to drill on the Bakelite, hard rubber or other insulation panel.

For panel drilling you will need a scriber, a square, a good rule (graduated to at least sixty-fourths of an inch) and a pair of dividers. Add to these the drill brace, drills, countersinks, a center punch and hammer.

If you are sure you will not make errors in your drilling measurements, you can draw your drill measurements on a piece of heavy paper and paste this on the back of the panel so that you have all your markings transferred and can drill from the template.

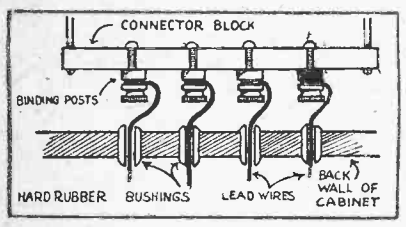


Figure 1—This shows how to have a connector block at back of set without cutting thru the back wall for the entire strip. Holes are drilled opposite the block and rubber bushings used to pass the wires thru the wall.

As the paste will dry out and the paper may shrink, it is necessary to drill the panel shortly after putting on the template.

Make Sure of Holes.

When you drill your panel be sure that the rheostat or other shafts will clear their holes easily, as otherwise an error in the mounting posts drill holes will throw the shaft off center and cause it to bind or scrape when it is turned.

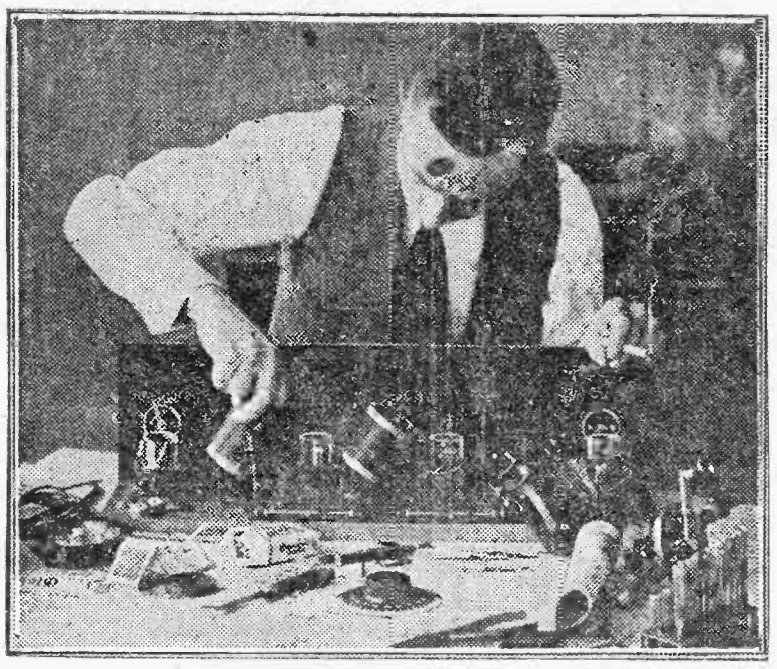
The art of the panel is important. This is the most conspicuous part of the set. It is to the receiver what the face is to a clock. To make it appear neat and practical is worth a good deal of study. Hence, match the proportions of the dials, knobs, etc., to the panel and so balance the panel that it will look attractive and inviting.

Engraving a panel by hand is a very difficult trick. The best practice is to send your panel to professional engraving companies. A concern now puts out a delcalomania series so that you can apply these to your panel and have an engraved effect with little cost or time.

In planning your panel it also will be wise to select your cabinet before you start your panel. Get a cabinet which permits you to keep your binding posts in the back. A simple method of carrying wires into the back of the set is to drill holes opposite the connector strip so that, with a special rubber bushing on each hole a neat lead connection can be made. Binding posts on the front of a panel look neat until you hook up a network of battery leads, and this is ruinous to a tidy appearance.

When you design your set so arrange that the panel will support all the parts, and when you remove the panel screws from the cabinet you can lift all the works out without loosening any connections.

The idea of mounting sockets and transformers on the cabinet base is



"I would emphasize the importance of making speed slowly when you begin your assembly. Think before you hook your wire to its place and think again before you put the iron on it and solder the connection fast."

poor practice. It is far better to use a bracket and shelf.

Proper Way to Solder.

When you start soldering use a clean iron, the best grade of solder with resin core or powdered resinos a flux. Keep yiur iron clean and tinned. Soldering is not difficult, but it requires considerable common sense in order to avoid burning insulation or your fingers and avoiding dropping solder into corners where it is not intended to run.

Before using the iron use a little acid flux to tin the iron. If you do not keep the iron clean, any oxide on the surface will cause the solder to collect in globules, and the heat will not be conducted evenly to the metal where the solder is to be applied.

For your wire use square tinned bus wire of heavy size, No. 14 preferably. Make your leads run as short and straight as possible. Avoid parallel wires. Bend on the square side of bus wire. Use a small radius for angles. A convenient wire bender is illustrated.

The art of assembling consists in so allocating the different units that your wiring is as simple as possible. If you spread your parts more to make a symmetrical panel layout than a "short lead" hook-up, you are certain to lose by the process, and these losses can be so serious that no end of howling and squealing will be heard in your set.

One of the mistakes the home

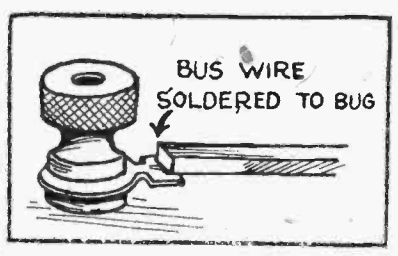


Figure 2—Use a flat lug on the binding posts rather than turning your bus bar wire around the post. The flag lug will tighten up hard, while it is not easy to make the nut tighten up on the bus bar wire.

builder often makes is to try to get too much apparatus in too small a space. It is better to have ample room in the cabinet than to have to bunch up the connecting leads or force parts into corners where you will have difficulty in making inspections or repairs.

Another precaution to observe is to allow adequate clearances so that if your condenser plates are full out they will not come close to other parts of the circuit, or vary the electrostatic coupling with other parts of the circuit, or when the tubes are in the sockets they will not hit the top of the cabinet even when adapters are used.

Visit a Radio Factory.

A part of every set builder's experience should be to visit a radio factory

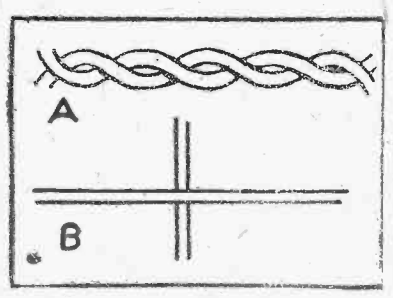


Figure 3—Twisting wires on low frequency or audio circuits will reduce the tendency to pick up energy from other circuits, but the twisting should be uniform for both wires so "cabled." See "A." Where wires used in radio-frequency circuits must cross they should cross at right angles, as in "B."

if he can observe how equipment is speeded thru in production. Regardless of what the apparatus may be, there is value in such an experience.

You will note in a head set factory, for example, that the cores are not magnetized until the last part of the receiver is assembled so that iron dust will not accumulate on the core. You will note how automatic motors are used to wind the bobbins an exact number of turns and then stop. You will note that standard tests are applied from stage to stage to catch the many defects which are continually

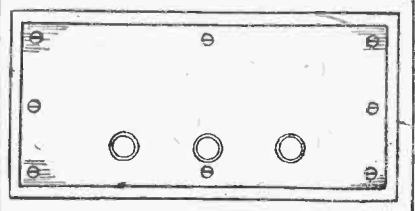


Figure 4—Keep your panel or alter screws all "lined up" to give a workmanlike appearance to the receiver.

occuring due to material, machinery or the human factors.

If you profit by a tour of a radio manufacturing concern you will appreciate how easy it is to have spoilage under conditions where routine production can make it profitable to spend large sums to guard against just this loss and waste. Obviously, you, as an individual, have a thousand times as much chance of wasting material and supplies.

Therefore, I would emphasize the importance of making speed slowly when you begin your assembly. Think before you hook your wire to its place and think again before you put the iron on it and solder the connection fast. Otherwise, you will finish the job and spend six or seven hours trying to find the reason why the set doesn't work well.

Seven Trouble Points.

Here are a few places where you easily can go wrong:

1. Getting the rheostats on the wrong side of the filament leads.
2. Reducing your adudio-transformers and making them step down and not up. Be sure to get the secondary end to the grid which is farthest from the center of the coil.
3. Grounding a filament to a B line.
4. Putting the aerial on the secondary coil.
5. Keeping your amplifier jacks correctly connected.
6. Grounding condensers thru shields.
7. Short circuiting on cross-over connections.

These will suggest a few points which may seem silly, but which even experienced experimenters repeatedly go thru. The mistakes are due to lack of concentration while wiring. With your thoughts on a squirrel hunt or a football game, you easily can fix a wire to the wrong point and later find it peculiar that the filaments burn out when the circuit is tested. Keep your mind on your work.

Incidentally, don't do soldering or switching of wires with your tubes in or your "B" batteries on. It is so easy to short circuit the batteries that you will earn a good deal by not ruining your batteries. You save time by disconnecting them.

Back of your wiring and assembly bear in mind that every loose connection means serious annoyance later. Every screw should be tight and locked if possible, and each time you dismantle the set to add a part be sure the screws are all tight, otherwise you may have some movable shaft or dial binding later.

It is good practice to solder the nuts to the screws where no later alteration is normally expected. This will also prevent setting up a current where two different metals are in contact.

The ordinary post connection made tight with a thumb nut is not a satisfactory connection. Better to solder it. Solder everything. Use no loose connections anywhere. Then your set will be functioning regardless of how it may be banged or misused.

Consider Stress Factors.

Again, be careful not to put heavy mechanical strains on panels or other parts which are unable to stand up under serious pressures. For example, don't expect a 3-16-inch panel to hold ten condensers. Better use ¼-inch panel regardless of what is loaded on it simply to avoid the possibility of warpage. Don't have tap wires so joined that an accidental touch of the hand will break off the taps. Don't have a shelf of such weak material that you will crack or break it if a tube has to be forced into a socket. Don't bend bus wire once, then bend it again at the same point. To do so weakens the wire, and it may break later when you don't want it to break.

You should also use heavy enough screws to assemble units. A small weak screw may be handy, but if you will get the exact size you need and not merely take the first screw you find, it will obviously be more satisfactory in the end.

Another thing to keep in mind is that your wiring may sag or be jarred to short circuit at some point. So devise the wiring that your connections are shock proof in this respect.

Line up your panel and other screws so that the slots will all be in one direction. The requires use of tightening nuts from the back, but it gives a style to the panel which is seriously lacking unless this is carried out.

Ruggedness is a virtue in any receiver. The more shock a set will withstand without the failure of parts, the longer it will give service, for the life of the receiver is not its hours of use but its hours of misuse. Incidentally any connection which can become a loose contact will create noises and aggravation enough to cost you the price of a new set. Altho you may have 300 soldered connections, it only takes one poor one to ruin the results of the outfit.

Power Tubes and Spaghetti.

Some allowance also should be made for the extremes of temperature to which the set may be subjected. This involves mainly the workmanship and material of the cabinet, the material and thickness of the panel, and the number of tubes inside the set.

If using power tubes or over four tubes, it may be desirable to have ventilating holes in the back wall of the cabinet as well as the bezels on the panel.

Spaghetti may or may not be used in the wiring of a receiver, depending upon the preferences of the builder. My own feeling is that if you use a heavy square bus wire spaghetti is not essential or desirable.

The purpose of spaghetti is to insulate, and if the wiring is rigid enough the air will afford the most satisfactory insulation. Where light wire is used spaghetti is required and it permits bending of leads into small space. This, however, increases the

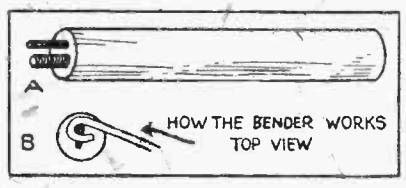


Figure 6—A useful wire bender (see A) for square or round wire. This may consist of a heavy nail, with the head filed off, and a "wire nail," also beheaded, separated about the thickness of the wire used, and, finally, held in a metal or wooden rod. This will shape a wire around for a binding post neatly. "B" shows how the bender works, a top view being given.

inductive and capacity coupling along the circuit and the spaghetti absorbs a certain amount of energy, being an imperfect dialectric.

For the novice who likes to show his set to friends, the use of colored spaghetti is an interesting way of indicating filament leads, "B" battery leads, grid leaks, etc.

A receiver built in a glass case, with rainbow colors of spaghetti, certainly is impressive, and if you are building a set for a friend who may not know much about the art, colored spaghetti may simplify his problems when looking for troubles, or trying to avoid them. It is difficult to make

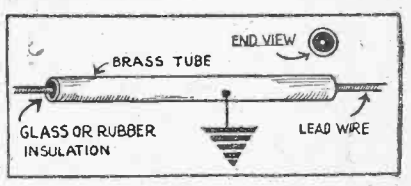


Figure 5—When a wire must be carried from one end of the set to the other it can be shielded by use of a cross sleeve which is grounded. The wire, of course, is insulated from the sleeve by rubber or glass.

spaghetti look as neat as plain bus wire and it costs more than an insulation.

Use Rigid Wire in Hook-up.

The use of flexible insulated wire in any part of a receiver is not desirable. This is not meant to apply to pigtail connections to moving elements. Flexible wire is sometimes used to connect up the taps of an inductance, which does not increase the neatness of the job, and it may afford a high risk of breaking the tap-turn on the inductance should the hand brush against the leads. The use of rigid wire is preferable, altho the panel taps may be so close together that only light wire can be used.

In assembling your set try to ar-

Continued on Page 15.

QUESTIONS AND ANSWERS

HOOK-UP FOR AUTOPLEX.

701—CHICAGO: I read in The Chicago Evening Post Radio Magazine on the hook-up of M. L. Muhleman's Autoplex set and would like to have the hook-up, if possible, for one stage of radio-frequency, detector and two stages of audio. I have four tubes not working and a panel complete to experiment with.

Radio-frequency has not been wholly successful on the Autoplex set, because it kills the super effect that is one of its greatest features. This subject will be discussed in the near future in The Post Radio Magazine.

736—Chicago: Will you be good enough to send me in inclosed self-addressed stamped envelope, hook-up of the best wave trap, which I am told was offered in your issue of Thursday, Nov. 15. My congratulations. The Radio Magazine supplement is superb. Keep up the good work.

The hook-up of wave trap is published again in this issue. It appears on another page.

607—CHICAGO: I read the Thursday edition with much interest. I was much interested in Muhleman's Autoplex contribution, and I would like very much to get a lettered and notated drawing with one stage audio-frequency and one stage of radio-frequency added. Can you furnish the drawing or tell me where I can get one? Will gladly meet the charge for same.

The Autoplex hook-up with one stage of audio-frequency was mailed you. Radio-frequency is not advised because it kills the super effect which is one of the Autoplex's greatest features.

PARTS NAMED FOR HOOK-UP.

626—CHICAGO: I have an Atwater-Kent variocoupler; Atwater-Kent variometer; one 43 and one 23 plate vernier condenser; one 10 to 1 all-American audio-transformer; one 5 to 1 all-American audio-transformer; two all-American radio-transformers; three WD-11 tubes, rheostats, batteries, etc. I imagine that these highly seasoned ingredients, properly mixed, should produce a diet fit for the Gods. All I seem to need is a recipe. May I please have it?

We have mailed you hook-up which will give you excellent results on the proper aerial, which should be of the "L" type one wire, 100 feet long, six to ten feet above all obstacles.

WANTS MORE DISTANCE.

627—CHICAGO: I would appreciate any suggestions as to how to get more distance out of the submitted hook-up; I find it highly selective, and it gives great volume for all Chicago stations. I have also heard WTAS (Elgin), and Kansas City Star, and Jefferson City, Mo., so faintly as to be almost inaudible. The set consists of Radio Products Manufacturing company variocoupler and variometer; Thordarson 43-plate vernier condenser; adjustable grid leak with standard grid condenser; Howard 40-ohm rheostat, 22½-volt "B" battery; UV-199 tube, operated on three dry cells in series, and Dictograph 3,000 ohm headphones. My aerial is 100 feet in length and consists of seven strands of No. 22 copper wire. It is on the roof of a three-story apartment building. It is five feet above the roof and extends north and south. Lead-in wire runs down to first floor, and is sixty feet long. Set is grounded to radiator steam pipe. I am practically unable to get stations outside of Chicago, whether Chicago stations are operating or not, altho I have been told that such a hook-up should have a range of 1,000 to 1,500 miles. Your Thursday Radio Magazine certainly is a winner. You are to be congratulated upon going into the radio field in such a big way.

Your hook-up, as submitted, is O. K. Are you using 40-ohm rheostats? Would advise using forty-five volts of "B" battery on the plate of your detector tube.

ERLA TWO-TUBE REFLEX.

618—CHICAGO: I have enclosed a self-addressed and stamped envelope in which I want you to send me a complete list of parts necessary for the building of the two-tube Erla Reflex Circuit, also give the distance which this set should be able to get. Please send it right away, as I am in a hurry.

If you refer to page 4 of Nov. 15 issue of Radio Magazine Section of The Post, you will find most of the information required. Parts also are listed on diagrams of article on Erla Reflex of Nov. 22 issue. However, here they are again:

One 180 degree variocoupler, twelve switch points, four switch stops, two inductance switches, one 23-plate variable condenser (vernier), one 11-plate variable condenser (vernier), one 25-ohm rheostat, two tube sockets, two 201-A or 301-A vacuum tubes, one No. 1 Reflex transformer, one No. 2 Reflex transformer, one 5-to-1 auto-transformer, one crystal rectifier (fixed), one .001 fixed condenser, one .002 fixed condenser, one .00025 fixed condenser, one loud speaker jack, six binding posts, four dry cell (1½ volts each) "A" batteries, or 16-volt storage battery, three 45-volt variable "B" batteries, fifteen feet No. 12 B&S gauge tinned copper wire, twelve feet bell cord wire for battery leads.

Better buy a synthetic crystal as galena will not stand up in a reflex circuit so well, altho it gives greater volume. Let us know with what success you meet and send a photo of your set after it is made.

AUTOPLEX AND AMPLIFICATION.

137—CHICAGO: Please mail me a copy of the Chicago Post Autoplex circuit and advise as to the results which are possible with UV-199 tube and the use of a "C" battery (negative of battery to grid, positive of battery to negative filament). Also advise me as to whether radio and audio-amplification are applied as in other sets. Have both the UV-199 tube and the "C" battery and would like to utilize them.

Autoplex circuit and construction details were printed in The Post Radio Magazine Nov. 28. The UV-199 tube has not enough capacity to handle the super-regenerative currents in an Autoplex set. Audio-frequency may be added in the usual way. Radio-frequency is not successful so far, in experiments made by The Post and others.

AERIAL AND GROUND DATA.

135—CHICAGO: Just picked up a one-tube set which I will send to a friend in a remote location in Wyoming and I want it to receive from as great a distance as possible, so will you give me explicit directions as to the antenna, kind of wire, length, height from ground, etc.? Country location, no water or pipes. What kind of a ground connection? Haven't the set at home yet, but, to best of recollection, the parts consist of a plate condenser (15, I think), two stationary spiderweb coils about one-half inch apart and a filament control rheostat grid leak. Congratulations on The Post Radio Magazine section and the daily department. Just what I wanted, as I have to buy The Post anyway on account of Rig and O. O. McIntyre.

Under the conditions specified, a one-wire aerial of No. 14 stranded copper wire, 150 feet long, well insulated at both ends and approximately twenty feet to thirty feet from the ground, would be ideal. The lead-in wire should be soldered to one end of the aerial, not the middle, and should be of No. 14 rubber-covered wire. For a ground, a connection to a water pump or to a well would suffice. If this is impossible, drive an eight-foot length of galvanized pipe into moist earth and solder ground wire to top.

AUTOPLEX HOOK-UP.

107—CHICAGO: Will you please advise if you have the complete information concerning the Muhleman Autoplex receiver, and if so if you can advise me what the hook-up is and an itemization of the parts which I would have to buy best suited to this receiver?

Hook-up is given in the Nov. 28 issue of The Post Radio Magazine with list of parts and construction details.

FREE SERVICE

QUESTIONS asked on any subject pertaining to radio will be answered in this department in either the daily edition or The Radio Magazine section published each Thursday. No charges are made for this service. If personal reply is desired by return mail, enclose self-addressed and stamped envelope. Write on only one side of the sheet, and where a check is desired on a faulty circuit be sure to send legible diagram as used in the hook-up.

WANTS TO LEARN RADIO.

109—CHICAGO: I was very much interested in your article on page seven of your Radio Magazine for Nov. 15, describing a one-tube set of considerable power and effect. I am absolutely green in the matter of radio tho I formerly was in the electrical business for a number of years, and have at the present time only recently purchased a small crystal set. I wanted to really learn something, and thus endeavor to build a set for myself. Your description of the Muhleman Autoplex outfit interests me. I am wondering whether you will give me an accurate list of the parts which I should buy in order to be able to set this up, and also if it is possible to get a more clear description of the hook-up itself. While I am interested in out-of-town stations to a certain degree, I am particularly desirous of being able to get our local stations and cut them out with some degree of definiteness one from the other. Perhaps you could tell me whether this set would accomplish the desired result as well as getting out of town. Incidentally, can you recommend any simple elementary booklet which will tell me as to something about what radio is, and how it is handled thru the different instruments in a set?

Below is given a list of parts and hook-up of the Autoplex receiver. A good book on radio for your purpose would be the Lefox Radio Handbook. See Nov. 18 issue of The Post Radio Magazine for construction details. List of parts: Two noulded variometers of high-ratio inductance, one 1,250-turn D. L. coil, one Western Electric 216-A or VT-2 tube, one socket, one 6-ohm rheostat, one 7x14x3-16 panel, two 3-inch bakelite dials, seven binding posts, 150 to 200 volts large "B" battery, one 80-amp. storage battery, baseboard, wire, screws, cabinet, etc.

AN OPEN CIRCUIT ERROR.

106—CHICAGO: We are very much interested in the Muhleman one-tube circuit in The Post's issue of last Thursday. We note that the diagram of the circuit shows that the plate variometer is open. Is this correct or unintentional? One or two of our boys are experimenting with this circuit, and have had fairly good results.

The plate variometer is not open. It was shown that way thru error of the artist. We hope that this has caused you no trouble.

TOO MUCH "ROAR" IN AUTOPLEX.

No. 108—Chicago: Following the diagram in the Radio Magazine of last Thursday's Post, I hooked up an Autoplex circuit. Realizing the importance of the material used, I bought two R. P. M. variometers, moulded, a 1,500-turn Remler coil and included a 30-ohm General Radio Rheostat. Decided to try a CW-299 tube with 45 volts of B and 4½ of A battery, also a "C" battery of 3 to 4½ volts. The city stations come in very loud, in fact at times are uncomfortable with the headset. But there is considerable noise. Not so much when tuning in the local stations thru, altho there is quite a bit of interference with them. But it is practically impossible to do anything with distant stations, due to the noise. The stations can be brought in as far as knowing they are there, but it is generally impossible to distinguish the initials or location. The noise is not a whistle, but a roar. Touching a finger to the aerial post reduces it slightly. A variable condenser tried several places in the circuit does not do any good nor is any help found from a wavemeter. Would like your suggestions as to what might eliminate this noise, as I think the set really would be a "knock-out" if that could be done.

The results you have obtained with a UV-199 tube are very good. Noise results probably because the UV-199 has not the capacity to respond fully to the super-regenerative currents in the Autoplex. Would advise using Western Electric 216-A or VT-2 tube, 6-ohm rheostat and 150 to 200 volts of "B" battery. The set is fairly selective and sharp tuning is a characteristic. Tune slowly and carefully with vernier knobs or rubber tip lead pencil.

326—Chicago: Is the hook-up which I submit for the wave trap shown in your Radio Magazine issue of Nov. 28 correct? If not, please tell me what is wrong. I have made one and hooked it up which works very well as an amplifier and makes the volume about one and one-half times its original weight. I would appreciate this information very much. It does not work as a trap.

The hook-up which you submit is entirely wrong. The circuit is as shown by diagram mailed you. I note also you are using eleven-plate variable condenser. If you are using the coils just as specified by The Post radio service department you will require 43-plate variable condenser. Some dealers have been selling mounted coils which were designed and built for neutrodyne circuits with the belief that these will answer for this wave trap. They will not do this, as the ratio of winding is entirely different from that of the coils designed for the wave trap. You will note that coil "B" is shunted by the 43-plate variable condenser and is not in series as you have it in your diagram. You will note also that a ground connection goes on one end of the inside, or "A" coil instead of to one terminal of the outside, or "B" coil, as you have it. The other terminal of the inside coil is fastened to the ground post of your receiver. The aerial connection to your receiver is not changed. Every failure reported to this department of this wave trap has been due to errors in hook-up and construction of the coils. If our instructions are followed implicitly, this wave trap will prove very effective under all conditions.

Set Won't Regenerate.

210—CHICAGO—I am submitting hook-up. Kindly check up as the set does not regenerate. Is this the hook-up you would advise with these instruments? Have an outside aerial 100 feet, single wire thirty feet, high. Am using Radio Products Manufacturing company molded variometers and Murdock variable condenser. Detector tube UV-200, amplifiers UV-201A. Am inclosing addressed envelope for reply.

We suggest that you place variometer next to plate of tube at point marked XX in diagram mailed you and short wire across where variometer was removed. Otherwise your hook-up is O. K.

FLEWELLING CIRCUIT.

113—CHICAGO: I have a Flewelling five-bank condenser hook-up I have been using for a year. In your Radio Magazine section Nov. 15 I see there has been a change. Will you please give the hook-up Q and A-10 with capacities. Mention capacities of each: Transformer ratio, grid leaks and variable condenser. Want to operate loud speaker. What is winding on stator and rotor and taps, etc.? Hurrah for the Radio Magazine section every Thursday. Hope it brings success.

Hook-up is given on this page. The values of parts are as follows: Variable condenser, 23-plate; grid condenser, .00025 mfd.; grid leak, variable, 0-5 megohms; transformers, first stage, 5 to 1 ratio second stage, 3 to 1 ratio; rheostat ohmage is according to tubes used. A variocoupler is not advised. Use 50 to 75-turn coils. Detector B battery is 45 volts. Amplifier B is 90 volts.

133, CHICAGO: Can you send me instructions and diagram how to add one or two stages radio-frequency set to a Colin Kennedy set?

The information wished must be obtained from manufacturer of your set, who will gladly give you the desired information.

CRYSTAL HOOK-UP.

221—CHICAGO: Will you please show hook-up for a good crystal set using 43-plate condenser?

The hook-up wanted was mailed you.

Wave-Trap Hook-Up

Continued from Page 9.

little time ago. I want to say right here that it is the best thing I have yet seen. I have spent enough on books and magazines dealing with radio to know what I am talking about. The wave trap directions published in that issue work fine. I know of two or three who have made one already from looking at the diagram.

I was wondering if I could secure the Radio Magazine without subscribing to the Chicago Evening Post. My father takes one Chicago daily and does not care to change papers or to subscribe for another one. I have heard several say that they would like to have the Radio Magazine, but like most all "radio bugs," they are always short of money.

I believe that if your subscription manager would make a special offer of the Chicago Evening Post and the Radio Magazine something like this it would take well in the rural sections. Have The Evening Post sent about twice a week, say, Tuesdays and Thursdays. It is generally conceded that The Post has the best market section of any of the Chicago papers. The plan I have merely suggested as a means of introducing The Post. Another reason I believe that my suggestion would prove feasible is that the young people of the country districts are beginning to take a real interest in radio and are looking for reliable information about various sets and circuits.

I would like to hear from you as soon as convenient, and I am trusting that some way will be found for meeting the popular demand.—WILLIAM G. TALCOTT, Williams, Iowa.

Buffalo Woman Tunes-In England

Mrs. Anson L. Roberts of 157 Park street, Buffalo, N. Y., enjoys the distinction of being the first woman radio enthusiast to tune-in an English station.

It was during one of the "stand by" periods while WGR of Buffalo remained silent that Mrs. Roberts tuned-in one of the British stations.

After listening eagerly for several minutes to an orchestra playing a catchy waltz, she distinctly heard the announcement, "2LO, the British Broadcasting company at Strand, London." After this the same voice repeated "WC2" several times.

Mrs. Roberts has written for confirmation of the selection which she heard, at the same time expressing her satisfaction in being able to pick up such long distance transmission. There were several American stations sending at the time, none of which interferred with her tuning.

Autoplex Colt-Breakers Tame Wild Bronchos of Radio Trick Circuits

The Post Autoplex family seems to be settling down to real earnest work. Reports are coming in by the scores, showing that many are mastering the bucking broncho of radio, and some have bridled it, fastened on the horn saddle and are beginning to make it do high school circus tricks.

Most of the trouble came from several hundred split variometers that were sold by dealers thru error. Split variometers work fine on the Grebe circuit, on the Miloplex and some others of special design, but, when it comes to the wild and woolly Autoplex they simply won't do.

Just as soon as The Post broadcast the source of trouble, radiophans who were beginning to cuss and go into paroxysms of grief patched up the split and the old Autoplex began to percolate.

And how she do percolate!

The Post has received reports of achievement from many. Some of them are almost unbelievable. One radiophan "brings in everything nightly from coast to coast," he writes and does it with just the one tube (VT-2 or 216-A) and on a loud speaker.

Most of the complaint from the Autoplex comes now from those who say that they find a world of station whistles, get all the wild shrieks and yowls of a frightened menagerie, but no voice or music. There's a reason for this, of course, as Charles Poston was wont to say.

Hard to Control.

The chief reason lies in the fact that careful tuning isn't used. Understand that this Autoplex fellow isn't a very tame sort of a cuss. He's as wild as they make 'em. And eccentric? Say, he's the most stubborn, erratic sonofagun you ever ran across in Tombstone valley!

Old Autoplex is sharp as a Damascus blade. You'll have to split a hair every time you find a station signal. And on every side of that hair are the most fiendish howls and yowls you can imagine. Just a microscopic turn of the dial either way and you've started something.

The whole secret lies in keeping the circuit in balance—a perfect balance. Just let one variometer, which controls the grid end of the circuit, go a little too far away from the resonance point of the other variometer, which is in the plate end, and Old Autoplex will begin to buck and even "Hoot" Gibson of movie fame wouldn't be able to calm her down. And "Hoot" is supposed to be good enough to take the worse maverick on the whole darn ranch and make it eat sugar out of his gloved hand.

Some of the radiophans say they are getting all the stations in the universe, but barely audible even on the phones, least of all with volume enough to operate a loud speaker. Their trouble, undoubtedly, is from two sources. The chief one is insufficient "B" battery. The other is improper tubes.

First of all the tube is an important factor. It must have enough external capacity to carry the great volume of energy that is sent thru it with the 1,250-turn inductance coil.

The smaller tubes like UV-199 won't do. Their internal capacity is too small. Neither will the WD-11 and WD-12. The UV-201-A and C-301-A serve fairly well. The VT-2 and the 216-A (five-watters) are better.

Call for High Plate Voltage.

But none of these will give full volume without all the plate battery they will stand. The 201-A and 301-A tubes are rated to take up to 100 volts from the "B" battery. They'll stand 110 to 120 without injury, if not so employed continuously. They will even stand 130 volts occasionally. If you expect them to work efficiently—that is with loud speaker volume, give them the full plate limit. Some tubes will stand more than others of the same make. You'll have to experiment. Shoot the plate voltage on until you see the tube begin to turn blue. That's your signal to lower the voltage.

On the power or five-watter tubes some of these will handle as high as 300 and even 350 volts. They won't operate on anything much lower than 150. Given 'em all both your pocketbook and they will stand.

I am publishing here a few letters received from Autoplex constructors the past week. The Question and Answer department has a number of others. If you are having trouble better look those over in the information columns of that page.

RADIO EDITOR: I am coming to you in despair, almost at the verge of despair, about this jinx Autoplex receiving set. For three weeks I have been concentrated upon that devil of a power machine, but all my coaxing, patience and efforts have been in vain in these respects:

(a) I have cut to innumerable lengths the aerial, even using the 34-foot long lead-in.

(b) I have used the ground in any position, finding the best possible position with the aerial, this to be connected on the ground's post.

(c) I have added two honeycomb coils between the two variometers, then taken out and replaced instead different lengths, rounds of two spider-web coils, the present ones being seventy turns.

(d) I have used condensers, different strength, and coils at the main connection with the receiver, honeycomb 75 turns, and now having there a good size of spider-web around. It must be a hundred turns.

(e) I have varied the plate pressure from 16-45.

(f) I have used my body capacity to serve as aerial for city broadcasting on 360 meters.

(g) I have tried grid leak with and without condenser.

(h) I have devoted an unexhaustible quantity and quality of long-suffering patience, but the imp refuses to cease roaring like five express trains—wail, whine, whistle, nerve-racking shrieks, screams and, at the approach of any human being, flair up into uncontrollable fits. But the worst is that she refuses to catch up, absolutely declines to catch up any station broadcasting above 400 meter-wave length, but, still the worst that she has been doing with another, the force of another station will cause her to return her elemental fury and discard all her long-acquired civilization.

Mr. Wells, I am on the verge of—well, I hate to say it—and I am exceedingly fond of harnessing such devils. What a power there is in it!

My variometers are the cheap kind, $2 a pair; but well constructed, all pig-tailed, and Drake, Elgin, Zion City and East Pittsburg all come with equal force, impossible to detect any differnce in distance. Still, that's all I get. I am sure there are many other stations, but somehow they pass over our humble roof.

There is one, or, rather, two more experiments I like to make with it and that is to try a variocoupler across the aerial. This in the hope of having variations in the wave length. Is it possible?

The other is the one for which I am writing to you chiefly—the honeycomb coil. I am using 199 tube. Do not care for the loud speaker, but wish the distance. Now, it occurred to me that, perhaps, the 1,500-turn coil is too much for it, and that a coil having, say, around 1,000 turns, may enable me to tune in up to 600-meter wave length without wrecking my mental, moral and spiritual nature.

Is there any other way to eliminate that terrific roaring?

Is there a way of comfortably increasing the wave length?

Is there a way to harness all that power and have it serve to good purpose?

Is there any constructive suggestions you can offer? Is there any one in your department who can look over this unruly imp? I have spent money on it, and most of the parts will be useless.—V. Y. GULESERIAN, 44 North Ashland Avenue, Chicago.

(Most of your questions were answered last week in this magazine or in this week's issue. The 1,250 coil works best. Instead of adding all the trappings why not follow the simple hook-up given you in these columns? That is the way others have succeeded.)

THIS READER HAD SUCCESS.

RADIO EDITOR: I have been experimenting with Autoplex receiver as described in your Radio Magazine of Thursday, Nov. 22, and wish to state my results.

I found that the tuning was very broad and that it was difficult to clear up the reception so I shunted a .0005 M. F. (23 plate) variable condenser across the grid and ground with the rotor plates to the ground. This gave exceedingly sharp tuning and did away with all growling and roaring. WGY, KDKA and WOR came in as loud as a two-step with absolutely no interference or howling. In three nights of listening-in I have logged fifteen broadcast stations and twenty-three amateurs.

I have also tried a variable grid leak across the grid and filament, using a ground only and shunting a condenser across the phones with no success. I did find that a 1,250 turn honeycomb coil works better than a 1,500 turn. I believe there is great possibilities with this circuit and am working to make it a "world beater."—MILTON RAMSER, 1222 Nineteenth street, Rock Island, Ill.

HAS TOO MANY "NOISES."

RADIO EDITOR: I have constructed an autoplex receiver with one stage of audio-frequency amplification hooked up according to the diagram given.

In some respects it is quite satisfactory. Using a homemade loud speaker consisting of a Baldwin type "C" unit and a pasteboard horn, I can get Pittsburg with sufficient volume to fill a room as loudly as a phonograph. However, it does not do things you say it should. I cannot get anything at all using the ground as a receiving agent. I have not been able to get anything farther away than Pittsburg and Kansas City, which I think is due to the fact that reception from distant points is drowned out by noises, which I have not been able to eliminate.

You lay so much emphasis on having the correct kind of variometers that I am wondering if you can tell me whether those I am using are suitable. They are a style sold by Kresge at $2 each. They contain sixty turns of cotton-covered wire in stator and the same number in the rotor. The stator windings are inside the frame close to the rotor windings, and the frame of both elements is a very light fiber construction, so arranged that there is a minimum of supporting material in contact with the wires. Altho these variometers are cheap, their construction seems good to me, but I should like to have your opinion on this point.

I am using two C-301A tubes, a six-volt "A" storage battery of sixty-ampere-hours rating and 100 volts of "B" battery. Bay-o-vac. The impedance coil is a 1,250-turn honeycomb, and there is a 100-turn honeycomb coil in series between each variometer and its connection to the tube.

I have found that by placing a twenty-three-plate condenser across the primary of the audio-frequency transformer I can often reduce objectionable noises considerably, but still have a great deal of trouble from that cause. Can you suggest anything which would be likely to reduce this noise trouble?—MILTON V. AYRES, 400 North Michigan Avenue, Chicago.

The variometer may look good, but not have the high ratio of inductance necessary. If you will try a better constructed set of variometers I am sure you will get better results. The noises are natural and should continue until you have both variometers timed into the signal. Then the set becomes quiet. Perhaps you are not timing close enough. Better employ a vernier knob or a lead pencil with rubber tip.

THIS AUTOPLEX WORKS.

RADIO EDITOR: Using the "Autoplex" circuit you published, with loading coils besides a 1,250-turn honeycomb inductance, and a UV-201A tube on 135 volts of "B" battery, my set drew 'em in as follows: KDKA, KOP, WTAS, WGY, WOR, WHAZ, WCBD, WBPA, WOS and KFI. Not so bad! I use a 65-foot one-strand antenna—DONALD A. HIRSCH, 2558 Southport Avenue, Chicago.

Conducts Class in Radio with a Ten Weeks' Course

EDWIN GOODRICH, instructor in Springfield, Mass., Technical High school, who is giving a series of radio lectures at Station WBZ.

Railway clerks, barbers, accountants, machinists, farmers, electricians, school boys and university students are among the many who are taking the course in "Radio Communication" now being broadcast from station WBZ (Springfield, Mass.) weekly, by arrangement with the extension division of the Massachusetts University.

There are also lawyers, engineers, principals of schools, chemists, besides a music teacher and a retired naval officer who are anxious to delve further in the mysteries of radio.

The course in radio, which is in charge of Edwin Goodrich, an instructor in the Springfield Technical high school, began Oct. 3, and will continue every Wednesday evening until the ten lessons composing the course will be sent out. The course is quite complete, and will help the radio listener to understand the functioning of the receiving set he is using. Diagrams are furnished with the course so that the students can follow the transmission by the instructor as given from the station.

Any radio fan who has a radio receiving set can enter the course. Of course, anyone can "sit in" on the lessons as they are broadcast, and enjoy the lectures.

Protect Grid Leak

Protect your grid leak, if of the open or common type, from moisture or atmospheric changes. The pencil or graphite mark which constitutes the leak absorbs moisture and collects dust, changing its value as a resistance. The leak should be mounted in a small box or placed under a tightly fitting cover.

How to Operate Radio Head Set

One of the most delicate and sensitive parts in a radio receiving set is the phone or head set. Yet it is one of the most abused.

Realizing the importance of proper care of the receiver one manufacturer—the Nathaniel Baldwin company—issues special instructions with each of its sets sold. These instructions might serve any head set, whoever the maker may be. They follow:

"The receiver depends for its sensitivity upon a movable armature superimposed in a concentrated electro magnetic field and subject to the effect of magnetic action.

"Proper care is just as essential to the continued efficiency of the receiver as it is to any delicately adjusted instrument.

Keep Out Dust.

"For instance, the receiver must be kept away from dust or dirt. If a little steel shaving gets into the armature space in the coil it will cause a great deal of trouble. Even if the receiver is never opened it should be kept in a dust proof box or bag when not in use. It is amazing to see the amount of dirt, dust and shavings, etc., which will find their way into the receiver to cut down tremendously on the efficiency.

"If it is necessary to open the receiver case do not place receiver face down on table unless inside ear piece. Under no circumstances, press on diaphragm, or tamper with adjustments.

"These headsets are very carefully adjusted at the factory and any tampering with the receiver will disturb the adjustments and injure the efficiency of the phone.

"Never take a receiver off the headset and replace with another or send one unit alone for repairs. These phones are matched to each other very accurately at the factory and it is necessary to adjust the entire set when one unit needs repairing.

Falls Injure Head Phones.

"If there is anything wrong with your set, send it to the factory for repairs, stating just what trouble you have had and under what conditions.

"A hard knock or fall may injure any phone so severely as to render it inoperative.

"Keep ear pieces screwed on tight.

"Do not keep receivers in either a damp or extremely hot or cold place.

"The Baldwin type 'C' unit attached to a horn makes a very satisfactory loud speaker. It is equipped with a heavy diaphragm and tightly adjusted for this work.

"A headset, on the other hand, has thin diaphragms and a looser adjustment, making it more sensitive but it is not so satisfactory for loud speaker use it has a tendency to rattle on extremely loud signals.

Polarity Makes No Difference.

"When connecting the cord terminals to the set it is not necessary first to determine the polarity. The terminals may be interchanged without interfering with the operation or the efficiency of the phone.

"'B' battery voltage as high as 200, or slightly higher, may be used safely. If you use a different type of ear piece on a single unit for the loud speaker be sure that it has a ring or flange exactly corresponding to the one in the regular type 'C' ear piece.

"Do not try to make a pair of headsets from two single units as they are equipped with heavy diaphragms and they are not matched with each other. Poor results will be secured if this is done."

St. Paul Now Has Station and Studio of Its Own

ST. PAUL, Minn., Dec. 14.—St. Paul made its debut as a permanent radio broadcasting station last night with the program from the new studio just completed in the St. Paul Athletic club. Regular programs will be broadcast alternately with those from Minneapolis over WLAG, the Twin City Radio central, operated by the Cutting & Washington Radio corporation, in Minneapolis, the St. Paul studio becoming a permanent unit of WLAG. Heretofore, irregular St. Paul numbers were broadcast from the Minneapolis studio or an emergency St. Paul studio.

Eleanor Poehler, one of the three women in complete charge of a radio broadcasting station, who has been in executive control of WLAG the last year, also will have charge of the St. Paul studio. The St. Paul Athletic Club orchestra, better known as the "Call of the North" orchestra, was one of the features of the dedicatory program. Paul Johnson, WLAG announcer, introduced the other studio personnel.

The new St. Paul studio will be conducted under WLAG's "Community broadcasting plan," with St. Paul commercial and civic associations and business concerns subscribing to programs. These include the St. Paul Retailers' association and the St. Paul Jobbers' association.

Too Many 'Tongues' Make India Radio Impracticable

Diversity of language in India is one of the greatest difficulties in popularizing broadcasting in that country.

A projected super-broadcasting station in Delhi was considered impracticable when it was discovered that a news program of 500 words, if translated into the many languages of India, would take twenty-four hours to transmit.

Wireless is being used successfully in India to send messages over a mountain 15,000 feet in height. Previously considerable difficulty was found in wire communication because of snow and storms which severed the wires. This achievement has been effected between the cities of Srinagar and Jammu, in Kashmir.

Alphabetical List of U. S. Radio Stations

ABERDEEN, Wash.—KNT.
ABILENE, Texas—WQAQ.
AGRICULTURAL COLLEGE, N. D.—WPAK.
AKRON, Ohio—WOE.
ALBANY, N. Y.—WNJ.
ALEXANDRIA, La.—KFFY.
ALLENTOWN, Pa.—WCBA.
ALLENTOWN, Pa.—WSAN.
ALTADENA, Cal.—KGO.
AMARILLO, Texas—WDG.
AMARILLO, Texas—WQAC.
AMARILLO, Texas—WRAU.
AMES, Iowa—WOI.
AMSTERDAM, N. Y.—WPAS.
ANDERSON, Ind.—WABC.
ANN ARBOR, Mich.—WQAJ.
ANTHONY, Kas.—WBL.
ARDMORE, Okla.—WOAA.
ARLINGTON, Ore.—KFGL.
ASHEVILLE, N. C.—WFAJ.
ATLANTA, Ga.—WGM.
ATLANTA, Ga.—WSB.
ATLANTIC CITY, N. J.—WHAR.
ATWOOD, Kas.—WEAD.
AUBURN, Ala.—WMAV.
AUSTIN, Texas—WCM.
AUSTIN, Texas—WNAS.

BAKER, Ore.—KFDA.
BAKERSFIELD, Cal.—KDZB.
BALTIMORE, Md.—WCAO.
BALTIMORE, Md.—WEAR.
BALTIMORE, Md.—WKC.
BALTIMORE, Md.—WNAY.
BANGOR, Me.—WABI.
BANGOR, Me.—WPAY.
BATON ROUGE, La.—KFGC.
BAUDETTE, Minn.—KFGY.
BAY CITY, Mich.—WTP.
BEAUMONT, Texas—WMAM.
BELLINGHAM, Wash.—KDZR.
BELLOWS FALLS, Vt.—WLAK.
BELOIT, Kas.—WPAR.
BELOIT, Wis.—WKAW.
BELVIDERE, Ill.—WOAG.
BERKELEY, Cal.—KQI.
BERKELEY, Cal.—KRE.
BERRIEN SPRINGS, Mich.—KFGZ.
BILLINGS, Mont.—KFCH.
BINGHAMTON, N. Y.—WIAV.
BIRMINGHAM, Ala.—WSY.
BOISE, Idaho—KFAU.
BOISE, Idaho—KFDD.
BOISE, Idaho—WFFB.
BOONE, Iowa—KFGQ.
BOSTON, Mass.—WNAC.
BOULDER, Colo.—KFAJ.
BOWLING GREEN, Ky.—WNAB.
BOZEMAN, Mont.—KFDO.
BRIDGEPORT, Conn.—WKAX.
BROOKINGS, S. D.—KFDY.
BROOKVILLE, Ind.—WSAL.
BUFFALO, N. Y.—WGR.
BURLINGTON, Iowa— WIAS.
BURLINGTON, Iowa—WLAT.
BURLINGTON, Vt.—WCAX.
BUTLER, Mo.—WNAR.
BUTTE, Mont.—KFAP.

CAMDEN, N. J.—WRP.
CAMERON, Mo.—WFAQ.
CANTON, N. Y.—WCAD.
CANTON, Ohio—WWB.
CAPE GIRARDEAU, Mo.—WSAB.
CARTHAGE, Ill.—WCAZ.
CASPER, Wyo.—KFDF.
CAZENOVIA, N. Y.—WMAC.
CEDAR RAPIDS, Iowa—WJAM.
CEDAR RAPIDS, Iowa—WKAA.
CENTERVILLE, Iowa—WDAX.
CHARLESTON, S. C.—WNAQ.
CHARLESTON, S. C.—WOAH.
CHARLESTON, W. Va.—WPAZ.
CHARLOTTE, N. C.—WBT.
CHENEY, Kas.—KFGP.
CHICAGO, Ill.—KYW.
CHICAGO, Ill.—WAAF.
CHICAGO, Ill.—WBU.
CHICAGO, Ill.—WDAP.
CHICAGO, Ill.—WJAZ.
CHICAGO, Ill.—WLAG.
CHICAGO, Ill.—WMAQ.
CHICAGO, Ill.—WPAD.
CHICAGO, Ill.—WSAH.
CHICKASHA, Okla.—KFGD.
CINCINNATI, Ohio—WAAD.
CINCINNATI, Ohio—WIAG.
CINCINNATI, Ohio—WIZ.
CINCINNATI, Ohio—WLW.
CINCINNATI, Ohio—WMH.
CINCINNATI, Ohio—WSAI.
CLARKSBURG, W. Va.—WHAK.
CLEARFIELD, Pa.—WPI.
CLEMSON COLLEGE, S. C.—WSAC.
CLEVELAND, Ohio—KDPM.
CLEVELAND, Ohio—WHK.
CLEVELAND, Ohio—WJAX.
COLLEGE PARK, Ga.—WDAJ.
COLLEGE STATION, Texas—WTAW.
COLORADO SPRINGS, Colo.—KFCK.
COLORADO SPRINGS, Colo.—KFFQ.
COLUMBIA, Mo.—WAAN.
COLUMBUS, Ohio—WBAV.
COLUMBUS, Ohio—WCAH.
COLUMBUS, Ohio—WEAO.
COLUMBUS, Ohio—WMAN.
COLUMBUS, Ohio—WPAL.
CORVALLIS, Ore.—KFDJ.
COUNCIL BLUFFS, Iowa—WPAF.
CRANSTON, R. I.—WKAP.

DALLAS, Texas (portable)—KFFZ.
DALLAS, Texas—WDAO.
DALLAS, Texas—WFAA.
DALLAS, Texas—WRR.
DARTMOUTH, Mass.—WMAF.
DARTMOUTH, Mass.—WSAQ.
DAVENPORT, Iowa—WHAI.
DAVENPORT, Iowa—WOC.
DAVID CITY, Neb.—WRAR.
DAYTON, Ohio—WABD.
DAYTON, Ohio—WJAJ.
DEARBORN, Mich.—WWI.
DECATUR, Ill.—WBAO.
DECATUR, Ill.—WHAP.
DENVER, Colo.—KDZQ.
DENVER, Colo.—KFAF.
DENVER, Colo.—KFDL.
DENVER, Colo.—KFEL.
DENVER, Colo.—KFEP.
DENVER, Colo.—KFIC.
DENVER, Colo.—KFLE.
DENVER, Colo.—KLZ.
DES MOINES, Iowa—KFDP.
DES MOINES, Iowa—WGF.
DETROIT, Mich.—WCX.
DETROIT, Mich.—WWJ.
DETROIT, Mich.—KOP.
DOUGLAS, Wyo.—KFEV.
DUBUQUE, Iowa.—WQJK.
DULUTH, Minn.—WJAP.
DULUTH, Minn.—WMAT.

EAST LANSING, Mich.—WKAR.
EASTON, Pa.—WMAP.
EAST PITTSBURG, Pa.—KDKA.
EAST PROVIDENCE, R. I.—WKAD.
EDGEWOOD, R. I.—WEAG.
ELGIN, Ill. (Near)—WTAS.
EL MONTE, Cal.—KUY.
EL PASO, Texas—WDAH.
EL PASO, Texas—WPAF.
EMPORIA, Kan.—WAAZ.
ERIE, Pa.—WOAV.
EUGENE, Ore.—KFAT.
EVANSVILLE, Ind.—WNAM.
EVERETT, Wash.—KFBL

FAIRBANKS, Alaska—WLAY.
FALL RIVER, Mass.—WSAR.
FALL RIVER, Mass.—WTAB.
FARGO, N. D.—WDAY.
FAYETTEVILLE, Ark.—KFDV.
FLINT, Mich.—WEAA.
FORT DODGE, Iowa—KFKR.
FORT DODGE, Iowa—WEAB.
FORT MONROE, Va.—WNAW.
FORT SMITH, Ark.—WGAR.
FORT WORTH, Texas—WEAP.
FRANKFORT, Ky.—WOAK.
FREMONT, Neb.—WOAE
FRESNO, Cal.—KMJ.
FROSTBURG, Md.—WPAQ.

GAINESVILLE, Ga.—WKAY.
GALVESTON, Texas—WHAB.
GALVESTON, Texas—WIAC.
GLADBROOK, Iowa—KFIK.
GLOUCESTER CITY, N. J.—WRAX.
GRAND FORKS, N. D.—WOAB.
GRAND ISLAND, Neb.—KFJA.
GRANVILLE, Ohio—WJD.
GREAT FALLS, Mont.—KDYS.
GREELEY, Colo.—KFJD.
GREELEY, Colo.—KFKA.
GREENCASTLE, Ind.—WLAX.
GREENSBORO, N. C.—WQAZ.
GREENVILLE, Ohio—WCBB.
GREENVILLE, S. C.—WQAV.
GRIDLEY, Cal.—KFU.
GROVE CIY. Pa.—WSAJ.
GUNNISON, Colo.—KFHA.

HAMILTON, Ohio—WBAU.
HAMILTON, Ohio—WRK.
HARRISBURG, Pa.—WABB.
HARTFORD, Conn.—WDAK.
HASTINGS, Neb.—WQAY.
HAVRE, Mont.—KFBB.
HILLSBORO, Ore.—KFFO.
HOLLYWOOD, Cal.—KFAR.
HONOLULU, Hawaii—KDYX.
HONOLULU, Hawaii—KGU.
HONOLULU, Hawaii—KYQ.
HOOD RIVER, Ore.—KFHB.
HOOD RIVER, Ore.—KQP.
HOULTON, Maine—WLAN.
HOUSTON, Texas—KFCV.
HOUSTON, Texas—WCAK.
HOUSTON, Texas—WEAY.
HOUSTON, Texas—WEV.
HOUSTON, Texas—WRAA.
HUNTINGTON, Ind.—WHAY.
HUTCHINSON, Kan.—KFHX.
HUTCHINSON, Minn.—WFAN.

INDEPENDENCE, Mo.—KFIX.
IOLA, Kan.—KFID.
IOWA CITY, Iowa—WHAA.
ITHACA, N. Y.—WEAI.

JACKSONVILLE, Fla.—WABG.
JACKSONVILLE, Fla.—WDAL.
JEFFERSON CITY, Mo.—WOS.
JOHNSTOWN, Pa.—WTAC.
JOPLIN, Mo.—WHAH.
JUNEAU, Alaska—KFIU.

KALAMAZOO, Mich.—WLAQ.
KALAMAZOO, Mich.—WOAP.
KANSAS CITY, Mo.—WDAF.
KANSAS CITY, Mo.—WMAJ.
KANSAS CITY, Mo.—WHB.
KANSAS CITY, Mo.—WOQ.
KEARNEY, Neb.—KFHP.
KELLOGG, Idaaho—KFEY.
KENOSHA, Wis.—WOAR.
KNOXVILLE, Tenn.—WNAV.

LACEY, Wash.—KGY.
LACONIA, N. H.—WKAV.
LA CROSSE, Wis.—WABN.
LAKE FOREST, Ill.—WABA.
LAKESIDE, Colo.—KFKH.
LAMONI, Iowa—KFFV.
LANCASTER, Pa.—WDBC.
LANCASTER, Pa.—WGAL.
LANSING, Mich.—WHAL.
LAPORTE, Ind.—WRAF.
LARAMIE, Wyo.—KFBU.
LAREDO, Texas—WWAX.
LAWRENCEBURG, Tenn.—WOAN.
LE MARS, Iowa—KFCY.
LE MARS, Iowa—WIAU.
LEXINGTON, Ky.—WQAH.
LIHUE, Hawaii—KFHS.
LIMA, Ohio—WOAC.
LINCOLN, Neb.—KFDU.
LINCOLN, Neb.—WFAV.
LINCOLN, Neb.—WJAB.
LINCOLN, Neb.—WKAC.
LINCOLN, Neb.—WMAH.
LINDSBORG, Kan.—WDAD.
LITTLE ROCK, Ark.—WCAV.
LOCKPORT, N. Y.—WMAK.
LONG BEACH, Cal.—KSS.
LOS ANGELES, Cal.—KDZF.
LOS ANGELES, Cal.—KFI.
LOS ANGELES, Cal.—KHJ.
LOS ANGELES, Cal.—KJS.
LOS ANGELES, Cal.—KNR.
LOS ANGELES, Cal.—KNV.
LOS ANGELES, Cal.—KNX.
LOS ANGELES, Cal.—KUS.
LOS ANGELES, Cal.—KWH.
LOS GATOS, Cal.—KFHQ.
LOUISBURG, Kan.—KFIL.
LOUISVILLE, Ky.—WHAS.
LOUISVILLE, Kan.—WLAP.
LOWELL, Mass.—WQAS.

MACON, Ga.—WMAZ.
MADISON, Wis.—WGAY.
MADISON, Wis.—WHA.
MANHATTAN, Kan.—WTG.
MARIETTA, Ohio—WBAW.
MARIETTA, Ohio—WSAA.
MARION, Ind.—WIAQ.
MARION, Kan.—WRAD.
MARSHALL, Mo.—WJAT.
MARSHALLOWN, Iowa—KFJB.
MATTOON, Ill.—WQAL.
MAYVILLE, N. D.—KFHU.
McKEESPORT, Pa.—WIK.
McLEANSBORO, Ill.—WRAS.
MEDFORD, Ore.—KFAY.
MEDFORD HILLSIDE, Mass.—WGI.
MEMPHIS, Tenn.—WMC.
MIAMI, Fla.—WQAM.
MIDDLEPORT, Ohio—WSAK.
MIDDLETOWN, Conn.—WOAS.
MILWAUKEE, Wis.—WAAK.
MILWAUKEE, Wis.—WCAY.
MILWAUKEE, Wis.—WHAD.
MILWAUKEE, Wis.—WIAO.
MINNEAPOLIS, Minn.—KFDZ.
MINNEAPOLIS, Minn.—KFEX.
MINNEAPOLIS, Minn.—WBAD.
MINNEAPOLIS, Minn.—WBAH.
MINNEAPOLIS, Minn.—WCAS.
MINNEAPOLIS, Minn.—WCE.
MINNEAPOLIS, Minn.—WLAG.
MINNEAPOLIS, Minn.—WLB.
MISHAWAKA, Ind.—WOAO.
MOBERLY, Mo.—KFFP.
MOBILE, Ala.—WEAP.
MODESTO, Cal.—KXD.
MONTEREY, Cal.—KLN.
MONTGOMERY, Ala.—WKAN.
MOORESTOWN, N. J.—WBAF.
MOOREHEAD, Minn.—WPAU.
MORGANTOWN, W. Va.—WHD.
MOSCOW, Idaho—KFAN.
MOUNT VERNON, Ill.—WABF.
MUNCIE, Ind.—WJAF.

NEAH BAY, Wash.—KFHH.
NEENAH, Wis.—WIAJ.
NEWARK, N. J.—WAAM.
NEWARK, N. J.—WBS.
NEWARK, N. J.—WOR.
NEWARK, N. J.—WRAZ.
NEWARK, Ohio—WBBA.
NEW BEDFORD, Mass.—WDAU.
NEW HAVEN, Conn.—WPAJ.
NEW LEBANON, Ohio—WPG.
NEW ORLEANS, La.—WAAB.
NEW ORLEANS, La.—WAAC.
NEW ORLEANS, La.—WCAG.
NEW ORLEANS, La.—WGV.
NEW ORLEANS, La.—WIAF.
NEW ORLEANS, La.—WWL.
NEWTON, Iowa—WIAH.
NEW YORK, N. Y.—WBAY.
NEW YORK, N. Y.—WEAF.
NEW YORK, N. Y.—WJX.
NEW YORK, N. Y.—WJY.
NEW YORK, N. Y.—WJZ.
NEW YORK, N. Y.—WLAW.
NEW YORK, N. Y.—WQAO.
NEW YORK, N. Y.—WSAP.
NEW YORK, N. Y.—WWZ.
NORFOLK, Neb.—WJAG.
NORMAN, Okla.—WNAD.
NORTHFIELD, Minn.—WCAL.
NORTH PLAINFIELD, N. J.—WEAM.

OAK, Neb.—KFEQ.
OAKLAND, Cal.—KLS.
OAKLAND, Cal.—KLX.
OAKLAND, Cal.—KZM.
OCEAN CITY, N. J.—WIAD.
OGDEN, Utah—KFCP.
OKLAHOMA CITY, Okla.—WMAB.
OKLAHOMA CIY, Okla.—WKY.
OKMULGEE, Okla.—WPAC.
OMAHA, Neb.—KFCZ.
OMAHA, Neb.—KFEX.
OMAHA, Neb.—WAAW.
OMAHA, Neb.—WIAK.
OMAHA, Neb.—WNAL.
OMAHA, Neb.—WOAW.
ORANGE, Texas—KFGX.
OSKALOOSA, Iowa—KFHL.

PADUCAH, Ky.—WIAR.
PARKESBURG, Pa.—WQAA.
PARSONS, Kan.—WOAJ.
PATERSON, N. J.—WBAN.
PENDLETON, Ore.—KFFE.
PENSACOLA, Fla.—WGAN.
PENSACOLA, Fla.—WLAV.
PEORIA, Ill.—WJAN.
PEORIA. Ill.—WQAX.
PHILADELPHIA, Pa.—WCAU.
PHILADELPHIA, Pa.—WDAR.
PHILADELPHIA, Pa.—WFI.
PHILADELPHIA, Pa.—WGL.
PHILADELPHIA, Pa.—WIP.
PHILADELPHIA, Pa.—WNAT.
PHILADELPHIA, Pa.—WOO.
PHILADELPHIA, Pa.—WWAD.
PHOENIX, Ariz.—KDYW.
PHOENIX, Ariz.—KFAD.
PINE BLUFF, Ark.—WOK.
PITTSBURG, Kan.—KFIV.
PITTSBURG, Pa.—KQV.
PITTSBURG, Pa.—WCAE.
PITTSBURG, Pa.—WJAS.
PLAINVIEW, Texas—WSAT.
PLATTE, S. D.—KFIJ.
PORT ARTHUR, Texas—WFAH.
PORTLAND, Ore.—KDYQ.
PORTLAND. Ore.—KFEC.
PORTLAND. Ore.—KFIF.
PORTLAND, Ore.—KGG.
PORTLAND, Ore.—KGN.
PORTLAND, Ore.—KGW.
PORTSMOUTH, Va.—WOAQ.
POUGHKEEPSIE, N. Y.—WFAF.
PROVIDENCE, R. I.—WEAN.
PROVIDENCE, R. I.—WJAR.
PROVIDENCE, R. I.—WRAH.
PROVIDENCE, R. I.—WSAD.
PROVIDENCE, R. I.—WTAG.
PULLMAN, Wash.—KFAE.

RALEIGH, N. C.—WLAC.
RAPID CITY, S. D.—WCAT.
READING, Pa.—WBBD.
READING, Pa.—WRAW.
REEDLEY, Cal.—KMC.
RENO, Nev.—KDZK.
RICHMOND, Cal.—KFCM.
RICHMOND, Va.—WQAT.
RIDGEWOOD, N. Y.—WHN.
ROCHESTER, N. Y.—WABO.
ROCHESTER, N. Y.—WHAM.
ROCKFORD, Ill.—WIAB.
ROCKPORT, Mo.—WMAD.
ROSWELL, N. M.—KNJ.

SACRAMENTO, Cal.—KFBK.
SAGINAW, Mich.—WABM.
SAGINAW, Mich.—WIAW.
S. CLOUD, Minn.—WFAM.
ST. CROIX FALLS, Wis.—WRAL.
ST. JOSEPH, Mo.—KFHD.
ST. JOSEPH, Mo.—WEAK.
ST. LOUIS, Mo.—KFEZ.
ST. LOUIS, Mo.—KFGJ.
ST. LOUIS, Mo.—KFIB.
ST. LOUIS, Mo.—KSD.
ST. LOUIS, Mo.—WCK.
ST. LOUIS, Mo.—WEB.
ST. LOUIS, Mo.—WEW.
ST. LOUIS, Mo.—WMAY.
ST. LOUIS, Mo.—WRAO.
ST. PAUL, Minn.—WAAH.
ST. PETERSBURG, Fla.—WSAG.
SALEM, Ore.—KFCD.
SALT LAKE CITY, Utah—KDYL.
SALT LAKE CITY, Utah—KZN.
SAN ANTONIO, Cal.—KFCL.
SAN ANTONIO, Texas—WCAR.
SAN ANTONIO, Texas—WOAI.
SAN DIEGO, Cal.—KDPT.
SAN DIEGO, Cal.—KDYM.
SAN DIEGO, Cal.—KFBC.
SAN DIEGO, Cal.—KFFA.
SANDUSKY, Ohio—WABH.
SANDUSKY, Ohio—WQAF.
SAN FRANCISCO, Cal.—KFDB.
SAN FRANCISCO, Cal.—KPO.
SAN FRANCISCO, Cal.—KUO.
SAN JOSE, Cal.—KFAQ.
SAN JOSE, Cal.—KQW.
SAN JOSE, Cal.—KSC.
SAN JUAN, P. R.—WKAQ.
SAN LUIS OBISPO, Cal.—KFBE.
SANTA ANA, Cal.—KFAW.
SANTA BARBARA, Cal.—KFHJ.

Broadcasting Stations and Schedule of Programs

Continued from Poge 2.

company, 380 meters.
WHA—Madison, Wis., University of Wisconsin, 360 meters.
WHAA—Iowa City, Iowa, State University of Iowa, 283 meters.
WHAB—Galveston, Texas, Clark W. Thompson, 360 meters.
WHAC—Waterloo, Iowa, Cole Brothers Electric company, 360 meters.
WHAD—Milwaukee, Wis., Marquette university, 280 meters.
WHAG—Cincinnati, Ohio, University of Cincinnati, 222 meters.
WHAH—Joplin, Mo., Hafer Supply company, 360 meters.
WHAI—Davenport, Iowa, Radio Equipment and Manufacturing company, 360 meters.
WHAK—Clarksburg W. Va., Roberts Hardware company, 360 meters.
WHAL—Lansing, Mich., Lansing Capital News, 248 meters.
WHAM—Rochester, N. Y., University of Rochester (Eastman School of Music), 360 meters.
WHAP—Decatur, Ill., Otta & Kuhn, 360 meters.
WHAQ—Washington, D. C., Semmes Motor company, 360 meters.
WHAR—Atlantic City, N. J., Paramount Radio and Electric company (W. H. A. Paulus), 231 meters.
WHAS—Louisville, Ky., Courier-Journal and Louisville Times, 400 meters.
WHAV—Wilmington, Dela., Wilmington Electrical Special company, 360 meters.
WHAZ—Troy, N. Y., Rensselaer Polytechnic Institute, 380 meters.
WHB—Kansas City, Mo., Sweeney School company, 411 meters.
WHD—Morgantown, W. Va., West Virginia University, 360 meters.
WHK—Cleveland, Ohio, Radiovox company (Warren R. Cox), 360 meters.
WHN—Ridgewood, N. Y., George Schubel, 360 meters.
WIAB—Rockford, Ill., Joslyn Automobile company, 252 meters.
WIAC—Galveston, Texas, Galveston Tribune, 360 meters.
WIAD—Ocean City, N. J., Ocean City Yacht club (Howard R. Miller), 254 meters.
WIAF—New Orleans, La., 139 North Alexander street, Gustav A. DeCortin, 234 meters.
WIAH—Newton, Iowa, Continental Radio and Manufacturing company, 258 meters.
WIAI—Springfield, Mo., Heer Stores company, 360 meters.
WIAJ—Neenah, Wis., Fox River Valley Radio Supply company (Quinn Brothers), 224 meters.
WIAK—Omaha, Neb., Journal-Stockman company, 278 meters.
WIAO—Milwaukee, Wis., School of Engineering of Milwaukee, 360 meters.
WIAQ—Marion, Ind., Chronicle Publishing company, 226 meters.
WIAR—Paducah, Ky., Paducah Evening Sun, 360 meters.
WIAS—Burlington, Iowa, Home Electric company, 360 meters.
WIAT—Tarkio, Mo., Leon T. Noel, 360 meters.
WIAU—Le Mars, Iowa, American Trust and Savings bank, 360 meters.
WIK—McKeesport, Pa., K. & L. Electric company (Herbert F. Kelso and Hunter J. Lohman), 360 meters.
WIL—Washington, D. C., Continental Electric Supply company, 360 meters.
WIP—Philadelphia, Pa., Gimbel Brothers, 509 meters.
WJAB—Lincoln, Neb., American Electric company, 360 meters.
WJAD—Waco, Texas, Jackson's Radio Engineering laboratories, 360 meters.
WJAF—Muncie, Ind., Press Publishing company, 360 meters.
WJAG—Norfolk, Neb., Norfolk Daily News (Huse Publishing company), 360 meters.
WJAK—Greentown, Ind., Clifford L. White, 254 meters.
WJAM—Cedar Rapids, Iowa, 302 3d avenue, West, D. M. Perham, 268 meters.
WJAN—Peoria, Ill., Peoria Star, 280 meters.
WJAQ—Topeka, Kan, Capper Publications, 360 meters.
WJAR—Providence, R. I., The Outlet company (J. Samuels and Brother), 360 meters.
WJAS—Pittsburg, Pa., Pittsburg Radio Supply house, 360 meters.
WJAT—Marshall, Mo., Kelly-Vawter Jewelry company, 360 meters.
WJAX—Cleveland, Ohio, Union Trust company, 390 meters.
WJAZ—Chicago, Ill., Chicago Radio laboratory, 448 meters.
WJD—Granville, Ohio, Richahrd H. Howe, 229 meters.
WJH—Washington, D. C., White & Boyer company, 273 meters.
WJX—New York, N. Y., Deforest Radio Telephone and Telegraph company, 360 meters.
WJY—New York, N. Y., R. C. A, 405 meters.
WJZ—New 2York, N. Y., R. C. A., 455 meters.
WKAA—Cedar Rapids, Iowa, 1444 2d avenue, East, H. F. Paar, 268 meters.
WKAD—East Providence, R. I., Charles Loof (Cresent park), 240 meters.
WKAF—Wichita Falls, Texas, W. S. Radio Supply company, 360 meters.
WKAN—Montgomery, Ala., United Battery Service company, 226 meters.
WKAP—Cranston, R. I., Dutec W. Flint, 360 meters.
WKAQ—San Juan, P. R., Radio Corporation of Porto Rico, 360 meters.
WKAR—East Lansing, Mich., Michigan Agriculture college, 280 meters.
WKAS—Springfield, Mo., L. E. Lines Music company, 360 meters.
WRAV—Lacon, N. H., Laconia Radio club, 254 meters.
WKAW—Beloit, Wis., Turner Cycle company, 242 meters.
WKAX—Bridgeport, Conn., 1789 Park avenue, William A. MacFarlane, 231 meters.
WKAY—Gainesville, Ga., Brenau college, 280 meters.
WKC—Baltimore, Md., Joseph M. Zamoiski company, 360 meters.
WKY—Oklahoma, Okla., WKY Radio Shop, 360 meters.
WLAC—Raleigh, N. C., North Carolina State college, 360 meters.
WLAG—Minneapolis, Minn., Cutting and Washington Radio corporation, 417 meters.
WLAH—Syracuse, N. Y., 425 Brownell street, Samuel Woodworth, 234 meters.
WLAJ—Waco, Texas, Waco Electrical Supply company, 360 meters.
WLAK—Bellows Falls, Vt., Vermont Farm Machine corporation, 360 meters.
WLAL—Tulsa, Okla., Naylor Electric company, 360 meters.
WLAN—Houlton, Maine, Putnam Hardware company, 283 meters.
WLAP—Louisville, Ky., 306 West Breckenridge street, W. V. Jordon, 360 meters.
WLAQ—Kalamazoo, Mich., 108 Elm street, Arthur E. Schilling, 360 meters.
WLAT—Burlington, Iowa., Radio and Specialty company, 360 meters.
WLAV—Pensacola, Fla., Electric Shop, 254 meters.
WLAW—New York, N. Y., police department, City of New York, 360 meters.
WLAX—Greencastle, Ind., Putnam Electric company (Greencastle Community Broadcasting station), 231 meters.
WLB—Minneapolis, Minn., University of Minneosta, 360 meters.
WLW—Cincinnati, Ohio, Crosley Manufacturing company, 309 meters.
WMAB—Oklahoma, Okla., Radio Supply compnay, 360 meters.
WMAC—Cazenovia, N. Y., Fernwood street, J. Edw. Page (Olive B. Meredith), 261 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WMAH—Lincoln, Neb., General Supply company, 254 meters.
WMAJ—Kansas City, Mo., Drovers Telegram company, 275 meters.
WMAK—Lockport, N. Y., Norton Laboratories, 360 meters.
WMAL—Trenton, N. J., Trenton Hardware company, 256 meters.
WMAM—Beaumont, Texas, Beaumont Radio Equipment company, 360 meters.
WMAP—Easton, Pa., Utility Battery service, 246 meters.
WMAQ—Chicago, Ill., Chicago Daily News, 448 meters.
WMAV—Auburn, Ala., Alabama Polytechnic institute, 250 meters.
WMAY—St. Louis, Mo., Kingshighway Presbyterian church, 280 meters.
WMAZ—Macon, Ga., Mercer university, 268 meters.
WMC—Memphis, Tenn., "Commercial Appeal" (Commercial Publishing company), 500 meters.
WMH—Cincinnati, Ohio, Precision Equipment company, 248 meters.
WMU—Washington, D. C., Doubleday-Hill Electric company, 261 meters.
WNAC—Boston, Mass., Shepard stores, 278 meters.
WNAD—Norman, Okla, University of Oklahoma, 360 meters.
WNAL—Omaha, Neb., 5019 Capitol avenue, R. J. Rockwell, 242 meters.
WNAM—Evansville, Ind., Ideal Apparatus company, 360 meters.
WNAV—Syracuse, N. Y., Syracuse Radio Telephone company, 286 meters.
WNAP—Springfield, Ohio, Wittenberg college, 231 meters.
WNAQ—Charleston, S. C., Charleston Radio Electric company, 360 meters.
WNAR—Butler, Mo., C. C. Rhodes, 231 meters.
WNAS—Austin, Texas, Texas Radio Corporation and Austin Statesman, 360 meters.
WNAT—Philadelphia, Pa., Lemmig Brothers company (Frederick Lennig), 360 meters.
WNAV—Knoxville, Tenn., Peoples Telephone and Telegraph company, 236 meters.
WNAW—Fort Monroe, Va., Peninsular Radio club (Henry Kunzmann), 360 meters.
WNAX—Yankton, S. D., Dakota Radio Apparatus company, 244 meters.
WNJ—Albany, N. Y., Shotton Radio Manufacturing company, 360 meters.
WOAA—Ardmore, Okla., Dr. Walter Hardy, 360 meters.
WOAC—Lima, Ohio, Maus Radio company, 266 meters.
WOAD—Sigourney, Iowa, Friday Battery and Electric corporation, 360 meters.
WOAE—Fremont, Neb., Midland college, 360 meters.
WOAF—Tyler, Texas, Tyler Commercial college, 360 meters.
WOAG—Belvidere, Ill., Apollo theater (Belvidere Amusement company), 224 meters.
WOAH—Charleston, S. C., Palmetto Radio corporation, 360 meters.
WOAI—San Antonio, Texas, Southern Equipment company, 385 meters.
WOAJ—Parsons, Kan., Ervins Electrical company, 258 meters.
WOAK—Frankfort, Ky., Collins Hardware company, 240 meters.
WOAL—Webster Groves, Mo., 4 Jefferson road, William E. Woods, 229 meters.
WOAN—Lawrenceburg, Tenn., Vaughn Conservatory of Music (James D. Vaughn), 360 meters.
WOAO—Mishawka, Ind., Lyradion Manufacturing company, 360 meters.
WOAP—Kalamazoo, Mich., Kalamazoo college, 240 meters.
WOAQ—Portsmouth, Va., Portsmouth Kiwanis club, 360 meters.
WOAT—Wilmington, Del., 215 Market street, Boyd M. Hamp, 360 meters.
WOAV—Erie, Pa., Pennsylvania National Guard, 2d Battalion, 112th Infantry, 242 meters.
WOAW—Omaha, Neb., Woodmen of the World, 526 meters.
WOAX—Trenton, N. J., 600 Ingham avenue, Franklyn J. Wolff, 240 meters.
WOAZ—Stamford, Texas, Penick Hughes company, 360 meters.
WOC—Davenport, Iowa, Palmer School of Chiropractic, 484 meters.
WOI—Ames, Iowa, Iowa State college, 360 meters.
WOK—Pine Bluff, Ark., Pine Bluff company, 360 meters.
WOO—Philadelphia, Pa., 13th and Market streets, John Wanamaker, 509 meters.
WOQ—Kansas City, Mo., Western Radio company, 360 meters.
WOR—Newark, N. J., L. Bamberger & Co., 405 meters.
WOS—Jefferson City, Mo., Missouri State Marketing bureau, 441 meters.
WPAB—State College, Pa., Pennsylvania State college, 360 meters.
WPAC—Okmulgee, Okla., Donaldson Radio company, 360 meters.
WPAD—Chicago, Ill., W. A. Wieboldt & Co., 360 meters.
WPAH—Waupaca, Wis., Wisconsin department of markets, 360 meters.
WPAJ—New Haven, Conn., Doolittle Radio corporation, 268 meters.
WPAK—Agricultural College, N. D., North Dakota Agricultural college, 360 meters.
WPAL—Columbus, Ohio, Superior Radio and Telegraph Equipment company, 286 meters.
WPAM—Topeka, Kan., Auerbach & Guettel, 360 meters.
WPAP—Winchester, Ky., 222 Lexington avenue, Theodore D. Phillips, 360 meters.
WPAQ—Frostburg, Md., General Sales and Engineering company, 360 meters.
WPAR—Beloit, Kan., Ward Battery and Radio company, 360 meters.
WPAT—El Paso, Texas, St. Patrick's cathedral, 360 meters.
WPAU—Moorhead, Minn., Concordia college, 360 meters.
WPAZ—Charleston, W. Va., St. John's Church, 278 meters.
WPG—New Lebannon, Ohio, Nushawg Poultry farm, 234 meters.
WQAA—Parkersburg, Pa., Horace A. Beale, Jr., 360 meters.
WQAB—Springfield, Mo., Southwest Missouri State Teachers' college, 236 meters.
WQAC—Amarillo, Texas, 108 East 8th street, E. B. Gish, 360 meters.
WQAD—Waterbury, Conn., Whitall Electric company, 242 meters.
WQAE—Springfield, Vt., Moore Radio News station (Edmund B. Moore), 275 meters.

Continued on Page 15.

Today's Programs and Schedules

Continued from Page 3.

Schmidt; quartet selections, (a) "Sweet and Low" (Barnb.), (b) "He's Not Dead Yet" (Hall), male quartet; orchestra selection, "Connecticut" (Nassann), orchestra.

WGR—Buffalo; 319 meters.

Day—9:45 a. m., weather forecast for Lakes Erie and Ontario; special report from Buffalo and Oswego, N. Y.; for marine and aviation interests; weather forecast for western New York; 11 a. m., weather, produce and live stock market reports; 11:30 a. m., organ, dining-room, Hotel Statler, George Albert Bouchard; 1:30 p. m., closing prices of Chicago board of trade; 2:30 p. m., closing prices of New York Stock exchange; 3 p. m., tea-time music, Palm room, Hotel Statler; Miss Martha Gomph, harpist; Miss Elise de Grood, violinist; 5:30 p. m., dinner music, Vincent Lopez, Hotel Statler Dance orchestra.

Evening—6 p. m.: Boy Scout radiograms. Industrial employment bulletin. The American Boy story.

WJY—New York City; 405 meters:

This station broadcasts only on Sundays at 2:30 p. m. to 6 p. m.

WJZ—New York city; 455 meters. No silent night.

Day—2 p. m., organ recital on the Hotel Astor organ by Leo Riggs, by direct wire from the Hotel Astor; 3:15 p. m., recital by Tesa Bickman, soprano; 3:45 p. m., concert; 4 p. m., address.

Evening—6 p. m., bedtime story; 7 p. m., special musical program.

WOO—Philadelphia; 509 meters. Silent Sunday, Tuesday, Thursday, Friday and Saturday evenings.

Day—10 a. m., grand organ; 10:30 a. m., United States weather forecast; 10:55 a. m., United States naval observatory time signal; 11 a. m., luncheon music by the Tea-Room orchestra; 4:15 p. m., grand organ and trumpets; 4:30 p. m., sports results and police reports.

Evening—8:55 p. m.: United States naval observatory time signal. 9:02 p. m.: United States weather forecast.

WOR—Newark, N. J.; 405 meters.

Day—3 a. m. to 5 a. m.: Special test with Japan, New Zealand and Australia. Program for this period especially arranged. 1:30 p. m.: Edna Marie Scheller, soprano, accompanied by Marguerite S. Bippart. 1:45 p. m.: Program of popular numbers by Charles Kindelberger, tenor. 2 p. m. to 2:30 p. m.: Ex-Gov. Newton W. Gilbert of the Philippine islands will speak on "Immigration." 2:30 p. m.: Continuation of soprano solos by Edna Marie Scheller. 2:45 p. m.: Program of popular numbers by Charles Kindelberger.

Evening—5:15 p. m.: "Icicle," Santa Claus' assistant at his toy factory, will speak to the children. 5:30 p. m. to 6:30 p. m.: "Music While You Dine," featured by Tom Cooper's Country Club orchestra.

WRC—Washington, D C., 469 meters: Silent Tuesday, Thursday and Saturday evenings.

Day—2 p. m., fashion developments of the minute; 2:10 p. m., song recital by Mabel Finney, soprano; 2:25 p. m., the magazine of Wall street; 2:35 p. m., piano recital by Mary Ashton; 2:45 p. m., A talk on current events by the Editor of the National Interpreter; 3 p. m., Bradstreet's financial reports; 4:15 p. m., instruction in code practice; 5 p. m., children's hour, by Peggy Albion.

WRW—Tarrytown, N. Y., 273 meters:

Note—This station broadcasts only on Monday, Wednesday and Friday evenings.

Midwest Programs.

WCX—Detroit, Mich.; 517 meters: Silent Saturdays.

Day—2 p. m., news bulletins; 2:15 p. m., stock quotations; 2:20 p. m., Rev. Gaius Glenn Atkins, D. D., speaker (a twenty-minute exposition of the international Sunday school lesson); 2:50 p. m., government weather forecast; 4:15 p. m., music;

Evening—6 p. m., dinner concert. Pete Bontsema's orchestra, broadcast from Hotel Tuller; 8:30 p. m., musical program, Glenn Ashe and his Garden Terrace orchestra.

WJAX—Cleveland: 390 meters: Silent every night except Tuesday and Thursday.

Day—11 a. m., to noon, special studio program.

Evening—8 p. m.: Concert furnished by Miss Marie Simmelink and three student-teachers of the Cleveland Music school settlement; Hyman Schandler, violin; Margaret Scharp, cello; Gussie Berkowitz, piano. The Cleveland orchestra. Detailed program for the evening is as follows: "Mendelssohn's Trio," Music School Settlement trio; recitative and air, "He Shall Keep His Flock" (Handel), Marie Simmelink; "Songs My Mother Taught Me" (Dvorak), Marie Simmelink; "At Night" (Rachmaninoff), Marie Simmelink; "Over the Steppe" (Gretchaninoff), Marie Simmelink; Mozart's Trio, Music School Settlement trio; "In Arcady by Moonlight" (Branscombe), Marie Simmelink; "Hindu Slumber Song" (Ware), Marie Simmelink; "Homing (Del Riego), Marie Simmelink; "My Lover Is a Fisherman" (Strickland), Marie Simmelink; Symphony, G minor, Kochel 550 (Mozart); Rondo, "Till Eulenspiegel's Merry Pranks," opus 28 (Strauss), Cleveland orchestra, Nikolai Sokoloff director.

WLAG—Minneapolis, Minn.; 417 meters: No silent nights.

Day—9:30, 10 and 10:30 a. m., markets, news bulletins; 10:45 a. m., household hints; 11:30 a. m., markets, noon, lecture; 4:30 p. m., markets; 5 p. m., address; 5:30 to 6 p. m., children's program.

Evening—9:15 p. m., address; 9:30 p. m., musical program.

WLW—Cincinnati; 309 meters: Silent Friday, Saturday and Sunday.

Day—4 p. m., piano selections by Adellaide Apfel; address, "Why I Belong to the League of Women Voters and the Democratic Party," by Mrs. Frank Gorman.

Evening—10 p. m., Oriental program, with radario directed by Helen Schuster-Martin of the Schuster-Martin Dramatic school; musical arrangements by Mrs. Thomie Prewitt Williams of the Cincinnati Conservatory of Music, violin solos, Waldene Johnston, with accompaniments by Genevieve Goodoman.

WOC—Davenport, Iowa; 481 meters: Silent Tuesdays.

Day—10 a. m., opening market quotations; 10:55 a. m., time signals; 11 a. m., weather and river forecast; 11:05 a. m, market quotations and agriograms; 12 noon, chimes concert; 3:30 p. m., educational program (musical numbers to be announced). Lecture by Karl G. Stephan; subject, "Pathology of Diabetes."

Evening—7 p. m., educational lecture, "Our Political Parties," by Rev. Martin J. Cone, member of the faculty of St. Ambrose college, Davenport, Iowa; 8 p. m., musical program (one hour). P. S. C. orchestra, Gerald M. Barrow, director, featuring "After a While," "I'm Tired of Being Alone," "In a Covered Wagon," "Ginny," "London Bridge Is Falling Down," "Dance and Keep Young," "Lil-Lil-Lillian." (Popular selections released thru the National Association of Broadcasters, of which WOC is a member.) V. B. Rochte, barytone soloist.

WTAM—Cleveland: 390 meters: Broadcasts only Wednesday and Saturday evenings at 7 to 8 p. m.

WWJ—Detroit, Mich.; 517 meters: Silent Saturday.

Day—12 m., music by Jean Goldkette's orchestra, broadcast from the Graystone ballroom.

Evening—7 p. m., the Detroit News orchestra; C. H. Phillips, tenor; Crosby chapel quartet 10 p. m., dance music by Jean Goldkette's orchestra, broadcast from the Graystone ballroom.

Southern Programs.

KSD—St. Louis, 546 meters: Silent Friday.

Evening—8 o'clock, Broadcasting direct from the Odeon concert, given by St. Louis Symphony orchestra; Helen Traubel, soprano soloist; Rudolph Ganz, conductor.

WBAP—Fort Worth, Texas; 476 meters:

Day—10 a. m., to 4 p. m., markets and finsncial review.

Evening—7:30 to 8:30 p. m.: Coffin and assisting artists. (E. L. O. announcing.) 9:30 to 10:45 p. m.: Concert by the sixty-piece band of Moslah Temple Shrine (G. C. A. announcing.)

WDAF—Kansas City, Mo.; 411 meters:

Day—3:30 to 4:30 p. m., musical matinee; Eddie Kuhn's Kansas City Athletic club orchestra.

Day—3:30 p. m.: Musical matinee. The D. Ambert Haley Dance and Concert orchestra. 6 to 7 p. m.: Tuning-in piano number on the Duo-Art; marketgram; weather forecast and road report; address, speaker from the William Jewell college, Liberty, Mo.; the children's story and informatoin period; music, Fritz Hanlein's Trianon ensemble, Hotel Muehlbach. 11:45 p. m. to 1 a. m.: The "Merry Old Chief" and the Coon-Sanders Novelty-Singing orchestra, Plantation grill, Hotel Muehlbach.

WFAA—Dallas, Texas; 476 meters: Silent Wednesday.

Day—12:30 to 1 p. m., McFall's Dance orchestra.

Evening—8:30 to 9:30 p. m., musical recital, presenting faculty of Hauulea School of Hawaiian Music; several native Hawaiians.

WGM—Atlanta, Ga.; 429 meters:

Evening—6 to 7 p. m., concert; 9:30 to 10:30 p. m., concert.

WGV—New Orleans 359 meters:

Evening—7 to 8 p. m., concert.

WHAS — Louisville; 400 meters: Silent Mondays.

Day—4 to 5 p. m., four-minute talk on "Household Economics."

Evening—7:30 to 9 p. m., the ten best Foster songs, especially arranged and dedicated to WHAS by Zudie Harris Reinecke, and sung by the Courier-Journal quartet:: Miss Fannie Bess Morton, soprano; Mrs. K. W. Surman, contralto; K. W. Surman, tenor; Albion S. Cornwall, barytone; Mrs. Albion S Cornwall, accompanist. Four-minute digest of international Sunday school lesson for Sunday, Dec. 16; four-minute radio forum talk; late important news bulletins; official central standard time announced at 9 o'clock.

WHB—Kansas City, Mo.; 411 meters: Silent Monday, Wednesday, Friday and Saturday.

Evening—7 p. m., concert.

WMC—Memphis; 500 meters: Silent Wednesday.

Evening — 8:30 p. m.: Program by the Chisca Hotel Philharmonic orchestra, under the direction of Miss Clara Ahern.

WOAI—San Antonio, Texas; 385 meters: Silent night, Mondays, Wednesdays and Thursdays.

WOS—Jefferson City, Mo.; 441 meters: Silent Tuesdays, Thursdays and Saturdays.

WSB—Atlanta, Ga.; 428 meters:

Day—12 to 1 p. m.: Musical program for industrial workers. 2:30 p. m.: Weather forecast. 4 p. m.: Howard relay concert. 5 to 5:30 p. m.: Markets, news and sports.

Evening—5:30 p. m.: Burgess' bed-time story. 8 to 9 p. m.: Popular concert. 10:45 p. m.: Transcontinental Radiowl concert.

WHAR—Galveston, Texas; 360 meters:

Special program on Tuesday and Friday only.

Pacific Coast Concerts.

KDZE—Seattle, Wash.; 455 meters: Silent nights Tuesday, Thursdays and Sundays.

KFDB—San Francisco; 509 meters:

Evening—Musical program from midnight to 1:30 p. m.

KGW—Portland, Ore.; 492 meters:

Evening—10 to 12 p. m., a costume program will be given under the direction of the Pacific Musical society, by direct wire from the Palace hotel. Midnight to 1 a. m., vocal.

KHJ—Los Angeles; 395 meters:

Evening—10 45, 11:30 p. m. to 1 a. m.

KPO—San Francisco; 423 meters:

Day—2 p. m., time signals; 3 to 4 p. m., Rudy Seiger's Fairmont Hotel orchestra, by remote control.

West Indies Station Sends Code Half Around World

In spite of the determined attempts of American stations to wrest the leadership in long-distance communication from stations of other countries, the contest is still open, according to a dispatch from Curacal, Dutch West Indies, where a powerful code transmitter is located.

On the 10th of November the operator at Riffort was in direct communication with the big wireless station at Malabar, at Bandoeng, Java, in the Dutch East Indies. This distance is equivalent to one-half the circumference of the globe, and represents a mileage of 10,400 miles.

Since this record was made it is also reported that the operator at Malabar has been in intermittent contact with Rifford daily, using the newly developed arc transmitter of Dr. de Groot.

Short Aerials Give Set Sharper Tuning Quality

The simplest and perhaps the best method for reducing interference from neighboring stations, or even between stations which use the same wave lengths, is to reduce the size of the antenna. An antenna about seventy-five feet long will feed back plenty of energy to the set, with the added advantage of giving the operator a chance to eliminate much of the troublesome interference.

With the long aerial the receiver can change the wave length of the complete circuit but slightly. With the shorter aerial the receiver then is the deciding factor in the selection of the wave lengths. Sometimes a combination of a short and long aerial will work well, using one for selectivity and the other for reception for long distance stations.

Germans Use Mountains for Radio Antennae Masts

BERLIN—A wireless station using mountain peaks for antennae masts upper Bavaria.

The wires are supported by a strong cable and extend from one peak 5,100 feet high a distance of about a mile and a half across country to the top of a 2,820-foot peak.

The station is designed to communicate directly with the far east. Special arrangements were necessary for the fixing of the cable ends and to allow for its stretching. The end of the cable is fastened to a small carriage weighted with stones and running on rails. When the cable is bent by snow or wind the carriage is pulled forward. When the stress ceases, it rolls backward on its sloping railroad.

BROADCASTING STATIONS AND SCHEDULE OF PROGRAMS

Continued from Page 14.

WQAF—Sandusky, Ohio, Sandusky Register. 240 meters.
WQAH—Lexington, Ky., Brock-Anderson Electrical Engineering company, 254 meters.
WQAI—Mattoon, Ill., Coles County Telephone and Telegraph company, 258 meters.
WQAM—Miami, Fla., Electrical Equipment company, 360 meters.
WQAN—Scranton, Pa., Scranton Times, 280 meters.
WQAO—New York, N. Y., Calvary Baptist church, 360 meters.
WQAQ—Abilene, Texas, West Texas Radio company, 360 meters.
WQAS—Lowell, Mass., Prince-Walter company, 266 meters.
WQAV—Greenville, S. C., Huntington and Guerry (Inc.), 258 meters.
WQAW—Washington, D. C., Catholic university, 236 meters.
WQAX—Peoria, Ill., Radio Euipment company, 360 meters.
WQAZ—Greensboro, N. C., Greensboro Daily News, 360 meters.
WRAA—Houston, Texas, Rice institute, 360 meters.
WRAD—Marion, Kan., Taylor Radio shop (G. L. Taylor), 360 meters.
WRAF—Laporte Ind., The Radio club (Inc.), 224 meters.
WRAH—Providence, R. I., Stanley K. Read, 231 meters.
WRAI—St. Croix Falls, Wis., Northern States Power company, 248 meters.
WRAN—Waterloo, Iowa, Black Hawk Electrical company, 236 meters.
WRAO—St. Louis, Mo., Radio Service company, 360 meters.
WRAP—Winter Park, Fla., Winter Park Electrical Construction company, 360 meters.
WRAU—Amarillo, Texas, Amarillo Daily News, 360 meters.
WRAV—Yellow Springs, Ohio, Antioch college, 360 meters.
WRAW—Reading, Pa., Avenue Radio shop (Horace D. Good), 238 meters.
WRAX—Gloucester City, N. J., Flaxon's garage, 268 meters.
WRAY—Scranton, Pa., Radio Sales corporation, 280 meters.
WRAZ—Newark, N. J., Radio Shop of Newark (Herman Lubinsky), 233 meters.
WRC—Washington, D. C., Radio Corporation of America.
WRK—Hamilton, Ohio, Doron Bros. Electric company, 369 meters.
WRL—Schenectady, N. Y., Union college, 360 meters.
WRM—Urbana, Ill., University of Illinois, 360 meters.
WRR—Dallas, Texas, City of Dallas (police and fire signal department), 360 meters.
WRW—Tarrytown, N. Y., Tarrytown Radio Research laboratory, 273 meters.
WSAB—Cape Girardeau, Mo., Southeast Missouri State Teachers' college, 360 meters.
WSAC—Clemson College, S. C., Clemson Agricultural college, 360 meters.
WSAD—Providence, R. I., J. A. Foster company, 261 meters.
WSAG—St. Petersburg, Fla., City of St. Petersburg (Loren V. Davis), 244 meters.
WSAH—Chicago, Ill., 4801 Woodlawn avenue, A. J. Leonard, Jr., 248 meters.
WSAI—Cincinnati, Ohio, United States Playing Cards company, 309 meters.
WSAJ—Grove City, Pa., Grove City college, 360 meters.
WSAK—Middleport, Ohio, Foster Egner (Daily News, Pomeroy, Ohio), 258 meters.
WSAL—Brookville, Ind., Franklin Electric company, 246 meters.
WSAN—Allentown, Pa., Allentown Radio club, 229 meters.
WSAP—New York, N. Y., Seventh Day Adventist church, 360 meters.
WSAR—Fall River, Mass., Doughty & Welch Electrical company, 254 meters.
WSAT—Plainview, Texas, Donohoo-Ware Hardware company, 268 meters.
WSAU—Chesham, N. H., Camp Marienfeld, 229 meters.
WSAW—Canandaigua, N. Y., Curtice and McElwee, 275 meters.
WSAX—Chicago, Ill., Chicago Radio laboratory, 268 meters.
WSAY—Port Chester, N. Y., Port Chester Chamber of Commerce, 233 meters.
WSB—Atlanta, Ga., Atlanta Journal, 429 meters.
WSL—Utica, N. Y., J. and M. Electrical company, 273 meters.
WSY—Birmingham, Ala., Alabama Power company, 360 meters.
WTAB—Fall River, Mass., Fall River Daily Herald Publishing company, 248 meters.
WTAC—Johnstown, Pa., Penn Traffic company, 360 meters.
WTAD—Carthage, Ill., First Presbyterian church, 229 meters.
WTAF—New Orleans, La., Louis J. Gallo, 242 meters.
WTAH—Belvidere, Il., Carmen Ferro, 236 meters.
WTAG—Providence, R. I., Keru Music company, 258 meters.
WTAJ—Portland, Me., The Radio shop, 236 meters.
WTAL—Toledo, Ohio, Toledo Radio and Electric company, wave length unrecorded.
WTAM—Cleveland, Ohio, Willard Storage Battery company, 390 meters.
WTAN—Mattoon, Ill., Orndorff Radio shop, 240 meters.
WTAP—Cambridge, Ill., Cambridge Radio and Electric company, 242 meters.
WTAQ—Osseo, Wis., S. H. Van Gordon and Son, 226 meters.
WTAR—Norfolk, Va., Reliance Electric company, 226 meters.
WTAS—Elgin, Ill., (near) R. F. D. 6, Box 75, Charles E. Erbstein, 275 meters.
WTAT—Boston, Mass., Edison Electric Illuminating company, portable, 244 meters.
WTAU—Tecumseh, Neb., Ruegg Battery and Electric company, 360 meters.
WTAW—College Station, Texas, Agricultural and Mechanical college of Texas, 280 meters.
WTAX—Streator, Ill., Williams Hardware company, 231 meters.
WTAY—Oak Park, Ill., Iodar-Oak Leaves Broadcasting station, 226 meters.
WTAZ—Lambertville, N. J., Thomas J. McGuire, 283 meters.
WTG—Manhattan, Kans., Kansas State Agricultural college, 485 meters.
WWAB—Trenton, N. J., Hoenig, Swern & Co 226 meters.
WWAC—Waco, Texas, Sanger Brothers, 360 meters.
WWAD—Philadelphia, Pa., Wright & Wright (Inc.), 360 meters.
WWAX—Laredo, Texas, Wormser Brothers, 360 meters.
WWB—Canton, Ohio, Daily News Printing company, 268 meters.
WWI—Dearborn, Mich., Ford Motor company, 273 meters.
WWJ—Detroit, Mich., Detroit News (Evening News association), 517 meters.
WWL—New Orleans, La., Loyola university, 280 meters.
WWZ—New York, N. Y., John Wanamaker, 360 meters.
WZAZ—Pomeroy, Ohio, Chase Electric, 258 meters.

How to Hook Up Your Set

Continued from Page 11.

range the units so that you will be able to adjust any moving contact or set screw on a moving part such as on the rheostats, tube sockets, etc. The springs of jacks are also apt to get bent out of shape, and these must be accessible. Turn the jacks vertical so that dust will not collect on the springs and so they will also be easily inspected or adjusted. This is a point seldom considered by builders.

The most common causes of failures on the part of home set builders may be summarized:

1. Lack of proper tools.
2. Failure to secure proper mounting supports, shelves, etc.
3. Use of weak lead wire.
4. Improper location of parts for short wiring.
5. Poor layout of panel.
6. Poor selection of dials and knobs for neat panel appearance.
7. Use of cabinet base for support of apparatus.
8. Use of poor solder.
9. Failure to tighten all connections.
10. Inaccurate spacing of drill holes on panel.
11. Attempt to crowd parts into small space.

Back of every receiver there must be craftsmanship which is one of the intangible factors of set building. No one can put into stereotype rules all the ins and outs of good set assembly.

How to Bind Wires.

There is a knack in bending wire so that it will be clean and square. There is a knack in soldering so that only a proper amount of solder is used and the metal applied evenly. There is a knack of spacing units which cannot be reduced to formulae. Much of the knack is common sense, much of it is experience, but regardless of how little you may know of wiring or assembling your set, you should be able to learn from observation and inspection of other sets.

In one respect it is impractical to attempt to duplicate a commercial type or design. A manufacturer will make special parts and connections which you cannot buy, and where you attempt to copy his style it often gets you into difficulties.

For example, a neutrodyne receiver, when properly wired, is so spaced and assembled that the linkage of capacity, etc., between stages is at a minimum. If you use random or stock parts bought in a store, you will not be able to duplicate the average neutrodyne receiver without some special testing after your circuit is all wired.

In short, in any critical circuit, such as reflex or tuned radio-frequency, adequate allowance must be made for the constants used by the manufacturer. Imitation, therefore, is of limited assistance.

Your Advantage Over Manufacturer.

On the other hand, you can use potentiometers, variable grid leaks and variometers which many manufacturers cannot use. Neutrodyne manufacturers are not using variable neutralizing condensers, as these would involve infringement of the regenerative patent, but no such restriction applies to you.

Theoretically, if you are skillful in your assembly and design, you may be able to build a receiver whose efficiency cannot be duplicated by any manufacturer. This is one of the advantages of "building your own" that you can forget patents and royalties.

Practice, of course, makes perfect, and if you will try your hand at making a cigar box set as your first attempt, you will learn more by wasting $2 worth of wire and solder getting a crystal set to function than by getting a set of blue prints and following the instructions.

The old adage, "If it's worth doing at all, do it well," will apply to your assembly work with unusual force. You may be tempted to hurry your work, you may be inclined to substitute wood for real insulation. You may find it easier to install binding posts on your panel than to have a rear connector block.

But, if you determine to build for the future, you will not be chagrined a week after your set is built to be allowed to inspect a receiver made by some grammar school youngster which typifies the refinement, skill and neatness of a good receiver, consistently assembled and finished.

Note—Readers who wish to have Mr. Cardwell criticize their receivers or suggest improvements, may send photographs and circuits (with constants) care of The Chicago Evening Post Radio Magazine. Be sure to inclose stamps for reply. The return of photographs cannot be guaranteed, but every effort will be made to return them in good condition.

Open Evenings Until 9 P. M.; Sunday 9:00 A. M. to 5 P. M.

Our Guarantee

Nothing but brand new radio parts—tested and approved by our qualified radio experts—guaranteed to give complete satisfaction in service—guaranteed to be the greatest value in merchandise that you can get for your money—that's what "Salvage" really means.

MAIL ORDERS SHIPPED TO YOU PROMPTLY—ADDRESS DEPT. P-6.

509 South State Street

Phone: Wabash 4183

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509 South State Street

Phone: Wabash 4183

Our Guarantee

Nothing but brand new radio parts—tested and approved by our qualified radio experts—guaranteed to give complete satisfaction in service—guaranteed to be the greatest value in merchandise that you can get for your money—that's what "Salvage" really means.

MAIL ORDERS SHIPPED TO YOU PROMPTLY—ADDRESS DEPT. P-6.

Enjoy Your Christmas with a RADIOLA No. 1

Complete With Murdoch Phones

Thousands of these splendid $25.00 Radio Receivers, built by the Radio Corporation of America, are bringing opera, jazz, news and entertainments nightly to enthusiastic audiences. A fortunate purchase of 3,000 sets enables us to offer you this identical $25.00 receiver for $9.45. While they last, only one to a customer. No batteries, no extra expense, quickly installed, easily operated—an ideal Christmas gift.

Only One to a Customer—

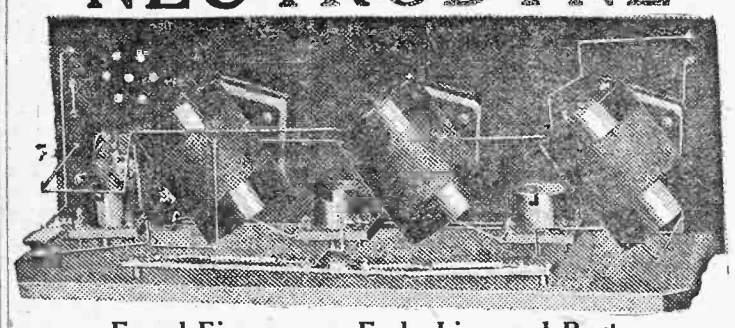
While They Last,

$9.45

(A $25.00 Value)

Build Your Own Sets with "Salvage" Parts

HAZELTINE NEUTRODYNE



Freed-Eiseman or Fada Licensed Parts

A UNIQUE method of tuning radio frequency amplification is employed in the Hazeltine Neutrodyne Receiver. This not only prevents tubes from oscillating, whistling and howling, but the tuning becomes so sharp that when once a station has been tuned-in, and the position of the numbers on the dial recorded, this identical position will again tune-in that particular station.

4 Tube ------$44.65
5 Tube ------$46.25

1 7x21x3-16 drilled Formica panel.
1 Howard rheostat.
3 4-inch Radion Dials.
3 John Firth bakelite sockets.
8 Binding posts.
3 23 plate variable condensers.
1 Wave control neutroformer.
2 Radio frequency amplifying neutroformers.
2 Grid neutralizing condensers.
1 .00025 micon grid condenser.
1 Marco variable grid leak.
1 Baseboard for mounting.
25 feet tinned copper bus bar wire and complete Instructions for assembling and wiring.

3-TUBE

Our Price **$28.60**

Important!

Any individual part (except the drilled panels) in any of the six outfits above may be purchased separately at the special reduced prices listed under column headed "Our Price."

Panels Drilled FREE

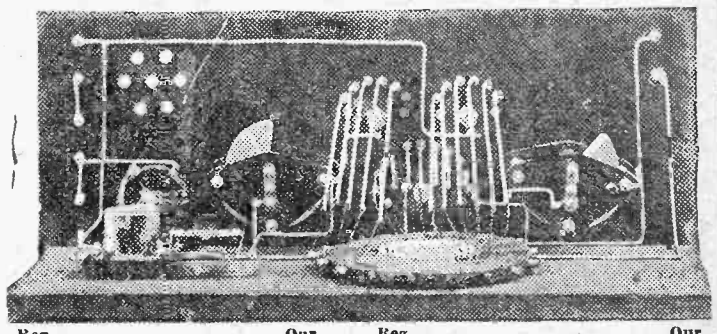
Specially drilled panels are included with each of the sets illustrated and described below. We give this free service only on panels included with complete sets.

Easy to Build

Complete instructions for assembling and blueprints for wiring are included with each outfit. Instructions written so everyone can understand them. No special skill or technical knowledge required—a few hours and you're ready to tune-in New York, Los Angeles—any of 'em!

Build Your Own Sets with "Salvage" Parts

REINARTZ DETECTOR



Reg. Price.		Consisting of	Our Price.
$1.89		7x18 Formica Panel	$1.70
1.00		Bakelite Socket	.45
1.50		Howard Vernier Rheostat	1.35
3.30		23-Plate Variable Condenser	1.45
3.10		11-Plate Variable Condenser	1.35
1.50	3	Switch Levers	.75
.80	2	Dozen Switch Points	.40
3.00	1	Schoonhoven Reinartz Coil	1.95
		1.00 Freshman Variable Grid Leak and Condenser combined	.75c
		.80 8 Binding Posts	.40c
		.30 25 Feet Tinned Wire	.15c

Reg. Price.	Consisting of	Our Price.
.50	Baseboard for mounting	.25
1.00	Blueprint with Complete Instructions for Assembly and Wiring	.50

Regular Price $21.69

Our Price **$11.45**

Complete parts for Detector and two-step with Vernier Condensers **$29.95**

Pick those KELLOGG Parts here for

A Good 3-CIRCUIT TUNER

11-Plate Vernier Condenser with 4-inch bakelite dial and knob	$4.95
23-Plate Vernier Condenser with 4-inch bakelite dial and knob	$5.95
43-Plate Vernier Condenser with 4-inch bakelite dial and knob	$6.45
Moulded Variometers	$5.95
Moulded Variocouplers	$6.75
3-Inch Bakelite Dials	65c
4-Inch Bakelite Dials	95c
Bakelite Sockets	55c
Grid Condensers	55c
Double Mountings	60c
Transformers (high or low ratio)	$2.95

Automatic Electric LONG RANGE HEADSETS

Formerly sold by the Automatic Electric Co., makers of telephone exchanges, at $10 each. We bought their entire stock—40,000 phones—paid spot cash, and because of this unequaled buying power, we are able to offer you a $10 headset for $3.65.

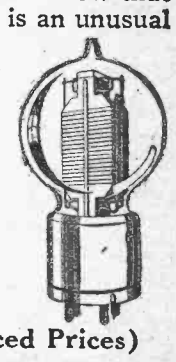
30 years of experience have produced the Automatic headset. Coil is wound with about 6,500 turns of No. 40 enamel-coated copper wire. DC resistance, 1,600 ohms. Impedance, at average music and voice frequency (800 cycles) is 21,000 ohms. (Effective impedance rather than DC resistance is the big factor in a good headset.)

$10.00 VALUE **$3.65**

Western Electric VT-2 TUBES

5 Watt "E" Tubes CW-931

One of the big features of these brand new, genuine Western Electric VT-2 Tubes that we bought from the U. S. Signal Corps is that they have a higher amplification factor than any other 5-watt tube made! And almost half of our purchase consisting of 10,000 tubes have been sold. Radio men know that a genuine VT-2 Tube for $7.45 is an unusual opportunity—a real "find"! These tubes may be used for both RF and AF Amplification, and for CW and phone transmitting. These are not Navy defects; they have been sold only as a surplus.



$12.00 VALUES **$7.45**

(All Other Tubes at Reduced Prices)

Complete Parts for AUTOPLEX

9½x13¼x⅛-inch Formica Panel, drilled and machined		$1.89
9½x13¼x⅛-inch Mahogany Cabinet with hinged top		2.95
1	John Firth Socket	.35
1	Frost Plain Rheostat	1.00
2	Moulded Autoplex Variometers	7.30
2	3-inch Bakelite Dials	.50
6	Binding Posts	.30
1	Single Circuit Pacent Jack	.35
1	1,250 or 1,500-Turn Honeycomb Coil	1.50
1	4x4x⅛-inch Formica sub base panel, drilled	.25
1	2¼x2¼x⅛-inch Formica Panel, Coil, clamp drilled	.07
1	Complete set machine screws for assembling various parts	(no charge)
1	Hook-up for assembling and wiring	(no charge)
4	Lengths square bus bar wire	.10

Our Special Price **$16.45**

HONEYCOMB COILS

1,500	Turns	$1.55
1,250	Turns	1.50
1,000	Turns	1.25
750	Turns	1.00
250	Turns	.75
150	Turns	.60
100	Turns	.50
75	Turns	.40
50	Turns	.40
35 and 25	Turns	.40

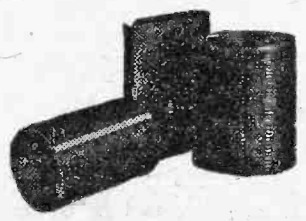
Bradleystat or Bradleyleak UNIVERSAL

New Type **$1.25** each

FORMICA

Made from Anhydrous Redmanol Resins

SHEETS TUBES RODS



We are prepared to furnish promptly and saw Formica panels of any dimensions. Cutting charge is included in the following prices:

3-16-inch Formica, sq. in	2c
⅛-inch Formica, sq. in	1½c
Tubing (2 to 4 inch diameter), per running inch	10c

Complete Parts for 2-STAGE AMPLIFIER

To amplify Ultra-Audion, Reinartz Flewelling, Knocked-Down Shore-Wave Receiver. Crystal or any receiving set so that loud speaker or phonograph can be used in place of headset.

Reg. Price.		Consisting of	Our Price.
$1.05		7 x 9 Formica Panel (other suitable size)	$ .95
4.75		High Ratio All-American of Thordarson Transformer	3.95
4.50		Low-Ratio All-American or Thordarson	3.95
2.20	2	Howard Rheostats	2.00
2.00	2	Bakelite Sockets	.90
3.00	3	Double Patent Jacks	1.50
1.30	13	Binding Posts	.65
.30		Baseboard	.15

$21.00 Value Our Price **$12.95**

Complete Parts for HERALD-EXAMINER

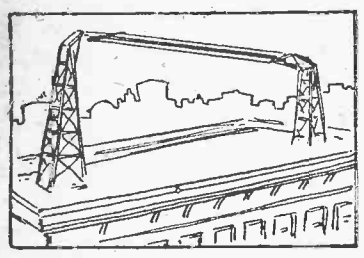
Single Tube Hook-Up

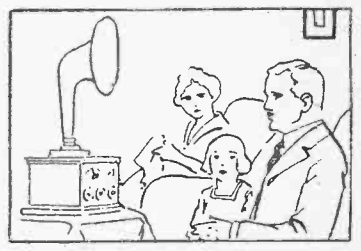
	Consisting of	Our Price.
6x10½	Drilled Panel	$ .95
23-Plate	Condenser	1.35
	Variocoupler	.95
	Rheostat	.35
	John Firth Socket	.35
	Freshman Grid Leak and Condenser	.65
2	Bakelite Dials	.50
	Switch Lever	.25
3	Binding Posts	.40
	Switch Points and Stops	.15
	Baseboard and Instructions and 25 feet Hook-Up Wire	.25

Our Price **$5.95**

THE CHICAGO EVENING POST

RADIO MAGAZINE





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THURSDAY, DECEMBER 20, 1923.

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The Chicago Evening Post

BROADCASTING

HOME RADIO

RADIO SETS

HOOK-UPS

AMATEUR RECEPTION

HOME-WORKSHOP

RADIO SCIENCE-

RADIO PROGRAMS

LOCAL NEWS

U.S. RADIO NEWS

HOME LABORATORY

AMATEUR TRANSMISSION

RADIO STATIONS

INVENTIONS

D.X. RECORDS

RADIO PRACTICE-

COMMERCIAL

"HANSEL AND GRETEL, opera, is on the air again tonight. Standing, left to right, are Doria Fernanda, William Beck and Maria Claessens. Middle row—Mary Fabian, Frank St. Leger and Beryl Brown. Bottom—Irene Pavloska.

FOREIGN RADIO NEWS

MANUFACTURERS NEWS

NEW EQUIPMENT

DEALERS NEWS

JOBBER NEWS

IN THIS ISSUE

Making the Neutrodyne Obey the Rheostat—How to Build a Neutrodyne Set—Construction Details on the "Sun" Receiver—Panel Layout and Notes on Building "Old Reliable," the Editor's Personal Set—Construction of Push-and-Pull Amplifier.

Broadcasting Stations and Schedules

Central, or Chicago time, is shown on all stations. If necessary to ascertain local time on any station deduct two hours from time shown for Pacific coast stations, one hour from time shown for the Rocky mountain stations and add one hour to those stations using eastern time. Hawaiian island time is four hours and a half slower than Chicago time. In the list the call number of the station is first given, followed by the location, the owner's name, wave length used and broadcasting schedule in order named. THE POST is making a thoro canvass of all stations in order that this directory may be complete and accurate. Changes are so frequent in stations and schedules that no list can be satisfactory which is not corrected frequently. Corrections and additions to this list will be made from week to week. Stations are urged to co-operate by sending information of changes in schedule to Radio Editor, The Chicago Evening Post.

KDKA—East Pittsburg, Westinghouse Electric and Manufacturing company, 326 meters.
KDPM—Cleveland, Ohio. Westinghouse Electric and Manufacturing company, 270 meters.
KDPT—San Diego, Calif., Southern Electrical company, 244 meters.
KDYL—Salt Lake City, Utah, Telegram Publishing company, 360 meters.
KDYM—San Diego, Calif., Savoy theater, 252 meters.
KDYQ—Portland, Ore., Oregon Institute of Technology, 360 meters.
KDYS—Great Falls, Mont., The Tribune, 360 meters.
KDYW—Phoenix, Ariz., Smith Hughes & Co., 360 meters.
KDYX—Honolulu, Hawaii, Star Bulletin, 360 meters.
KDZB—Bakersfield, Calif., 1402 20th street, Frank E. Siefert, 240 meters.
KDZE—Seattle, Wash., The Rhodes company, 455 meters.
KDZF—Los Angeles, Calif., Automobile Club of Southern California, 278 meters.
KDZI—Wenatchee, Wash., Electric Supply company, 360 meters.
KDZK—Reno, Nev., Nevada Machinery and Electric company, 360 meters.
KDZQ—Denver, Colo., Nichols Academy of Music, 360 meters.
KDZR—Bellingham, Wash., Bellingham Publishing company, 261 meters.
KDZT—Seattle, Wash., Seattle Radio association, 360 meters.
KFAD—Phoenix, Ariz., McArthur Bros. Mercantile company, 360 meters.
KFAE—Pullman, Wash., State College of Washington, 360 meters.
KFAF—Denver, Colo., Western Radio corporation, 360 meters.
KFAJ—Boulder, Colo., University of Colorado, 360 meters.
KFAN—Moscow, Idaho. The Electric shop, 360 meters.
KFAP—Butte, Mont., Standard Publishing company, 360 meters.
KFAR—Hollywood, Calif., Studio Lighting Service company (O. K. Olsen), 280 meters.
KFAU—Boise, Idaho, Independent School District of Boise City, Boise High school, 270 meters.
KFAV—Venice, Calif., Abbot Kinney company, 224 meters.
KFAW—Santa Ana, Calif., The Radio Den (W. B. Ashford and H. T. White), 280 meters.
KFAY—Medford, Ore., Virgin's Radio service, 283 meters.
KFBB—Havre, Mont., F. A. Buttrey & Co., 360 meters.
KFBC—San Diego, Calif., W. K. Azbill, 278 meters.
KFBE—San Luis Obispo, Calif., Reuben H. Horn, 360 meters.
KFBG—Tacoma, Wash., First Presbyterian church, 360 meters.
KFBK—Sacramento, Calif., Kimball-Upson company, 283 meters.
KFBL—Everett, Wash., Leese Bros., 224 meters.
KFBS—Trinidad, Colo., Trinidad Gas and Electric Supply company and the Chronicle News, 360 meters.
KFBU—Laramie, Wyo., The Cathedral (Bishop N. S. Thomas), 283 meters.
KFCB—Phoenix, Ariz., Nielsen Radio Supply company, 238 meters.
KFCD—Salem, Ore., Salem Electric company, 360 meters.
KFCF—Walla Walla, Wash., 707 Baker building, Frank A. Moore, 360 meters.
KFCH—Billings, Mont., Electric Service station (Inc.), 360 meters.
KFCK—Colorado Springs, Colo., Colorado Springs Radio company, 258 meters.
KFCL—San Antonio, Calif., Los Angeles Union Stock yards, 360 meters.
KFCM—Richmond, Calif., Richmond Radio shop (Frank T. Doeing), 360 meters.
KFCP—Ogden, Utah, 2421 Jefferson avenue, Ralph W. Flygare, 360 meters.
KFCV—Houston, Texas, Fred Mahaffey, Jr., 360 meters.
KFCY—Le Mars, Iowa, Western Union college, 252 meters.
KFCZ—Omaha, Neb., Omaha Central High school, 258 meters.
KFDA—Baker, Ore., Adler's Music store, 360 meters.
KFDD—Boise, Idaho, St. Michael's cathedral, 252 meters.
KFDH—Tucson, Ariz., University of Arizona, 360 meters.
KFDJ—Corvallis, Ore., Oregon Agricultural college, 360 meters.
KFDL—Denver, Colo., Knight-Campbell Music company, 360 meters.
KFDO—Bozeman, Mont., 420 West Koch street, H. Everett Cutting, 248 meters.
KFDP—Des Moines, Iowa, Hawkeye Radio and Supply Co., 278 meters.
KFDR—York, Neb., Bullock's Hardware and Sporting Goods (Robert G. Bullock), 360 meters.
KFDU—Lincoln, Neb., Nebraska Radio Electric company, 240 meters.
KFDV—Fayetteville, Ark., Gilbrech & Stinson, 360 meters.
KFDX—Shreveport, La., First Baptist church, 360 meters.
KFDY—Brookings, S. D., South Dakota State College of Agriculture and Mechanic Arts, 360 meters.
KFDZ—Minneapolis, Minn., 2510 South Thomas avenue, Harry O. Iverson, 360 meters.
KFEC—Portland, Ore., Meier & Frank company, 360 meters.
KFEJ—Tacoma, Wash. 1724 South Jay street, Guy Greason, 360 meters.
KFEL—Denver, Colo., Winner Radio corporation, 360 meters.
KFEP—Denver, Colo., Radio Equipment company (Joseph L. Turre), 240 meters.
KFEQ—Oak, Neb., J. L. Scroggin, 360 meters.
KFER—Fort Dodge, Iowa, Auto Electric Service company, 231 meters.
KFEV—Douglas, Wyo., Radio Electric Shop, 263 meters.
KFEX—Minneapolis, Minn., Augsburg Seminary, 261 meters.
KFEY—Kellogg, Idaho, Bunker Hill and Sullivan Mining and Concentrating company, 360 meters.
KFEZ—St. Louis, Mo., American Society of Mechanical Engineers (F. H. Schubert) 360 meters.
KFFA—San Diego, Cal., 3443 5th street, Dr. R. O. Shelton, 242 meters.
KFFB—Boise, Idaho, Jenkins Furniture company, 240 meters.
KFFE—Pendleton, Ore., Eastern Oregon Radio company, 360 meters.
KFFO—Hillsboro, Ore., Dr. E. H. Smith, 229 meters.
KFFP—Moberly, Mo., First Baptist church, 275 meters.
KFFQ—Colorado Springs, Colo., Marksheffel Motor company, 360 meters.
KFFR—Sparks, Nev., Nevada State Journal (Jim Kirk), 226 meters.
KFFV—Lamoni, Iowa, Graceland college, 360 meters.
KFFX—Omaha, Neb., McGraw company, 278 meters.
KFFY—Alexandria, La., Pincus & Murphy, 275 meters.
KFFZ—Dallas, Tex. (portable), Al. G. Barnes Amusement company, 226 meters.
KFGG—Baton Rouge, La., Louisiana State university, 254 meters.
KFGD—Chickasha, Okla., Chickasha Radio and Electric company, 248 meters.
KFGH—Stanford University, Cal., Leland Stanford university, 360 meters.
KFGJ—St. Louis, Mo., Missouri National guard, 138th infantry, 266 meters.
KFGI—Arlington, Ore., Arlington garage, 234 meters.
KFGP—Cheney, Kan., Cheney Radio company, 229 meters.
KFGQ—Boone, Iowa, Crary Hardware company, 226 meters.
KFGV—Utica, Neb., Heidbreder Radio Supply company, 224 meters.
KFGX—Orange, Texas, First Presbyterian church, 250 meters.
KFGZ—Berrien Springs, Mich., Emmanuel Missionary college, 268 meters.
KFHA—Gunnison, Colo., Colorado State Normal school, 252 meters.
KFHB—Hood River, Ore., Rialto theater (P. L. Beardwell), 280 meters.
KFHD—St. Joseph, Mo., Utz Electric Shop company, 226 meters.
KFHF—Shreveport, La., Central Christian church, 266 meters.
KFHH—Neah Bay, Wis, Ambrose A. McCue, 283 meters.
KFHJ—Santa Barbara, Cal., Fallon & Co., 360 meters.
KFBQ—Los Gatos, Cal., Curtis Brothers Hardware store, 242 meters.
KFHR—Seattle, Wash., Star Electric and Radio company, 270 meters.
KFHS—Lihue, Hawaii, Clifford J. Dow, 275 meters.
KFHU—Mayville, N. D., M. G. Sateren, 261 meters.
KFHX—Hutchinson, Kan., 407 East 1st street, Robert W. Nelson, 229 meters.
KFI—Los Angeles, Cal., Earle C. Anthony (Inc.), 469 meters.
KFIB—St. Louis, Mo., 5666 Vernon avenue, Franklin W. Jenkins, 244 meters.
KFID—Iola, Kan., Ross Arbuckle's garage, 246 meters.
KFIF—Portland, Ore., Benson Polytechnic institute, 360 meters.
KFIK—Gldabrook, Iowa, Gladbrook Electric company, 234 meters.
KFIL—Louisburg, Kan., Windisch Electric Farm Equipment company, 234 meters.
KFIO—Spokane, Wash., North Central high school, 252 meters.
KFIQ—Yakima, Wash., Yakima Valley Radio Broadcasting association, 224 meters.
KFIU—Juneau, Alaska, Alaska Electric Light and Power company, 226 meters.
KFIV—Pittsburg, Kan., 706 East 10th street, V. H. Broyles, 240 meters.
KFIX—Independence, Mo., Reorganized Church of Jesus Christ of Latter Day Saints, 240 meters.
KFIY—Seattle, Wash., Brott laboratories, 236 meters.
KFIZ—Fond du Lac, Wis., Daily Commonwealth, 237 meters.
KFJA—Grand Island, Neb., Central Power company, 244 meters.
KFJB—Marshalltown, Iowa, Marshalltown Electrical company, 248 meters.
KFJC—Seattle, Wash., Post Intelligencer, 233 meters.
KFJD—Greeley, Colo., Weld County Printing and Publishing company, 236 meters.
KFJF—Oklahoma City, Okla., National Radio Manufacturing company, 252 meters.
KFJH—Selma, Cal., The Sugar Bowl (H. R. Shaw), 273 meters.
KFJI—Astoria, Oreg., Liberty theater (E. E. Marsh), 252 meters.
KFJJ—Carrollton, Mo., Carrollton Radio shop, 236 meters.
KFJK—Bristow, Okla., Delano Radion and Electric company, 233 meters.
KFJL—Ottumwa, Iowa, Hardsacg Manufacturing company, 242 meters.
KFJM—Grand Forks, N. D., University of North Dakota, 229 meters.
KFJQ—Grand Forks, N. D., Electric Construction company (portable), 252 meters.
KFJR—Stevensville, Mont., Ashley C. Dixon and Son, 258 meters.
KFJV—Dexter, Iowa, Thomas H. Warren, 224 meters.
KFJW—Towanda, Kan., Le Grand Radio company, 226 meters.
KFJX—Cedar Falls, Iowa, State Teachers' college, 229 meters.
KFJY—Fort Dodge, Iowa, Tunwall Radio company, 246 meters.
KFJZ—Fort Worth, Texas, Texas National Guard, 112th Cavalry, 254 meters.
KFKA—Greeley, Colo., Colorado State Teachers' college, 248 meters.
KFKB—Milford, Kas., Brinkley-Jones Hospital association, 286 meters.
KFKH—Lakeside, Colo., Denver Park and Amusement company, 248 meters.
KFKQ—Conway, Ark., Conway Radio laboratories, 224 meters.
KFKV—Butte, Mont., F. F. Gray, 283 meters.
KFKX—Hastings, Neb., Westinghouse Electric and Manufacturing company, 286 meters.
KFKZ—Colorado Springs, Colo., Nassour Bros. Radio company, 234 meters.
KFLA—Butte, Mont., Abner R. Wilson, 283 meters.
KFLB—Menominee, Mich., Signal Electric Manufacturing company, 248 meters.
KFLD—Franklinton, La., Paul E. Greenlaw, 234 meters.
KFLE—Denver, Colo., National Educational Service, 268 meters.
KFLH—Salt Lake City, Utah, Erickson Radio company, 261 meters.
KFLP—Cedar Rapids, Ohio, Everette M. Foster, 240 meters.
KFLQ—Little Rock, Ark., Bizzell Radio shop, 261 meters.
KFLR—Albuquerque, N. M., University of New Mexico, 254 meters.
KGB—Tacoma, Wash., Wm. A. Mullins Electric company, 360 meters.
KGG—Portland, Ore., Hallock & Watson Radio service, 360 meters.
KGN—Portland, Ore., Northwestern Radio Manufacturing company, 360 meters.
KGU—Honolulu, Hawaii, Waikiki Beach, Marion A. Mulrony, 360 meters.
KGW—Portland Ore., Portland Morning Oregonian, 492 meters.
KGY—Lacy, Wash., St. Martins college (Rev. Sebastian Ruth), 258 meters.
KHJ—Los Angeles, Cal., Times-Mirror company, 395 meters.
KHQ—Seattle, Wash, 419 13th avenue, Louis Wasmer, 360 meters.
KJQ—Stockton, Cal., 615 East Main street, C. O. Gould, 360 meters.
KJR—Seattle, Wash, Northwest Radio Service company, 270 meters.
KJS—Los Angeles, Cal., Bible Institute of Los Angeles, 360 meters.
KLN—Monterey, Cal., Monterey Electric Shop, 360 meters.
KLS—Oakland, Cal., 2201 Telegraph avenue, Warner Brothers, 360 meters.
KLX—Oakland, Cal., Tribune Publishing company, 360 meters.
KLZ—Denver, Colo., Reynolds Radio company, 360 meters.
KMJ—Fresno, Cal., San Joaquin Light and Power corporation, 360 meters.
KMO—Tacoma, Wash., Love Electric company, 360 meters.
KNJ—Roswell, New Mexico, Roswell Public Service company, 250 meters.
KNT—Aberdeen, Wash., Grays Harbor Radio company (Walter Hemrich), 263 meters.
KNV—Los Angeles, Cal., Radio Supply company, 360 meters.
KNX—Los Angeles, Cal., Electric Lighting Supply company, 360 meters.
KOB—State College, New Mexico, New Mexico College of Agriculture and Mechanic Arts, 360 meters.
KOP—Detroit, Mich, Detroit Police department, 286 meters.
KPO—San Francisco, Cal., Hale Brothers, 423 meters.
KQI—Berkeley, Cal., University of California, 360 meters.
KQP—Hood River, Ore., Apple City Radio club, 360 meters.
KQV—Pittsburg, Pa., Doubleday-Hill Electric company, 360 meters.
KQW—San Jose, Cal., 467 1st street, Charles D. Herrold, 360 meters.
KRE—Berkeley, Cal., Berkeley Daily Gazette, 278 meters.
KSD—St. Louis, Mo., Post Dispatch (Pulitzer Publishing company), 546 meters.
KSS—Long Beach, Cal., Prest & Dean Radio company and Radio Research Society of Long Beach, Cal., 360 meters.
KTW—Seattle, Wash., First Presbyterian church, 360 meters.
KUO—San Francisco, Cal., Examiner Printing company, 360 meters.
KUS—Los Angeles, Cal., City Dye Works and Laundry company, 360 meters.
KUY—El Monte, Cal., Coast Radio company, 360 meters.
KWG—Stockton, Cal., Portable Wireless Telephone company, 360 meters.
KWH—Los Angeles, Cal., Los Angeles Examiner, 360 meters.
KXD—Modesto, Cal., Modesto Herald Publishing company, 360 meters.
KYQ—Honolulu, Hawaii, Electric Shop, 360 meters.
KYW—Chicago, Ill., Westinghouse Electric and Manufacturing company, 345 meters.
KZM—Oakland, Cal., 13th and Harrison streets, Preston D. Allen, 360 meters.
KZN—Salt Lake City, Utah, The Deseret News, 360 meters.
KZV—Wenatchee, Wash, Wenatchee Battery and Motor company, 360 meters.
WAAB—New Orleans, La., 137 South St. Patrick street, Valdemar Jensen, 268 meters.
WAAC—New Orleans, La., Tulane university 360 meters.
WAAD—Cincinnati, Ohio, Ohio Mechanics institute, 360 meters.
WAAF—Chicago, Ill., Chicago Daily Drovers Journal, 360 meters.
WAAH—St. Paul, Min., Commonwealth Electric company, 360 meters.
WAAK—Milwaukee, Wis., Gimbel Brothers, 280 meters.
WAAM—Newark, N. J., I. R. Nelson company, 263 meters.
WAAN—Columbia, Mo., University of Missouri, 254 meters.
WAAW—Omaha, Neb., Omaha Grain Exchange, 360 meters.
WAAZ—Emporia, Kans., Hollister-Miller Motor company, 360 meters.
WABB—Harrisburg, Pa., Dr. John B. Lawrence, 266 meters.
WABC—Anderson, Ind., Fulwider-Grimes Battery company, 229 meters.
WABD—Dayton, Ohio, Parker high school, 283 meters.
WABE—Washington, D. C., Young Men's Christian association, 283 meters.
WABF—Mount Vernon, Ill., Mount Vernon Register-News company, 234 meters.
WABG—Jacksonville, Fla., Arnold Edwards Piano company, 248 meters.
WABH—Sandusky, Ohio, Lake Shore Tire company, 240 meters.
WABI—Bangor, Me., Bangor Railway and Electric company, 240 meters.
WABA—Lake Forest, Ill., Lake Forest college, 266 meters.
WABJ—South Bend, Ind., The Radio Laboratories, 240 meters.
WABK—Worcester, Mass., First Baptist church, 252 meters.
WABL—Storrs, Conn., Connecticut Agricultural college, 283 meters.
WABM—Saginaw, Mich., F. E. Doherty Automotive and Radio Supply company, 254 meters.
WABN—La Crosse, Wis., Waldo C. Grover, 234 meters.
WABO—Rochester, N. Y., Lake Avenue Baptist church, 252 meters.
WBAA—West Lafayette, Ind., Purdue University, 360 meters.
WBAD—Minneapolis, Minn., Sterling Electric company, 360 meters.
WBAH—Minneapolis, Minn., The Dayton company, 360 meters.
WBAN—Paterson, N. J., Wireless Phone corporation, 244 meters.
WBAO—Decatur, Ill., James Millikin university, 360 meters.
WBAP—Fort Worth, Texas, Wortham-Carter Publishing company (Star-Telegram), 476 meters.
WBAV—Columbus, Ohio, Erner & Hopkins company, 390 meters.
WBAW—Marietta, Ohio, Marietta college, 246 meters.
WBAX—Wilkesbarre, Pa., 66 Gildersleeve street, John H. Stenger Jr., 360 meters.
WBAY—New York, N. Y., Western Electric company, 492 meters.
WBBA—Newark, Ohio, Newark Radio Laboratories, 240 meters.
WBBC—Sterling, Ill., Sterling Radio Equipment company, 229 meters.
WBBD—Reading, Pa., Barbey Battery Service, 234 meters.
WBL—Anthony, Kan., T & H. Radio company, 261 meters.
WBS—Newark, N. J., D. W. May, Inc., 360 meters.
WBT—Charlotte, N. C., Southern Radio corporation, 360 meters.
WBU—Ohicago, Ill., City of Chicago, 286 meters.
WBZ—Springfield, Mass., Westinghouse Electric and Manufacturing company, 337 meters.
WCAD—Canton, N. Y., St. Lawrence university, 280 meters.
WCAE—Pittsburg, Pa., Kaufmann & Baer company, 462 meters.
WCAG—New Orleans, La., 2813 Calhoun street, Clyde R. Randall, 268 meters.
WCAH—Columbus, Ohio, Entrekin Electric company, 286 meters.
WCAJ—University Place, Neb., Nebraska Wesleyan university, 360 meters.
WCAK—Houston, Texas, 2504 Bagby street, Alfred P. Daniel, 360 meters.
WCAL—Northfield, Minn., St. Olaf college, 360 meters.
WCAM—Villanova, Pa., Villanova college, 360 meters.
WCAO—Baltimore, Md., Sanders & Stayman company, 360 meters.
WCAP—Washington, D. C., Chesapeake & Potomac Telephone company, 469 meters.
WCAR—San Antonio, Texas, Alamo Radio Electric company, 360 meters.
WCAS—Minneapolis, Minn., William Hood Dunwoody Industrial institute, 360 meters.
WCAT—Rapid City, S. D., South Dakota State School of Mines, 240 meters.
WCAU—Philadelphia, Pa., Durham & Co., 286 meters.
WCAV—Little Rock, Ark., J. C. Dice Electric company, 360 meters.
WCAX—Burlington, Vt., University of Belmont, 360 meters.
WCAY—Milwaukee, Wis., Kesselman O'Driscoll company, 261 meters.
WCAZ—Carthage, Ill., Carthage college, 246 meters.
WCBA—Allentown, Pa., 1015 Allen street, Charles W. Heimbach, 280 meters.
WCBB—Greenville, Ohio, K. & K. Radio Supply company (Charles H. Katzenberger) 240 meters.
WCBD—Zion, Ill., Wilbur G. Voliva, 345 meters.
WCE—Minneapolis, Minn., Findley Electric company, 360 meters.
WCK—St. Louis, Mo., Stix, Baer & Fuller Dry Goods company, 360 meters.
WCM—Austin, Texas, University of Texas, 360 meters.
WCX—Detroit, Mich., Detroit Free Press, 517 meters.
WDAD—Lindsborg, Kans., Central Kansas Radio Supply company (Wm. L. Harrison), 360 meters.
WDAE—Tampa, Fla., Tampa Daily Times, 360 meters.
WDAF—Kansas City, Mo., Kansas City Star, 411 meters.
WDAG—Amarillo, Texas, J. Laurance Martin, 360 meters.
WDAH—El Paso, Texas, Trinity Methodist church (South), 360 meters.
WDAI—Syracuse, N. Y., Hughes Radio corporation, 246 meters.
WDAK—Hartford, Conn., The Courant, 261 meters.
WDAL—Jacksonville, Fla., Florida Times-Union, 360 meters.
WDAO—Dallas, Texas, Automotive Electric company, 360 meters.
WDAP—Chicago, Ill., Board of Trade, 360 meters.
WDAR—Philadelphia, Pa., Lit Brothers, 395 meters.
WDAS—Worcester, Mass., 692a Main street, Samuel A. Waite, 360 meters.
WDAU—New Bedford, Mass., Slocum Kilburn, 360 meters.
WDAX—Centerville, Iowa, First National bank, 360 meters.
WDAY—Fargo, N. D., Fargo Radio Service company, 244 meters.
WDBC—Lancaster, Pa., Kirk, Johnson & company, 258 meters.
WDBF—Youngstown, Ohio, 254 West Federal street, Robert G. Phillips, 261 meters.
WDM—Washington, D. C., Church of the Covenant, 360 meters.
WDT—Stapleton, N. Y., Ship Owners Radio Service, 405 meters.
WDZ—Tuscola, Ill., Star Store building, James L. Bush, 278 meters.
WEAA—Flint, Mich., Fallain & Lathrop, 280 meters.
WEAB—Fort Dodge, Iowa, Standard Radio Equipment company, 360 meters.
WEAF—New York, N. Y., American Telephone and Telegraph company, 492 meters.
WEAG—Edgewood, R. I., Nichols-Hineline-Bassett Laboratory, 231 meters.
WEAH—Wichita, Kans., Witchita Board of Trade, 244 meters.
WEAI—Ithaca, N. Y., Cornell university, 286 meters.
WEAJ—Vermilion, S. D., University of South Dakota, 360 meters.
WEAM—North Plainfield, N. J., Borough of North Plainfield (W. Gibson Buttfield), 250 meters.
WEAN—Providence, R. I., Shepard company, 273 meters.
WEAO—Columbus, Ohio, Ohio State University, 360 meters.
WEAP—Mobile, Ala., Mobile Radio company, 360 meters.
WEAR—Baltimore, Md., Baltimore American and News Publishing company, 360 meters.
WEAS—Washington, D. C., Hecht company, 360 meters.
WEAU—Sioux City, Iowa, Davidson Brothers company, 360 meters.
WEAY—Houston, Texas, Iris theater (Will Horowitz Jr.), 360 meters.
WEB—St. Louis, Mo., Benwood company, 360 meters.
WEV—Houston, Texas, Hurlburt-Still Electrical company, 360 meters.
WEW—St. Louis, Mo., St. Louis University, 261 meters.
WFAA—Dallas, Texas, Dallas News and Dallas Journal, 476 meters.
WFAB—Syracuse, N. Y., 802 McBride street, Carl F. Woese, 234 meters.
WFAF—Poughkeepsie, N. Y., H. C. Spratley Radio company, 360 meters.
WFAH—Port Arthur, Texas, Electric Supply company, 360 meters.
WFAJ—Asheville, N. C., Hi-Grade Wireless Instrument company, 360 meters.
WFAM—St. Cloud, Minn., Times Publishing company, 360 meters.
WFAN—Hutchinson, Minn., Hutchinson Electric Service company, 360 meters.
WFAQ—Cameron, Mo., Missouri Wesleyan college, 360 meters.
WFAT—Sioux Falls, S. D., Daily Argus-Leader, 360 meters.
WFAV—Lincoln, Neb., University of Nebraska, department of electrical engineering, 360 meters.
WFI—Philadelphia, Pa., Strawbridge & Clothier, 395 meters.
WGAL—Lancaster, Pa., Lancaster Electric Supply and Construction company, 248 meters.
WGAN—Pensacola, Fla., 216 West Romana street, Cecil E. Lloyd, 360 meters.
WGAQ—Shreveport, La., Glenwood Radio corporation (W. G. Patterson), 360 meters.
WGAR—Fort Smith, Ark., Southwest American, 360 meters.
WGAU—Wooster, Ohio, Radio Manufacturing and Service company (Marcus G. Limb), 226 meters.
WGAW—Altoona, Pa., 1918 West Chestnut street, Ernest C. Albright, 261 meters.
WGAY—Madison, Wis., Northwestern Radio company, 360 meters.
WGAZ—South Bend, Ind., South Bend Tribune, 360 meters.
WGI—Medford Hillside, Mass., American Radio and Research corporation, 360 meters.
WGL—Philadelphia, Pa., 2303 North Broad street, Thomas F. J. Howlett, 360 meters.
WGR—Buffalo, N. Y., Federal Telephone and Telegraph company, 319 meters.
WGV—New Orleans, La., Interstate Electric company, 360 meters.
WGY—Schenectady, N. Y., General Electric

Continued on Page 14.

THE CHICAGO EVENING POST TABLOID RADIO SCHEDULES

These stations are those most commonly tuned in evenings by the Chicago broadcast listeners. The time given is central standard. Pacific coast time is two hours earlier than that shown here. Mountain time is one hour earlier, and eastern time one hour later. Evening program schedules only are given. This list was compiled by The Chicago Evening Post Radio Department and is protected by copyright.

STATION	Miles	Met	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Chicago—									
KYW, Comm. Edison Bldg		536		6:30- 9:30	6:30-12:00	6:30- 9:30	6:30- 9:30	6:30-12 m.	6:30- 9:30
WAAF, Union Stock Yards		286	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00		
WMAQ, Hotel La Salle		448		7:00- 9:55	7:00- 9:55	7:00- 9:55	7:00- 9:55	8:00-10:00	
WDAP, Drake Hotel		360		7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	9:15-10:30
WJAZ, Edgewater Beach Hotel		448		10:00-12:30	10:00-12:30	10:00-12:30	10:00-12:30	10:00- 2:00	6:00- 9:00
Suburban—									
WCBD, Zion, Ill.	39	345	8:00- 9:00				8:00- 9:00		
WIAB, Rockford, Ill	77	252			8:00- 9:00				
WRM, Urbana, Ill.	120	360			8:50- 9:30				
WTAS, Elgin, Ill.	37	275			7:30-10:00				
Eastern—									
KDKA, East Pittsburg	430	326	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WBZ, Springfield, Mass	802	337	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	
WEAF, New York City	733	496	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10.00
WGI, Medford Hillside, Mass	875	360	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	7:30- 9:00
WHAZ, Troy, N. Y.	748	380	8:00- 9:30						
WGY, Schnectady, N. Y.	698	280	6:45-11:30	6:45- 9:00	6:45- 9:00	6:45- 9:00	6:45-11:30	6:45- 9:00	
WGR, Buffalo	472	319	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	
WJY, New York City	733	405							2:30- 6:00
WJZ, New York City	733	455	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	
WOO, Philadelphia	677	509	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	
WRC, Washington, D. C	612	469	8:00-10:00		8:00-10:00		8:00-10:00		
Midwest—									
WCX, Detroit	245	517	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00		
WJAX, Cleveland	323	390		7:30- 9:30		8:00-10:30			
WLAG, Minneapolis	358	417	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	
WLW, Cincinnati	262	309	8:00-10:00	10:00-12:00	8:00-10:00	10:00-12:00			
WOC, Davenport	105	481	7:00-11:00		7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WTAM, Cleveland	323	300	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30
WWJ, Detroit	245	517	8:30-10:00	8:30-10:00	8:30-10:00	8:30-12 m.	8:30-10:00		
Southern—									
KSD, St. Louis	270	546	8:00-11:00	8:00-11:00	8:00-11:00		8:00-11:00	8:00-11:00	
WBAP, Fort Worth, Texas	855	476	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00		
WDAF, Kansas City, Mo	480	411	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	
WFAA, Dallas, Texas	853	476	6:45- 9:30	6:45- 9:30	6:45- 9:30	6:45- 7:30	6:45- 9:30	6:45- 9:30	9:30-11:00
WGV, New Orleans	858	350	7:00- 8:00		7:00- 8:00			7:00- 8:00	
WHAS, Louisville	271	400			7:30- 9:00				4:00- 5:00
WHB, Kansas City, Mo	430	411		7:00- 9:00		7:00- 9:00	7:00- 9:00		8:00-10:00
WMC, Memphis	480	500		11:00-12:00			11:00-12:00	8:00-10:00	8:00-10:00
WOAI, San Antonio, Texas	1,080	385		9:30-10:30				9:30-10:30	
WOS, Jefferson City, Mo	337	441	8:00- 9:30		8:00- 9:30		8:00- 9:30		
WSB, Atlanta, Ga	605	428	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	7:30- 9:00
Pacific Coast—									
KFDB, San Francisco	1,910	509	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30
KGW, Portland, Ore.	1,895	492	1:00-2 a.m.	10:00-11:00	10:00-11:00	10:00 11:00	1:00-2 a.m.	10:00-11:00	9:00-10:00
KHJ, Los Angeles	1,705	395	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	10:00-12:00
KPO, San Francisco	1,910	423	6:30-12 m.	6:30-12 m.		6:30-12 m.		6:30-12 m.	10:30-12 m.

IVERSON C. WELLS
EDITOR

Assisted by a Staff of Regular and Special Contributing Writers.

The RADIO MAGAZINE Section is edited with the view of giving authentic news of the radio broadcasting field and authoritative information on the subjects of home construction of receiving and transmission sets, of the operation and maintenance of apparatus, and as an exchange of opinion for its readers.

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THURSDAY, DECEMBER 20, 1923.

Weekly Subscription $1.35 Per Year.

Opera on Radio for Tonight by KYW

By THE NIGHT PROWLER.

Tonight KYW broadcasts the Chicago Civic Opera company's presentation of "Hansel and Gretel," which will be played with Irene Pavloska and Mary Fahian in the leading roles.

This same opera was broadcast last evening by WMAQ. Both these stations, broadcasting the same opera so close together, are giving the radiophans a chance to compare the work of the two stations.

Unfortunately, the great masses of radiophans do not get to enjoy the work of either station. Most of the simple set owners and crystal operaors cannot get away from the other stations when WMAQ is on the air, so they are denied that program. Neither can but a few of them reach the higher wave length under which KYW is forced to take the air, so they are cheated out of that reception.

It might be said that both stations have rather "select" audiences.

All Want to Hear Opera.

And it is too bad, too, for opera is a popular feature and all want to listen in. Seems that some sort of an arrangement could be devised whereby everyone could enjoy these programs.

Christmas eve and New Year's eve fall on Mondays. The local stations are not going to deviate from their rule to remain silent from 7 p. m. to 11 p. m. It may be that late programs will be broadcast. KYW already has announced a special program for 11 p. m. Christmas eve.

Judging from the telephone calls and letters written The Post radio department most of the radiophans wanted the stations to take the air for just this one "silent" night. It would have been a treat for those who have been denied Monday night programs for the last year.

Special Christmas Service.

KYW also is announcing a special Christmas service for Sunday, Dec. 23. In addition to the regular services of the Central church, which are held every Sunday morning at 11 o'clock and broadcasted from Orchestra hall, KYW will broadcast "The Messiah" oratorio by the Apollo club, to be given at Orchestra hall in the afternoon at 3 o'clock. The Apollo Musical club is the third largest organization of its kind in the world, now in its fifty-second concert season. It is composed of over 300 members, accompanied by the Chicago Symphony orchestra, with Edgar Nelson at the organ and Harrison M. Wild as conductor. The following soloists will assist: Misses Edith Bideau Normelli, soprano, and Betty Baxter, contralto, and Messrs. Arthur Kraft, tenor, and Edgar Fowlston, barytone.

At 6 o'clock William Ziegler Nourse will read excerpts from the Goodspeed "New Testament," published thru arrangement with The Chicago Evening Post, and the Chicago Sunday Evening club will begin its services fifteen minutes earlier than usual, owing to the special Christmas services it has programed. There will be a preliminary service consisting of the "Old-Fashioned Christmas Carols," by a chorus of choir members, numbering more than 100 voices.

Radio Programs

Below are given the complete schedules of all the Chicago and suburban broadcasting stations and those of the out-of-town stations which are most commonly tuned by local radiophans.

These schedules are a regular daily feature in The Chicago Evening Post.

On Thursday of each week a complete list and schedule of every broadcasting station in the United States is published in The Chicago Evening Post's sixteen-page Radio Magazine section.

CHICAGO STATIONS

(Central Time Is Shown.)

KYW—Located in Commonwealth Edison building; 536 meters; Wilson J. Wetherbee, director.

Day—9:30 a. m., news and markets; 10 a. m., market reports; 10:30 a. m., financial news and comment; 10:58 a. m., naval observatory time signals; 11 a. m., market reports; 11:05 a. m., weather report; 11:30 a. m., news and comment of the financial and commercial market; 11:35 a. m., table talk by Mrs. Anna J. Peterson; 12 m., market reports; 12:30 p. m., late market reports; 1:20 p. m., closing market quotations; 2:35 p. m., studio program; 6:50 p. m., children's bedtime story.

Evening—8 p. m., opera, "Hansel and Gretel" by Chicago Civic Opera company.

WAAF—Located at Union Stock yards; 286 meters.

Day—Live stock reports at 8:40, 10:30, 10:45 a. m., 12:30, 12:45, 3, 4:30 p. m.

Evening—No schedule.

WMAQ—Located on Hotel LaSalle; 447.5 meters. Miss Judith C. Waller, station director.

Day—4:30 p. m., to be announced.

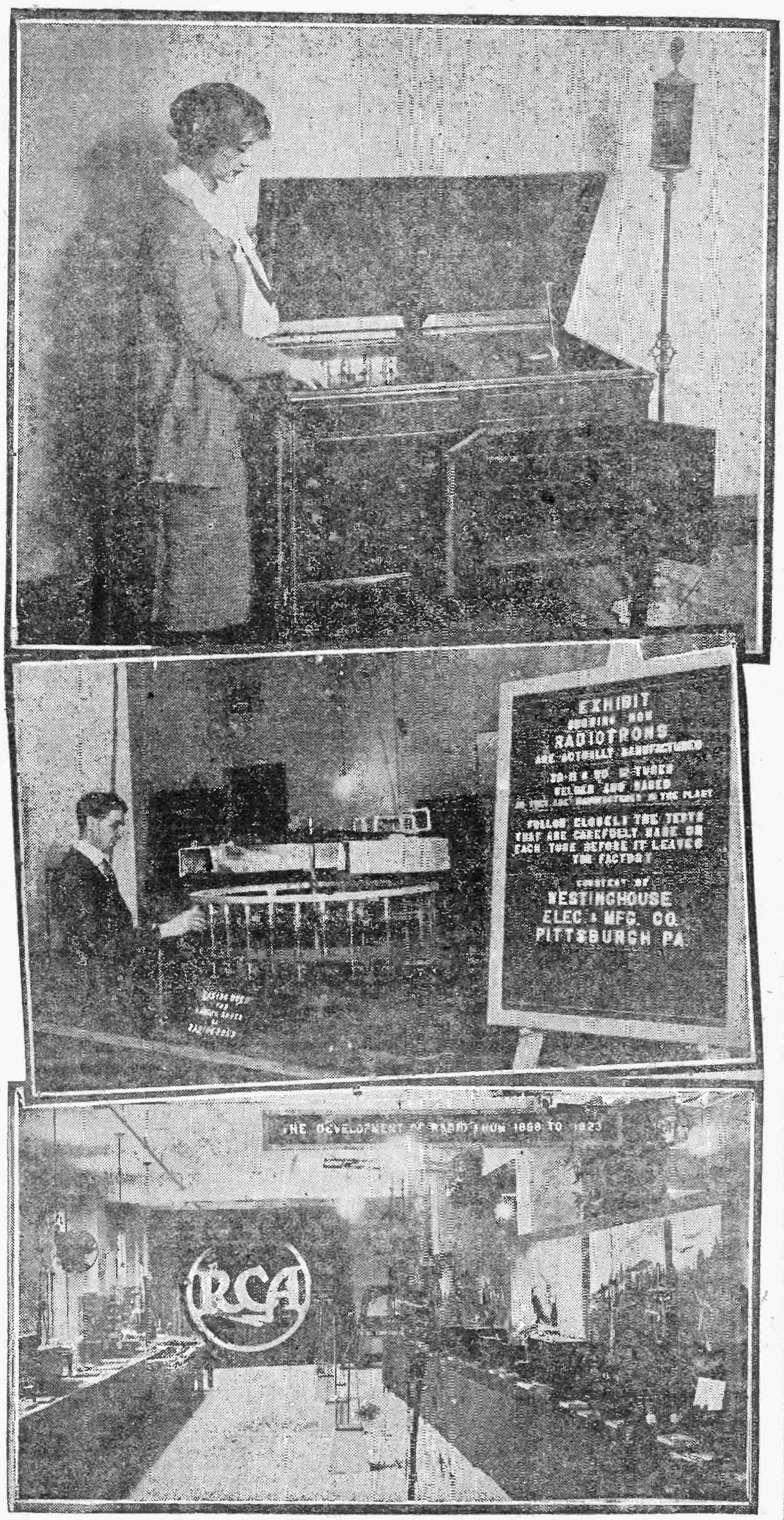
Evening—7 p. m., Balieff's "Chauve-Souris," from the Garrick theater; 8 o'clock, station silent while KYW is broadcasting opera, "Hansel and Gretel."

WJAZ—Located on Edgewater Beach hotel; 447.7 meters. E. Warren Howe, program director.

Day—This station has no regular day schedule.

Evening—10 p. m. to 2 a. m.: "Wonderland of Dreams" and "Dance and Keep Young," by Oriole orchestra; soprano solos, selected, by Selveig Shevalson; "Tarantelle" (Luder Buehl), "Sonstine" (Beethoven), and "Music Box" (Hall), by Shirley Himman; "A Spirit Flower" (Campbell-Tipton), and "Home" (MacFayden), by William Benson; "Honolulu Moon" and "Faded Love Letters," by Oriole orchestra; soprano solos, selected, by Solveig Shevalson; "Sighing Wind" (Lemont), Sonata No. 3 (Mozart) and "Wintry Wind" (Blake), by Marion Smith. "Who Knows" (Stickles) and "Sylvia" (Speaks), by William Benson; popular song selections, by Graham Publishing company; soprano solos, selected, by Solveig Shevalson; Prelude C minor (Rachmaninoff) and Japanese Etude (Poldoni), by Florence Holly; "Before the Dawn" (Chadwick) and "Take Joy Home" (Bassett), William Benson; "Silvery Moon" and "Pekin" by Oriole orchestra.

Continued on Page 6.



Scenes at Lyon & Healy exhibit.

Displays History of Radio in Exhibit

Radio from 1898 until the present is shown in the two weeks' exposition being held from Dec. 8 to Dec. 22, in a special quarters on the sixth floor of the Lyon & Healy building. The exhibit requires 9,000 square feet. It is educational in nature and under direction of the show division of the Radio Corporation of America.

The exhibit is transported from one city to another and will have been shown in every important center in the United States when the present trip has been completed. It requires two express cars to transport the exhibit.

There are six divisions in the exhibit, these being historical, marine, high power, educational, army and navy and amateurs.

Shows Old Sets.

The historical section gives a picture of the development of radio from 1898 until the present time. A complete line of receivers is shown, from the Massie receiver of 1901 thru the three-slide United Wireless Receiver that so many old-time operators remember, down to the Radiolas of modern times.

Old-time detectors, from cohearer down to electrolytic and finishing with the radiotron of today, are shown. The transmitter side is well represented by the 10-inch spark coil that was the first ship installation; the open spark gap and helix of the old United Wireless sets, and other old-time condensers, keys, insulators, etc. Anyone who looks at this complete chronological picture of radio and its development will get clearly the idea that the infancy of radio was twenty years ago, and that it is a very much "grown-up" young man today.

In the marine section there is shown complete receiver of the type used in modern ships. This is mounted on a table, with a bulkhead in the rear, simulating very closely an actual ship scene. A standard spark-transmitter of the type used on thousands of vessels is shown. A radio compass, consisting of a loop inclosed in tubing for mechanical protection is shown, and also an old-time direction finder of the "crossed loop antenna" type.

Map of Power Stations.

A feature of the high power section is a huge map of the world, in which different-colored tiny lights are inserted. These are controlled by a commutator, and show, respectively the high-power "world-wide wireless" radio chain of the Radio Corporation of America; its marine stations, including those of affiliated companies in other parts of the world; the principal broadcasting stations of the world, and the army and navy chain.

A very attractive exhibit is that of the actual high-speed sending and receiving apparatus used in trans-oceanic working. A message intended for a foreign country is first punched out on a tape by a typewriter perforator, and this perforated tape is then run thru an automatic transmitter which sends the dots and dashes over a wire line to Radio Central, seventy-five miles from New York.

On the receiving end, the signals are recorded on a tape appearing as little hills or larger plateaus corresponding to dots and dashes. As these pass in front of the operator, he keeps his eye on the rapidly moving tape and prints the message by touch-typewriting on a machine in front of him.

So rapid is this service that a message handed in at New York is in the hands of the delivery clerk in Paris, Berlin or London, one minute after it has been handed in. Not everyone knows that 33 per cent of all the traffic across the Atlantic ocean is handled by radio, but this is a fact.

Tube Making at Show.

The educational feature of the show is varied. In one booth, the actual apparatus used in welding the plates, grids and filaments of radiotrons is shown in operation, as well as the method used in baking the bases of the tubes.

In another booth is shown a very complete series of vacuum tubes, over a hundred in all, showing the first Fleming valves, the fifty-seventh audion ever made by Dr. DeForest, foreign tubes used during the war, and so on down to the radiotrons of today.

An exhibit never before shown shows the various steps in the invention and

Continued on Page 4.

Autoplex Works Best on Ground, So Experimenters Report

INTEREST in the Autoplex circuit is unabated. Many Post readers have reported exceptional success with the hook-up. Others continue to meet with failure. The following article was prepared with the idea of throwing some light on the troubles and trials of home-builders.—THE EDITOR.

EXPERIMENTS made by Post readers and by The Post experimental laboratory indicates that the Autoplex super-receiver more often works best without an aerial and only using the ground connection.

Reports from one tube Autoplex sets the past week tell of bringing in coast to coast stations on a loud speaker with nothing but the ground connection. Some experimenters report that short aerials, where one must be used, are the best. One reader even tells of using the bed springs in his room and getting the best results. It was connected in this case to the ground post of the set.

It seems, however, that location has much to do with the kind of collective agency employed. Where a ground works best in one locality an aerial will work best in another. In some locations the aerial must be short to bring in the stations loud and clear and in another a much longer aerial has been found more satisfactory. The collective agency, therefore, is a matter of experimentation.

M. L. Muhleman, the inventor of the circuit, has given us some valuable suggestions which may help troubled Autoplexphans in getting rid of the noisiness of the circuit and which will tend to stabilize the circuit.

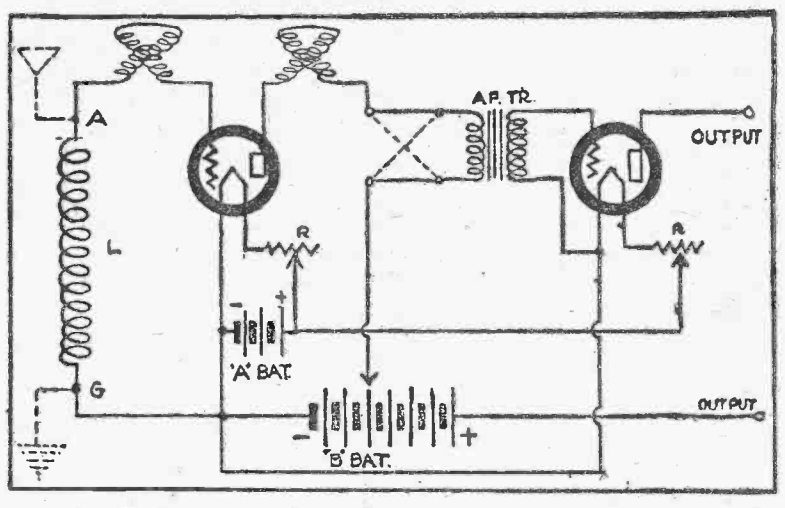


FIG. 3—Here is the Autoplex circuit with one stage of audio-amplification added. Note the dotted lines at the output of the detector part of the circuit and input of the amplifier. If the amplifier does not give satisfactory service reverse the leads into the audio-transformer.

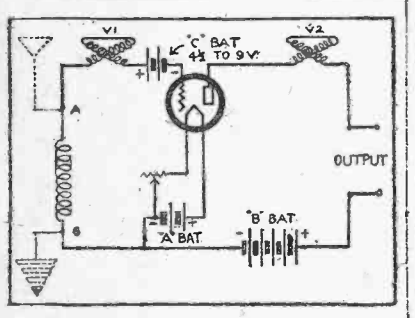


FIG. 1—The above diagram shows how a "C" or bias battery may be added to the Autoplex circuit. Note the positive lead of the battery is attached to the grid variometer and the negative lead goes to the grid side of the tube. Try several voltages from 4½ to 9 volts. This "C" battery is designed to quiet the set and increase amplification.

Getting Rid of Noise.

Wherever the ground can be eliminated entirely, Mr. Muhleman says, much of the noise readers complain of disappears. This also increases the selectivity of the set. He says that the use of a "C" battery as shown in Fig. 1 will clear up the signals and give greater amplification. He advises the use of four and one-half to nine volts inserted in the circuit as shown in Fig. 1.

One might try also inserting the "C" battery between the 1,250-turn honeycomb coil and the "A" negative and "B" negative batteries. In this case see that the minus of the "C" is attached to the coil.

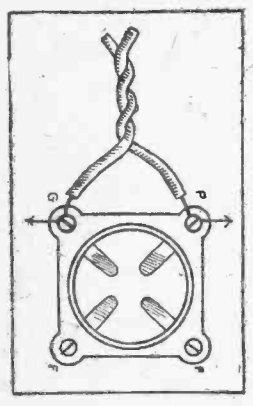


FIG. 2—Here is a small capacity condenser, working somewhat on the principle of the Hazeltine neutrodon, or neutralizing capacity. It consists of two well-insulated wires attached to the grid and plate posts of the tube socket. The wires are twisted as shown, the number of twists regulating the capacity effect. This little device will enable one to operate low voltage tubes such as WD-11, WD-12, UV-199 and C-299, which may be operated more satisfactorily if treated in this way, as the capacity of the tubes will be increased and permit them to handle the great volume of energy which the circuit develops and throws into the tubes.

Many phans who have smaller capacity tubes, rather than buy a 201-A or 301-A tubes or the five watters such as 216-A and VT-2, have sought to use what they have. This has proven very unsatisfactory. The WD-11, WD-12, UV-199 and C-299 tubes have very low capacity and will not carry the energy that is demanded of a tube in this circuit.

Mr. Muhleman, however, suggests that the carrying power of these tubes may be raised to some extent by inserting a capacity from the plate to the grid posts on the tube sockets. This is illustrated in Fig. 2. Use two pieces of well-insulated wire about three inches long each. Twist these together as shown in the sketch. Attach two ends to the grid and plate posts. This capacity condenser can be increased or decreased, as you desire, by twisting or untwisting the two wires. Be careful that the two ends of the wires do not come in contact with each other. If they do, the "B" battery would be shortened and the phones or the loud speaker would burn out, in all probability.

Notes on Tuning.

Mr. Muhleman's observations on the tuning of the circuit are summed up as follows: "The tuning characteristics of the Autoplex circuit are rather out of the ordinary. A single broadcast station can be tuned in at possibly four different dial settings with a noticeable increase in volume at only one of the four settings.

"Any number of people have picked up a broadcasting station when tuning and received the signals quite loudly, but with considerable noise present, and took it for granted that it was the best that could be done. If they had attempted to pick up the same station at other dial settings they could have struck eventually a point where the signals came in loudly and clearly and free of circuit noises. At this point the circuit is tuned to the true wave-length of the transmitting station."

There have been numerous requests for an audio-amplifier for the Autoplex. Since the circuit was designed for the purpose of eliminating the expense of an amplifier and its two tubes, and since it really brings in stations on a loud speaker when operating properly, it would seem to be unnecessary to add anything to it.

For instance, J. A. Kristoffersen, 3430 Carroll avenue, Berwyn, Ill., a Post reader, who built an Autoplex from the diagram published in this magazine, tells of his experience with the circuit in this way:

"I have built a set just as described by The Post, buying the complete parts just as they were used in the experimental set made by The Post laboratory. I had a wonderful experience with it from the very start. I find that the circuit is more selective than my regular three-tube sets and that it takes less time to find a station and bring it in.

Finds Circuit Selective.

"I get all my stations on a loud speaker, using just the one tube, which is a VT-2 and 135 volts on the plate. I get practically every station I have been getting on my regular set, and even have pulled in some that I never got before.

"I do not need amplification. For instance, a station like KDKA came in so well that the first night we got it we thought we had a local station. My set is noisy, however. She howls and spits at a tremendous rate until we get in the station. Then she quiets down."

Notwithstanding this assurance by Mr. Kristoffersen that amplification is not needed, we are printing an Autoplex hook-up, showing how one stage of audio-frequency amplification can be added. This will increase the volume of the signals considerably.

Reverse Output Leads.

When adding the audio-amplifier, if the results are not as good as expected, do just as has to be done with any amplifier. Reverse the leads from the "B" battery and the variometer of the plate circuit. The dotted lines in the schematic diagram shows how this may be done.

W. S. Best, 124 West Randolph street, Chicago, proves by his experience that fortune smiles on some and frowns on others. The Post Questions and Answers department is flooded with letters seeking help from readers who have taken every precaution in the way of perfect equipment and yet fail to get results with the circuit. Here comes along Mr. Best with this letter:

Since you are inviting phans to tell of experiments with the Muhleman Autoplex circuit, let me add mine.

The condition of the apparatus used was close to zero. My variometers had two or three turns missing on each rotor, and the loose contacts were very poor.

I used a 1,250 duo-lateral coil and one of seventy-five turns each on the grid and plate. One of these small coils was anything but a duo-lateral, as it had come unwrapped.

I noticed that by turning either of the small coils to a right angle it had the effect of turning out one station and bringing in another. However, I made both coils permanent.

The first night I tried the set I brought in the following stations, most of them with an improvised loud speaker consisting of a Kainer head set and a porcelain umbrella jar:

Dallas, Texas; Kansas City, Mo.; Davenport, Iowa; Louisville, Ky.; Madison, Wis.; Cleveland, Ohio; Cincinnati, Ohio; Pittsburg, Pa.; Rochester, N. Y.; Boston, Mass.; Atlanta, Ga.

Atlanta is the first station brought in. I very nearly fell of the chair when I heard the dialect of the announcer, for the voice was a new one to me.

By sitting directly in front of my hastily constructed loud speaker, all of these stations except Boston and Cincinnati could be heard plainly across the room.

My aerial is only 100 feet long and is about seventy feet above the street level.

Now, I should like to request that you publish the hook-up for the two-tube Autoplex circuit, or mail it if you will.

Thanking you for the wonderful radio magazine you edit, I am your respectfully.

Radio-frequency Unsatisfactory.

Continued requests are being received for radio-frequency for the Autoplex. Experiments so far conducted show that this form of amplificatoin is not satisfactory. You practically kill the super-effect of the circuit by attempting it.

NOTE—The Post invites readers who have had success with the Autoplex circuit to write their experience and send it to the Autoplex editor. The Post is particularly interested in any improvements in the circuit or its tuning.

Displays History of Radio at Show

Continued from Page 3.

development by Prof. Pickard of the crystal detector.

A series of paintings shows vividly the development of communication, from the smoke screen signals of the Indians thru the various stages of the first mail train, the laying of the first Atlantic cable, the birth of the telephone and finally radio.

Other paintings show vividly modern phases of radio in daily life, such as "Being Good by Rapid," "The Little Red Loud Speaker," featuring radio in the school and a complete set showing how time signals pass from the naval observatory at Washington to your Radiola in order that you may keep the kitchen clock in correct time. time.

Displays War Apparatus.

An interesting exhibit is furnished by the army and by the navy. This shows apparatus used during the war, sets captured from the enemy and post-war developments. Officers from both branches are on hand to explain everything regarding radio in military work.

To those who have not had the opportunity of seeing the interior of a broadcasting studio, interest will be found in the Model Broadcasting studio at the show. This illustrates how the walls are hung with material to deaden the echo, and at regular intervals during the day a short program is given, showing how the announcer and the artist actually perform.

Still-life scenics, with wax figures and actual furniture convey clearly to the visitor an idea of how radio in the home means harmonious, beautiful material as well as a source of amusement; how the kiddies of today long for their bedtime stories; and how radio is a boon to the shut-ins.

A new development of radio is shown in the Radiola IX. This is a very thin model of receiver, of only one and three-quarters inches thick. This set fits into the lid of many standard types of phonographs, or can be cut to suit console types. An attachment permits of using the phonograph horn for the loud speaker.

The show is open all this week until 6 p. m., but next week the doors will remain open until 10 p. m.

Protect Your Tubes

All battery leads should be well insulated. Should one be dropped across the filament lead, vacuum plates would be saved.

Controls Balky Neutrodyne Set with Vernier Rheostat on Each of the Five Tubes

THERE is illustrated and described on this page today a neutrodyne set of special design and construction. It employs the usual five tubes, but is more compact in form. Its designer lays considerable emphasis on the filament controls. He employs five vernier rheostats of special type, one for each tube. This gives the set greater selectivity, he maintains, and corrects the poor neutralization of the tubes which so many neutrodyne owners complain of. The set illustrated has been in The Post experimental laboratory under test for several days. It has exceptional volume and selectivity.—The Editor.

BY ROBERT C. DONALDSON.
(6906 Cornell Avenue, Chicago.)

I HAVE been hearing a lot of abuse hurled at the Hazeltine neutrodyne receiver of late. Most of this comes from a failure on the part of home builders to get their tubes neutralized, in accordance with the theory of Mr. Hazeltine.

I will admit that the neutralization of the tubes is a task for the average home builder, especially if he is not equipped with the proper devices. Some day some one is going to wake up to the golden opportunity that awaits him and will open up a neutralizing factory. When he does he will have a steady stream of customers.

With the tubes neutralized the Hazeltine neutrodyne is a marvel. However, like all hook-ups, much depends upon the way the neutrodyne is put together and the parts that are used.

Set Radical Departure in Design.

The accompanying illustrations show a set which I have constructed, with the assistance of W. O. Stahlberg, who gave me my panel design. You will note that it is quite a departure in many respects from the conventional design.

In the first place, instead of stretching the parts out, we have built this set more compactly. Altho five tubes are employed, we have used very little more space than is allotted to the typical three-tube set of the regenerative type.

You will note, too, that I have used five rheostats, where the usual neutrodyne employs but two.

It is on these two points—the short leads which a compactly built set permits, and the perfect filament control, which a rheostat for each tube insures, I base claims for superiority.

It has been an established and proven fact that the shorter you can keep your radio frequency wiring the better it is for the set. This holds equally true in the audio amplification circuit. The photos and sketches show how we have achieved these ends.

I think, however, one of the most important factors in making this set highly selective is in getting perfect filament control on each tube. There are no two tubes with the same characteristic. I have employed a vernier rheostat of a special type on each of the five tubes.

On local reception this nicety of control is not necessary, but on long-distance work one soon realizes the great advantage he has when by a michromatic control he can "shade in" half a dozen different stations broadcasting along about the same wave length with his rheostats alone.

I have used one 6-ohm rheostat and four 25-ohm rheostats. The six-volt type was necessary because I have a C-300 soft detector tube. The higher resistance was necessary because the four amplifying tubes are C-301-A, two for the radio frequency circuit and two for the audio-frequency circuit.

Aids in Selectivity.

As an illustration of the advantage of filament control, one evening recently I found the two Texas stations —WBAP of Fort Worth, and WFAA of Dallas, operating at the same time. Both of these stations are practically on the same wave length of 476 meters..

By manipulating the rheostats these stations were separated easily and brought in and out at will, just a turn of the rheostat dials a fraction of an inch being all that was required. Filament control absolutely was necessary here. No tuning device would have been selective enough to have unscrambled these stations.

Another advantage the vernier rheostat on each tube gives is the correction of imperfectly neutralized tubes. It almost solves this problem.

Here are the loggings of stations I have brought in during December, using the set which is pictured in this article:

WJAZ, Chicago; WDAP, Chicago; WMAQ, Chicago; KYW, Chicago; WTAS, Elgin; WSAC, Cincinnati; WOR, Newark; WBAP, Fort Worth; WOAW, Omaha; KSD, St. Louis; WFAA; Dallas; WDAF, Kansas City; WGY, Schenectady; KDKA, East Pittsburg; WHB, Kansas City; WGR, Buffalo; WMC, Memphis; WOS, Jefferson City; WJAX, Cleveland; WEAF, New York; WOC, Davenport; WLW, Cincinnati; WWJ, Detroit; WSB, Atlanta; WOAI, San Antonio; WJZ, New York City; WDAR, Philadelphia. WPAD, Chicago; WCAZ, Columbus, Ohio; WHAS, Louisville; WCX, Detroit; KFID, Iola, Kan., WJAM, Cedar Rapids; WNAV, Knoxville, Tenn.; KBE; KFKE, Milford, Kan.; WTAM, Cleveland; WCAE, Pittsburg; PWX, Havana, Cuba; WLAG, Minneapolis; KFIL, Louisburg, Kan.; KHJ, Los Angeles; WOO, Philadelphia; WCAP, Washington D. C.; WIC, Philadelphia; KLZ, Denver; KFIX, Independence, Kan.; WEAN, Providence, R. I.; KFKX, Hastings, Neb.; WSY, Birmingham, Ala.

This list may not be as pretentious as many that are published, but these stations are brought in regularly. The dial readings on each station has been logged and if any of them are on the air they may be brought in full and clear by working the combinations on the dials. All stations, of course, came in on a loud speaker.

Here is the list of parts used in constructing this set:

Three Fada neutroformers, consisting of radio-frequency, transformers and Fada condensers.
Two Fada neutrodynes, or neutralizing condensers.
Two Jefferson audio-transformers.
Five Federal sockets.
One six-ohm Unity vernier rheostat.
Four 25-ohm Unity vernier rheostats.
Two double circuit Carter jacks.
One single circuit Carter jack.
One Carter switch jack.
Three Kellogg dials.
One CRL grid leak.
One C-300 detector tube.
Four C-301A amplifying tubes.

I used the Fada neutroformers but not the Fada hook-up, this being one of special design. It is shown in schematic form in the accompanying illustrations.

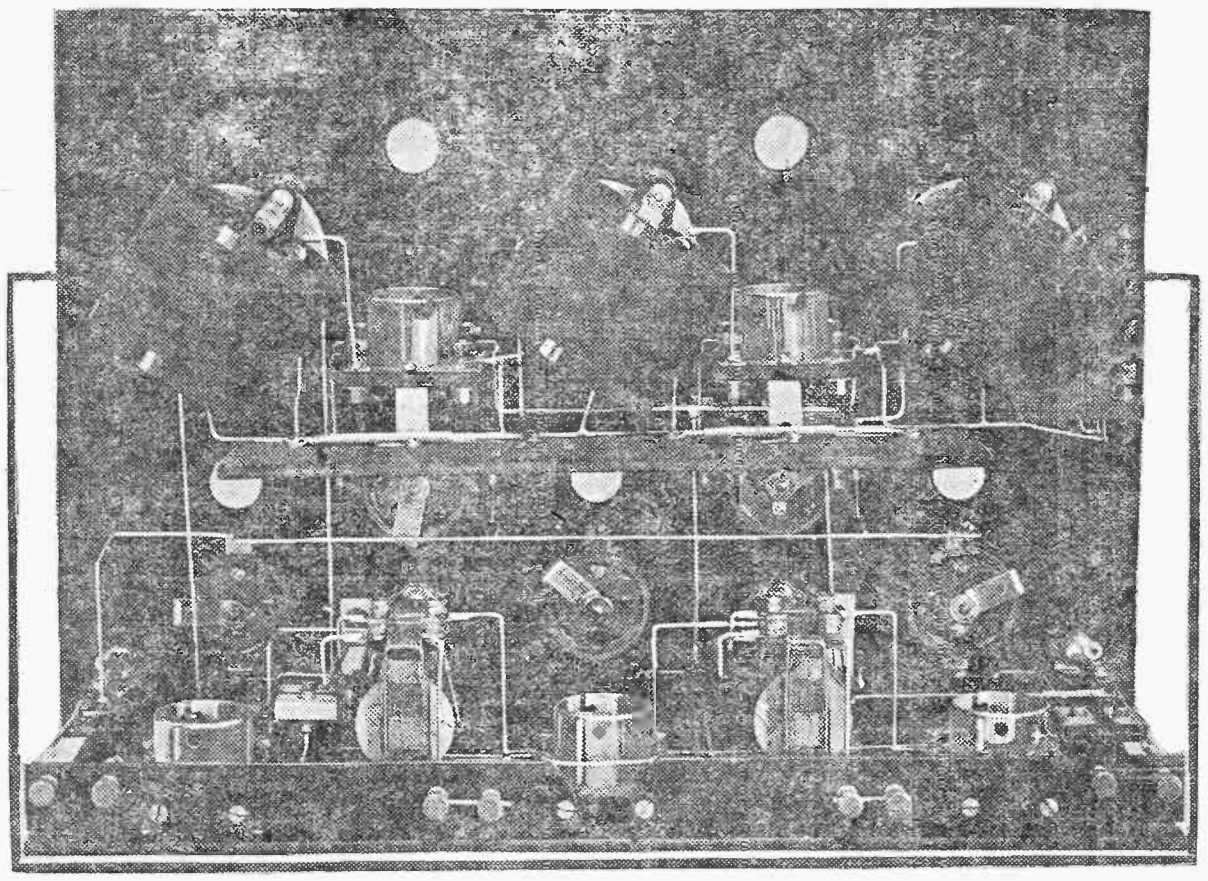


FIG. 1—Rear view of five-tube neutrodyne set of unusual design, which Robert C. Donaldson, 6906 Cornell Ave., Chicago, designed and constructed. Note the compactness of the set and the radical departure from the conventional type of neutrodyne receivers.

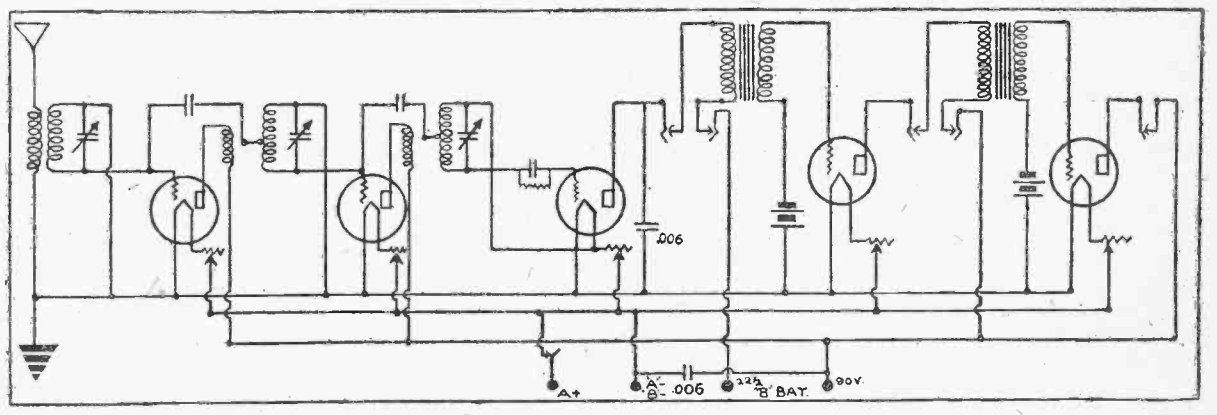


FIG. 4—Schematic diagram of the Donaldson five-tube neutrodyne set. Note the five rheostats—one for each tube. The typical neutrodyne set uses only two rheostats. Mr. Donaldson claims that vernier control rheostats for each tube will help neutralize the balky neutrodyne tubes, where the home builder fails to achieve results in the usual way.

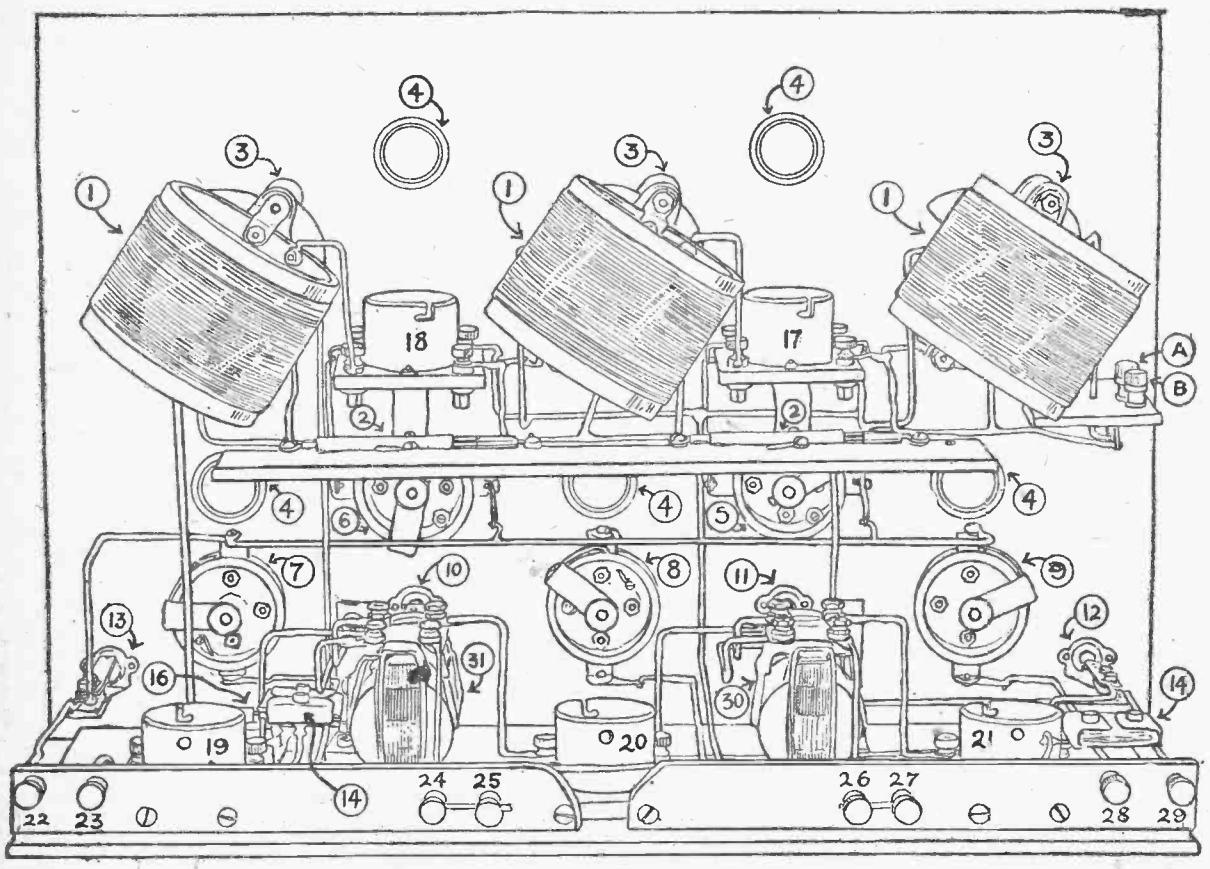


FIG. 3—Wiring plan of the Donaldson five-tube neutrodyne set. No. 1—Three Fada radio-frequency transformers. 2—Two Fada neutralizing capacities. 3—Two Fada variable condensers of .0025 capacity. 4—Five Erla bezels. 5—Unity vernier rheostat for first stage radio-frequency tube. 6—Unity vernier rheostat for second stage radio-frequency tube. 7—Unity vernier rheostat for detector tube. 8—Unity vernier rheostat for first stage audio-frequency tube. 9—Unity vernier rheostat for second stage audio-frequency tube. 10—Carter detector jack. 11—Carter first audio stage jack. 12—Carter second audio stage jack. 13—Carter switch jack for "A" battery. 14.—Fixed condenser .006 capacity. 15—.00025 grid leak condenser. 16—CRL variable grid leak. 17—Federal socket for first radio-frequency tube. 18—Federal socket for second stage radio-frequency. 19—Federal socket for detector tube. 20—Federal socket for first audio state tube. 21—Federal socket for second audio-frequency tube. 22—"A" plus battery post. 23—"A" minus and "B" minus battery post. 24—"C" negative battery post. 25—"C" positive battery post. 26—"B" minus battery post. 27—"B" plus battery post. 28—"B" plus battery post for detector tube (22½ volts). 29—"B" plus battery post for amplifier tubes (90 volts). 30—Jefferson first stage audio-transformer. 31—Jefferson second stage audio-transformer.

Oatmeal Box Peps Up Picture-Moulding Aerial

J. A. Leland, 6408 Drexel avenue, Chicago, uses a bell cord wire around the picture moulding in his living room as an aerial. He increases its efficiency by wrapping twenty-four turns of No. 18 DCC wire in one direction on one end of an oatmeal box and then, reversing the direction, wrapping another twenty-four turns on the other end. This is placed in series with the aerial and the aerial post on the receiver. He receives stations within a range of 100 miles on this aerial.

Drop Wire Out Window for Fair Radio Aerial

If you are living in an apartment house where the landlord refuses to permit you to erect an aerial on the roof you can improvise a fair antenna system by dropping an insulated wire, such as a bellcord wire, out of a window to within a few feet of the ground. It can be drawn back into the room each night. If the wire is wound around a broom stick and formed into a coil, a hundred feet of wire can be used in this manner.

Wireless Code Proves Success in Berlin Test

BERLIN, Dec. 20.—The success is announced of experiments in the wireless transmission of code messages between the central telegraph offices in Berlin and Berne, by way of the wireless stations at Konigswusterhausen, Prussia, and Herzogenbuchsee, Switzerland.

The German and Swiss ministers of posts and telegraphs exchanged code messages of greetings, afterward exchanging the same messages decoded as a check, with most satisfactory results.

The experiments are said to have shown it to be impossible for outsiders to make anything of the coded messages.

Best Parts Cheapest

Precision apparatus may cost more at the start, but saves money in the long run. Not only will properly constructed parts last longer, but they give you wider range and greater selectivity. Buy the best.

USE OF SOLDER LUGS.

Soldering a wire to a lug and slipping the lug under a terminal screw is not soldering a connection. It is neater than a bent wire but no more efficient. Wires should be soldered direct to the terminal.

How to Construct Coils in Hazeltine Neutrodyne

FREQUENT inquiries on the construction of the radio-frequency transformers used in the Hazeltine neutrodyne set prompts The Post to give some simple construction data. On page 13, this issue, a circuit diagram is shown of a popular neutrodyne circuit. Reference to it in connection with the illustrations in this article will supply all the information required.

The radio-frequency transformers

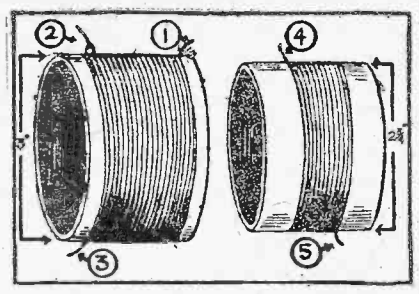


FIG. 1—Here are the two coils used as radio-frequency transformers in the Hazeltine neutrodyne set. The coil at the left is the secondary. (1) and (3) are the ends of the wound coil. (2) is the tap taken off at the twentieth turn. This coil has a winding of eighty turns of No. 22 DCC wire. The coil at the right is the primary and has twenty turns of No. 22 DCC wire. (4) and (5) are the two terminals. This coil fits inside the other, as explained in the text.

easily can be made by anyone who can wind a simple coil. Procure two pieces of bakelite tubing, cut to three inches in width. One piece should be three inches in diameter. The other tube should be two and three-quarters inches in diameter. Fiber or pasteboard tubing may be used, if coated with collodian, but is not as satisfactory as the bakelite.

If the fiber tubing is used the smaller tube may be made from the three-inch tube by cutting a small slot the full length of the tube so that when the wire is wrapped around the coil it will pull the tubing together and

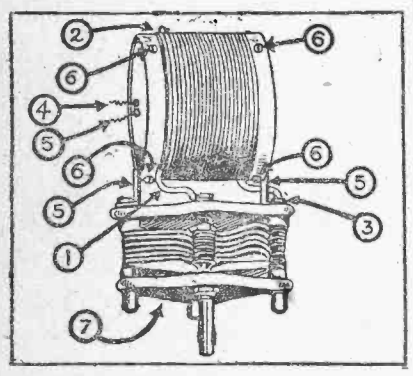


FIG. 2—This is the transformer mounted on the 23-plate variable condenser. The figures used correspond to those used in Fig 1. (1) is one terminal of the secondary coil. (2) is the tap taken off at the twentieth turn. (3) is the other terminal of the secondary coil. (4) and (5) are the terminals of the primary coil. (5) and (5), misnumbered by an error on drawing, are the angle supports for the coils. (6), (6) and (6) are screw bolts used to fasten the two coils together. (7) is the 23-plate variable condenser.

make it small enough to fit within the large tube.

Number of Turns to Windings.

The larger tube is the secondary of the transformer. It should be wound with eighty turns of No. 22 DCC wire. A tap should be taken off at the twentieth turn. Do not shellac or coat the wiring with a varnish.

The smaller tube is the primary. It consists of twenty turns of No. 22 DCC wire. Note the illustration in figure 1. The wire shown at No. 1 is one end of the winding. No. 2 is

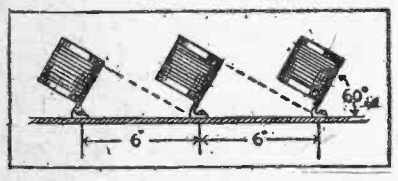


FIG. 3—Shows how radio-frequency transformers should be mounted. Note the angle of each coil.

the tap taken at the twentieth turn. No. 3 is the other end of the wiring. Nos. 1 and 3 make the terminals.

In the smaller tube shown in figure 1 the winding begins at No. 4 and comes out at No. 5. These two ends make the terminals for the primary.

The primary or smaller tube is to fit snugly into the secondary or larger tube. The method of mounting is shown in figure 2. Note that the same figures used in figure 1 are used in this illustration. No. 6 are four screw bolts which hold the two tubes in place. A small nut inserted in between the two tubes will keep them separated. The coils are mounted on the 23 plate variable condenser (No. 7) by small angles (No. 5), which can be bought already made or which can be cut from strips of brass and bent to shape.

The rest of the mounting data is given in the text under the illustration in figure 2. In mounting the three transformers with their tuning condensers be sure that they are at least six inches apart and that they be at such an angle that a line, if drawn at right angles to the axis at the end of the winding, does not intersect the winding on the adjoining transformer. See figure 3.

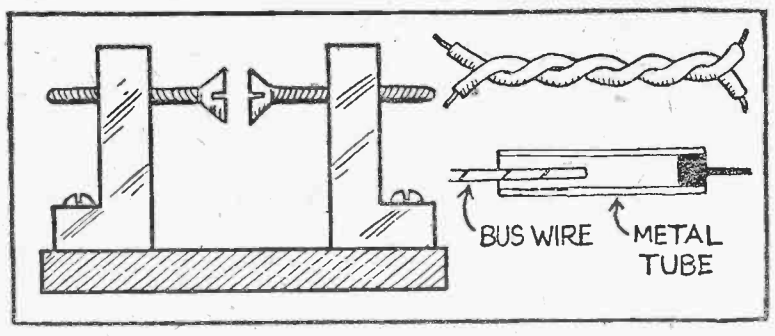


FIG. 4—Three methods of making neutralizing capacities for Hazeltine neutrodyne set.

The heart of the Hazeltine neutralizing principles lies in the small capacity condensers. There are two of

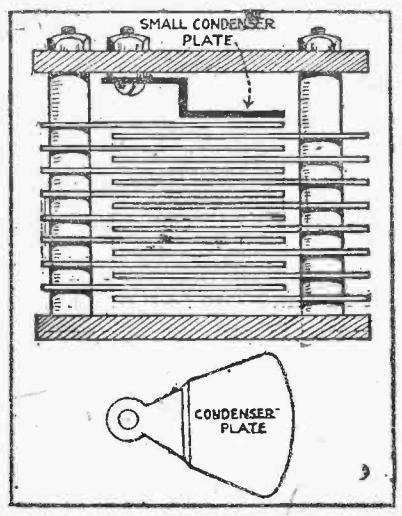


FIG. 5—Small condenser plate attached to variable condenser to control neutralizing of capacity of vacuum tube.

these and they control or regulate the two radio frequency tubes.

There are several methods of making these condensers. Figure 4 and figure 5 show four different styles. The illustrations explain themselves.

How to Vary Capacity.

The two pieces of twisted wire shown in one illustration are twisted and untwisted to vary the capacity. The two screws shown mounted between two insulated supports may be moved closer together or separated as necessity requires.

The small condenser plate shown in figure 5 is, perhaps, one of the best forms of constructing the neutralizing capacities and is the idea of a writer in the Radio News.

In the circuit used the variable condensers are connected between the grid and the filament. If this method is employed, connect the grid to the fixed plates of the variable condenser and mount the other small movable plate on the back of the insulated back of the condenser. By moving this small plate the proper value can be ascertained. When this is done tighten up the bolt and the capacity will be permanent and need never be disturbed until tubes are changed.

This Tip Will Pep Up Your Old Baldwin Units

To those having Baldwin phones, which are not as loud as when they were new, I am making a suggestion which will lessen their trouble. The pin in the center of the diaphragm works loose in time and the phones are not as efficient To remedy this trouble, drop a little wax where the diaphragm and pin meet. You will find your phones much clearer and louder. Be sure not to injure the diaphragm, as it is very delicate.—KENNETH SOUTH, 2145 Cleveland Avenue, Chicago.

Water for Battery

Never use ordinary well or pipe water in a storage battery. Distilled water is the proper thirst-quencher for boiling water. Alkiline water has a bad effect on lead batteries.

Today's Programs

Continued from Page 3.

WDAP—Chicago Board of Trade, located at Drake hotel, 390 meters.

Day—9:30 a. m., 10 a. m., 10:30 a. m., 11 a. m., 11:30 a. m., 12 noon, 12:30 p. m., 1 p. m., 1:30 p. m., quotations and market reports direct from the Chicago Board of Trade.

Evening—7 p. m., Drake Concert ensemble (direction Henry Selinger); Blackstone string quintet (direction Irving Margrath); 10 p. m., Mme. Joan Young, soprano; David Nixon, violinist; Leo F. Ives, tenor. Jack Chapman's orchestra. 10:30 p. m., closing market reports.

WPAD—Formerly on W. A. Wiebold & Co.'s, School street and Ashland avenue.

Notice—This station has closed and is being moved to Armour institute, where it will be operated by the radio department of that institution.

WSAH—Located at 4801 Woodlawn avenue; 248 meters.

WSAX—Located on Chicago Radio laboratory; 268 meters.

SUBURBAN STATIONS

(Central Time Is Shown.)

WCBD—Zion, Ill.; 345 meters: J. H. Depew, station manager.

Day—2:30 to 3:45 p. m., sacred solos and duets, and an address either by Wilbur Glenn Voliva, general overseer of the Christian Catholic Apostolic church in Zion, or one of his representatives.

WCAY—Milwaukee, Wis.; 261 meters; no silent nights.

Day—1 p. m. to 4:30 p. m., special concert; novelty and test programs as announced.

Evening—7:30 p. m., regular concert program.

WHAD—Marquette University, Milwaukee, Wis.; 280 meters.

Wednesdays—At 7:30 p. m. only.

WIAB—Rockford, Ill.: 252 meters; Wednesday and Friday evenings.

WJAN—Peoria, Ill.; 280 meters; daily except Sunday.

Day—9 a. m., live stock market; 9:15 a. m., weather; 11:30 a. m., Chicago, Peoria and St. Louis live stock and grain markets; 1:30 p. m., Chicago and Peoria grain and produce markets; United States agriograms

Evening—Tuesday and Thursday, special musical program to be announced by radiophone.

WRM—Urbana, Ill., University of Illinois; 360 meters; 8:50 to 9:30 p. m., lectures and news.

WTAS—Elgin, Ill.; 286 meters.

Evening—7:30 p. m.-12 midnight, musical program.

FOREIGN STATIONS

CKAC—Montreal, Canada; 430 meters:

Note—This station broadcasts only on Sundays, Tuesdays, Thursdays and Saturdays.

Evening—7 p. m., Kiddie stories in French and English; 7:30 p. m., concert by Desrochers trio, violin, clarinet, piano, solos by Paul Valade and others.

PWX—Havana, Cuba; 400 meters. Jose Isquierdo, chief operator; Urbano del Castillo, program director; Remberto O'Farrill, announcer. Regular broadcasting nights, Wednesday and Saturday, 7:30 to 10 p. m., central standard time.

OUT-OF-TOWN STATIONS

Eastern Programs.

(Central Time Is Shown.)

KDKA—East Pittsburg; 326 meters.

Day—8:45 a. m., Union live stock market reports from the National Stockman and Farmer; 10:55 a. m., Arlington time signals; 11 a. m., United States bureau of market reports furnished thru the National Stockman and Farmer; 11:10 a. m., music, weather forecast; 5:30 p. m., musical program.

Evening—6:15 p. m., Radio Boy Scout meeting; 7:30 p. m., concert.

WBZ—Springfield, Mass.; 337 meters:

Day—10:55 a. m., Arlington time signals, weather reports; Boston and Springfield market reports.

Evening—6:30 p. m., twilight tales for the kiddies; 8:55 p. m., Arlington time signals; 10 p. m., musical program.

WEAF—New York city; 495 meters: 5:30 to 8 p. m., concerts.

WHN—New York city, Lowe's State broadcasting station; 360 meters.

Day—1:15 to 1:20, Tom Bracken singing "Stay Home, Little Girl, Stay Home; 1:20 to 1:25 p. m., Harry Shaw singing "In the Evening"; 1:25 to 1:30 p. m., James White singing "Why Should I Weep About One Sweetie?"; 1:30 to 1:35 p. m., Harry Shaw singing "Clawence"; 1:35 to 1:40 p. m., Jack Sheehan singing "Last Night on the Back Porch"; 1:40 to 1:45 p. m., Tom Bracken singing "Remember the Waltz"; 1:45 to 2 p. m., Phil Ellis in piano solos; 2 to 2:15 p. m., Sylvia Brown in popular songs; 2:45 to 3 p. m., George Blundon, barytone, singing "Somebody Nobody Loves" and "Twelve O'Clock at Night"; 3 to 4:05 p. m., William Berkes, barytone, singing "Irish Moon, "Somebody's Wrong" and "So I Took the Fifty Thousand Dollars"; 3:15 to 4:40 p. m., Matty Levine, pianist, playing "Stepping Out," "First, Last and Always" and "Dreamy Melody"; 3:30 to 3:35 p. m., Sherman and Mayo, whistlers and singers; 3:30 to 3:40 p. m., Inez Johnston singing "You" and "Lovey, Come Back"; 3:40 to 3:45 p. m., Joe Sherman singing "If the Rest of the World Don't Want You"; 3:45 to 3:50 p. m., Bob Schaefer singing "Sittin' in a Corner"; 3:50 to 3:55 p. m., James Clarke in syncopated melodies on the piano; 4 to 4:15 p. m., Beulah Wolf, 10-year-old singer, in popular numbers; 4:15 to 4:30, musical program.

Evening—8:30 to 9 p. m., Lou Gold's Wigwam Club orchestra; 9 to 9:10 p. m., Belle Bart, astrologist; 9:10 to 9:15 p. m., Clara Horton, Los Angeles picture star, in talk on "Hollywood" and "Advice to Girls Who Wish to Go into the Movies"; 9:20 to 9:45 p. m., dance music by the "Original Manford Aces," John J. Lesko leader; 9:45 to 10 p. m., Harry Richman of Benny Leonard's "Wigwam" in his own songs; 10 to 10:10 p. m., Edward Nelson and Harry Pease singing popular songs; 10:10 to 10:20 p. m., Irving Cherin and Vincent Allaria singing popular songs; 10:30 to 10:45 p. m., Lee Morse of "Artists and Models" singing her own original southern melodies; 10:45 to 11 p. m., Sidney Sollinger, cellist, in popular selections.

WGI—Medford Hillside, Mass.; 360 meters:

Day—5:30 p. m., Boston police reports, Boston police headquarters; 5:40 p. m., code practice, lesson No. 193.

Evening—6 p. m., "Bits of Wisdom," by George Brinton Beal, prominent newspaper man; stories for parents, prepared by the Children's Aid association, read by Alfred F. Whitman, executive secretary, "A Christmas Fairy Godmother"; Mendelssohn Choral society concert.

WHAZ—Troy, N. Y.; 330 meters. This station broadcasts only on Monday evenings.

WGY—Schenectady, N. Y.; 380 meters:

Silent night Wednesday.

Evening—6:45 p. m., musical program by Albany Chamber of Commerce Mixed quartet and Albany College of Pharmacy orchestra. "A Few Moments with New Books," by L. L. Hopkins, assistant librarian of the General Electric company. Orchestra selection, "Eddie-Steady," by Cantor, the Albany College of Pharmacy orchestra; tenor solo, "Prologue," from the "Vision of Sir Launfal" (Cadman), by J. Raymond Simmons; violin solos, "Allegro" (Vivaldi) and "Andante" (Vivaldi), by Sophie Poskanzer; quartet selection, "Christmas Carols," the Albany Chamber of Commerce Mixed quartet; Helen K. Eberle, soprano; Mrs. B. Rickards, contralto; J. Raymond Simmons, tenor; George D. Elwell, bass; contralto solo, "Till I Wake" (Woodforde-Finden), by Mrs. Burt R. Rickards; orchestra selection, "Palais De Danse" (Horne), bass solo, "Israfel" (King), by George D. Elwell; address, "Citizenship," by Boy S. Smith, executive secretary, Albany Chamber of Commerce; piano solos, "Etude Mignon" (Schytte) and "A Butterfly" (Rosenthal), by Stuart Swart; soprano solo, "Calm as the Night" (Bohm), by Helen K. Eberle; violin solo, "Perpetuo Moblie" (Bohm), by Sophie Poskanzer; quartet selection, "Christmas Carols"; orchestra selection, "Maggie! Yes, Ma'am," by John Tucker.

WGR—Buffalo; 319 meters.

Evening—6:30 p. m., digest of the day's news; second broadcasting of all daily reports; industrial employment bulletin; the American Boy story.

WJY—New York city; 405 meters:

Continued on Page 15.

How to Build a Four-Tube "Sun" Receiver Set, with Full Instructions on Tuning

FULL construction details, with panel layout and notes on tuning, are given today on the new "Sun" circuit, which is the invention of Capt. Anatol Gollos. This circuit was described in last week's Radio Magazine section.—THE EDITOR.

A FOUR-TUBE receiver (one stage of radio-frequency amplification, detector and two stages of audio-frequency amplification) is the ideal "Sun set" to build. It will get distance with plenty of volume.

This set will require a panel eighteen inches long and nine inches high. The cabinet to accommodate this panel should have an inside depth of nine inches. This will make a very neat and compact set, as the wires and leads will be kept as short as practicable.

The other parts required are:

One "Sun" tuner unit.
Three variable condensers (.00025).
One variable condenser (.0005).
One fixed condenser (.0005).
One fixed condenser (.006).
One vernier rheostat (6 ohms).
Three plain rheostats (30 ohms).
One potentiometer (400 ohms).
Four tube sockets.
One C-300 detector tube.
Three C-301A amplifier tubes.
One two-megohm grid leak with .00025 condenser.
One radio-frequency transformer.
Two audio-frequency transformers ratio 5-1 and 3-1.
One open circuit jack.
One closed circuit jack.
One battery switch.
Seven binding posts.
One 6-volt "A" storage battery.
Two 45-volt "B" batteries.
Necessary wire, screws, bolts, etc.

The arrangement of the different parts may be made to suit the fancy of the builder, the only precautions to be taken being that loading coil L1 and radio-frequency transformer L6 must be kept at right angles to the tuner unit, not too close to, but as far apart as practicable. If possible, follow the layout shown in the accompanying sketches.

The Sun tuner unit, consisting of inductances L2, L3, L4 and L5 and capacities C5, C7, C8, C9 and C10, has been made in the laboratory because of the importance of having the two sides of the circuit precisely balanced in inductive and capacitative values. It will have to be bought at the dealers'. This unit may be mounted as desired, but effects a neater appearance if mounted in the center and to the rear of the cabinet. The tubes should be spaced equidistant and as far apart as practicable, to prevent interference.

The two variable condensers, C4 and C6, always require identical settings. It, therefore, is found very convenient for tuning to mount them on the same shaft, i. e., connect their shafts together so they may be operated by a single dial. This may be accomplished easily by drilling holes for the two shafts (the inner end of one and the outer end of the other) in a round piece of hard rubber or similar insulating material, and then inserting set screws. Condensers with shafts protruding at both ends should be selected for this purpose. Diagram 3 shows these two condensers mounted in this manner.

After having assembled the set, i. e., mounted all the parts, the set is ready for wiring. Proceed as follows:

Binding posts 1C1, 2C2, L, N, G, A refer to the Sun tuner unit. Connect the two fixed condensers C2 (which is of .0005 capacity) and C3 (which is of .001 capacity) to the antenna binding post as shown in schematic diagram No. 6. Then connect the free end of condenser C3 to the fixed plates of variable condenser C1 (.0005 capacity) and thence to binding post L on the Sun tuner unit.

Connect one terminal of loading coil, L1 (being the small green coil furnished with the parts), to binding post A on Sun tuner and the other terminal of loading coil L to the movable plates side of the variable condenser C1, thence to ground binding post. Connet ground binding post to positive feed wire from 6-volt (A) battery. This completes the primary circuit.

Wiring the Secondary Circuit.

Connect the free end of the fixed .0005 condenser (C2) to binding post G on Sun tuner unit and thence to grid of first tube. Connect binding post N on the Sun tuner to the negative line from the A battery. Connect the stationary plates side of the variable condensers C4 and C6 (both of which are of .00025 capacity) to binding posts C1 and C2 on the Sun tuner unit respectively.

Connect the movable plates sides of these same condensers to binding posts 1C and 2C on the Sun tuner unit respectively. Check to make sure the two sides of one condenser are connection to binding posts 1C1 and the two sides of the other condenser to 2C2. This completes the secondary circuit.

Connect binding post P on Sun radio-frequency transformer (the small white coil furnished with the parts) to binding post P on the first tube socket and binding post B of the same transformer to the positive side of a 90-volt B battery (dry cells), the negative lead from which dry battery is then connected to the wire leading from the positive terminal of the A battery.

Connect the fixed plate side of the .00025 variable condenser C11 to binding post G of the same transformer, also connect the same binding post G of the Sun radio frequency transof the Sun radio-frequency mica condenser C12, .00025 mf capacity, and a 2-megohm variable resistance grid leak in parallel, as shown in diagram.

Connect the other side of this fixed condenser and resistance to the grid binding post (G) on the detector tube socket. Connect the movable plates side of variable condenser C-11 to binding post F of the same transformer. Connect the same binding post F to the wire leading from the positive side of the "A" battery. Connect a .002 mf fixed mica condenser (C-13) across the

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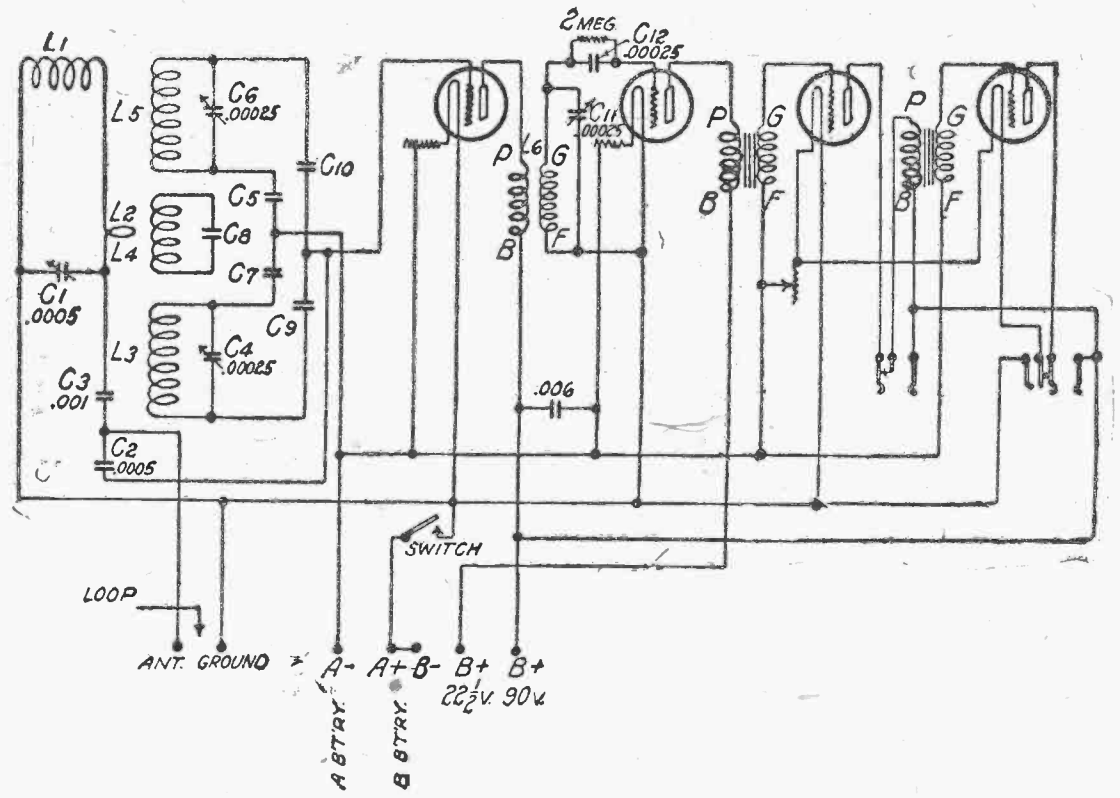


Schematic diagram showing "Sun" circuit.

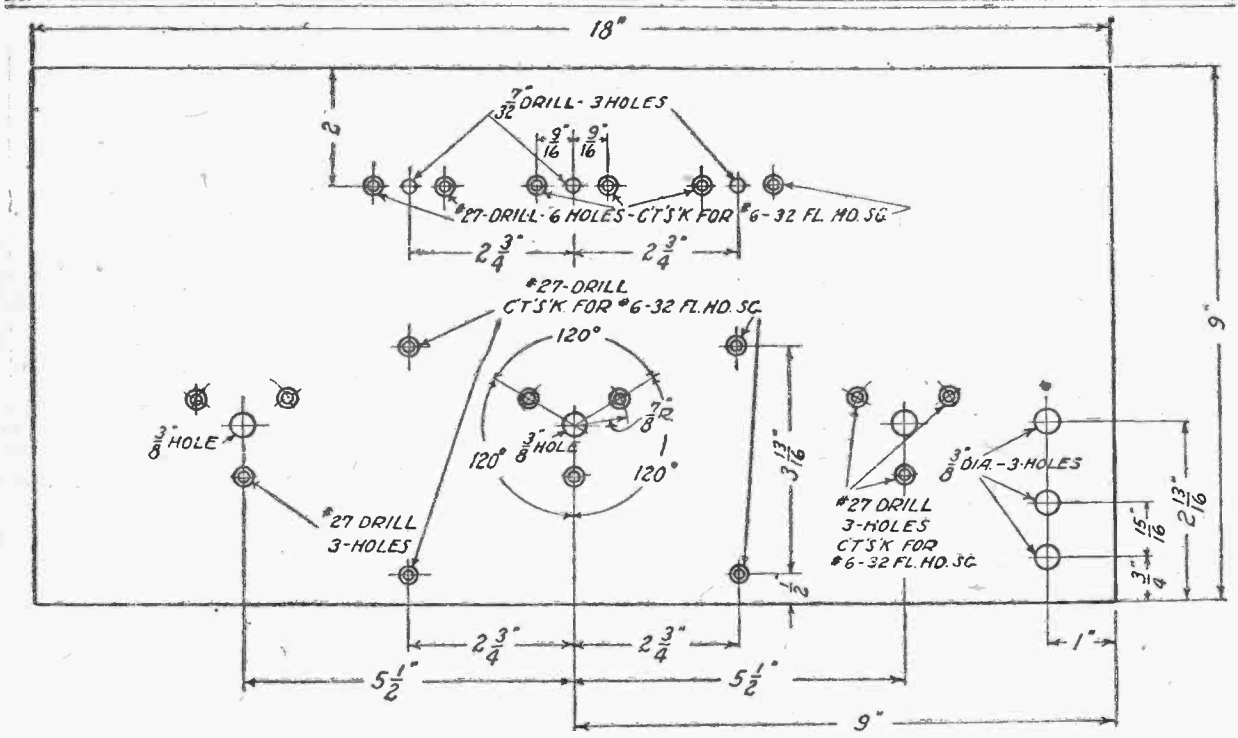


DIAGRAM No. 1—Panel layout for the "Sun" receiver.

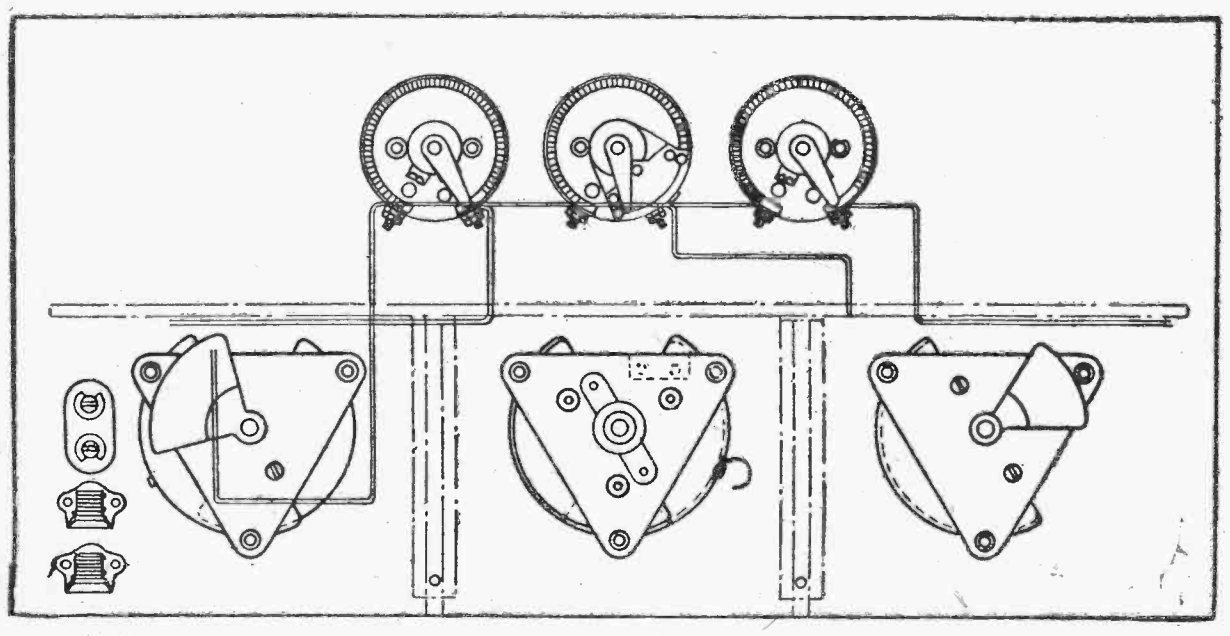


DIAGRAM No. 2—Rear view of panel of "Sun" circuit receiver with location of rheostats and variable condensers.

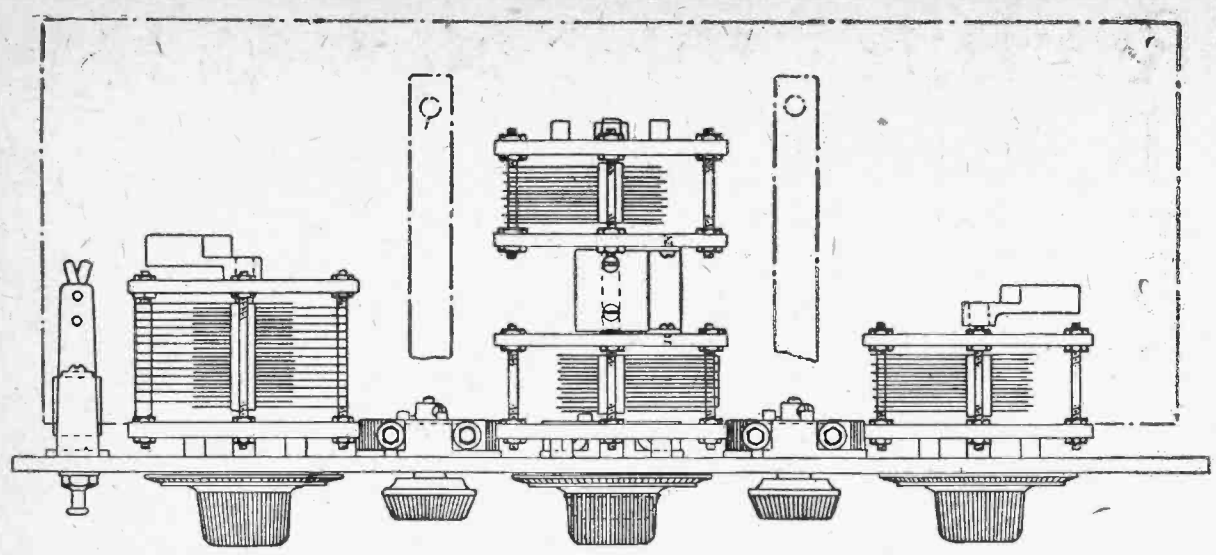


DIAGRAM No. 3—Bottom view of panel in "Sun" circuit receiver with condensers and rheostats mounted.

England Establishes 2-Way Radio Communication

HARTFORD, Conn., Dec. 20.—By virtue of recent two-way amateur radio contacts established by Kenneth B. Warner, secretary of the American Radio Relay league, England comes to the forefront among nations of the world that can now communicate across the Atlantic thru radio stations operated by citizen-amateur radio men.

Nine complete messages have been sent across the ocean on a wave length of 100 meters between Mr. Warner, operating station 1MO here, and J. A. Partridge, owner of the English amateur station 2KF, situated in London.

With the utmost ease these two amateurs have been able to seek out in the already overbusy ether their respective call signals and maintain consistent communication without atmospheric breaks or interference at various times while dawn was approaching across the ocean. For three nights they have conversed back and forth with the same reliability that amateurs do over short distances in this country.

The first time that they were in contact with each other their antennas vibrated in perfect harmony, acting in strict accordance with the will of the operators for a period of two and a half hours.

The English amateur station, in addition to working both ways with 1MO here, has been heard by a number of amateurs in the east and it was recently reported as far west as Chicago. While this contact has been going on, the French amateur station 8AB, operated by M. Leon Deloy, has been working consistently with about seven American stations. The two most recent stations reported to have worked 8AB are 1CMP, operated by William E. Jackson at Bridgewater, Mass., and 2AGB, operated by John H. Dodman, whose home is situated in Summit, N. J.

Kenneth B. Warner, secretary of the league, estimated today that a total of sixty messages had been transmitted across the Atlantic since the first two-way contact was made between amateur stations 1MO in Hartford and 8AB in France the night of Nov. 27. The signals of 8AB have been loud and scores of amateurs are hurriedly bringing their recievers down to the 100-meter wave length.

A radiogram received at league headquarters stated that amateur station 9ZT, operated by Donald Wallace, assistant manager of the Dakota division, had been in two-way contact with the French amateur and messages had been exchanged reliably. Deloy is believed to have transmitted a total of thirty-three messages.

Never apply more than the specified plate voltage on a vacuum unless you want to shorten its life.

(Continued from Preceding Page.

two-jack contact, for by-passing alternating currents.

This completes the wiring up to the radio-frequency amplification, which is clearly shown by diagram and is a simple matter to follow.

How to Tune the "Sun" Set.

To tune the set, turn the dial of condensers C-4 and C-6 (being the center dial on the set) until a station is heard, then turn dial of condenser C-11 (the left-hand dial) to increase volume, then dial of C-1 (the right-hand dial) to perfect the tuning. If no signals are picked up as above, try setting dials of condensers C-1 and C-11 at corresponding figures proceeding after each setting as above. Try also different setting of filament rheostat of detector tube.

Very distant stations may require the simultaneous settings of C-4, C-6 and C-11; it, therefore, makes operation simpler and more effective if the shafts of the two condensers are connected as indicated in a preceding paragraph. All three condensers may then be turned simultaneously with two hands, thus facilitating operation.

It will be found very helpful if a record is made of the settings of the dials each time a station has been completely tuned in, together with its wave length of frequency in kilocycles. When the weekly programs then show that any certain station is on the ether, and it is desired to tune in on it, it will only be necessary to adjust the dials to the recorded settings and then bring it in by slowly turning the rheostat of the detector tube.

Rheostat Is Critical.

Last, but not least, use a rheostat with a vernier control for the filament of the detector tube. Otherwise distant stations may be passed over entirely when turning the rheostat, or they may be heard indistinctly with no possibility of tuning them properly. Many efficient sets of the earlier types are limited in range thru neglect of this point.

The square bus wire or No. 14 tinned copper hook-up wire is recommended. Do not use any more insulating tubing than absolutely necessary. There is but a small amount of the so-called "spaghetti" insulating material that does not have considerable leakage. To secure efficient operation all connections should be carefully soldered. No one can expect a set to give anything but unsatisfactory results unless this is done.

A good soldered connection is really a simple matter. Several brands of noncorrosive soldering paste can be purchased. This with a hot iron and plain solder will do the job nicely. Always strive to use as little solder as will make a perfect connection. One may see on all sides, home-made sets where the amateur builder has made a connection by dropping a piece of solder on the joint as large as a pea. This puts an added burden on the set.

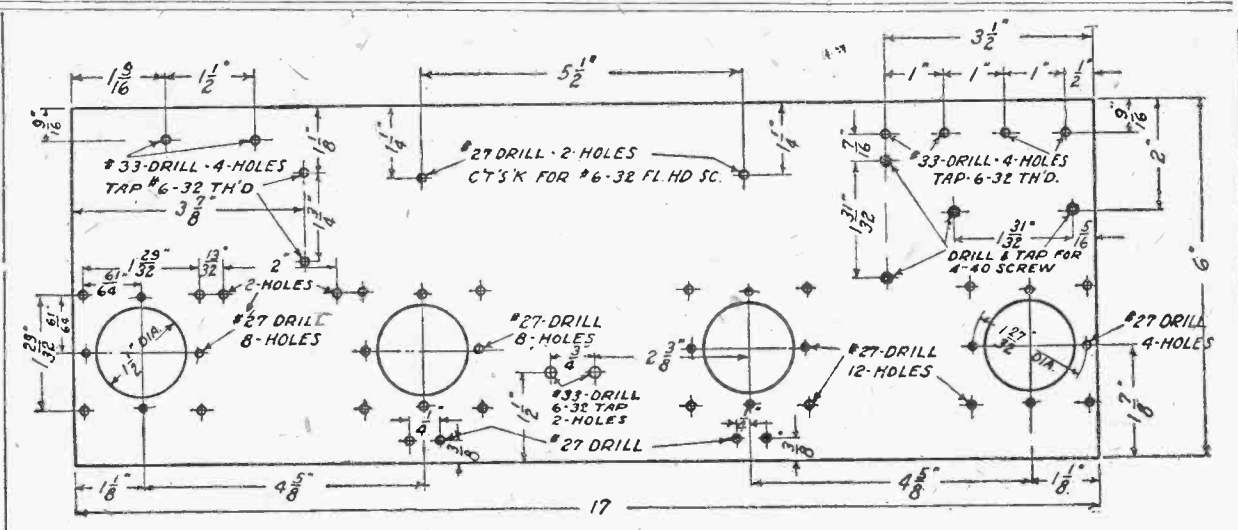


DIAGRAM No. 4—Shelf layout of "Sun" circuit receiver.

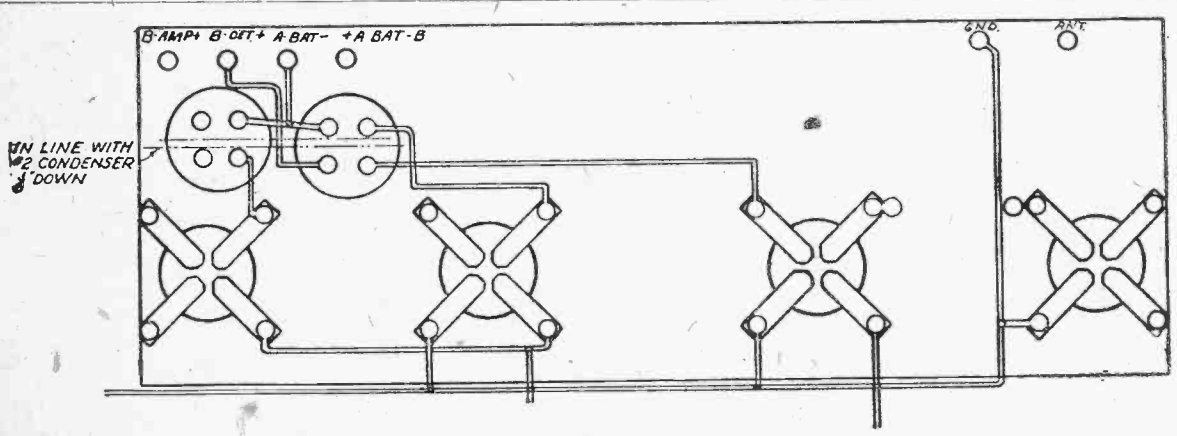


DIAGRAM No. 5—Bottom view of shelf on "Sun" circuit receiver with location of tube sockets and audio-frequency transformers.

Broadcast Station Has Loudspeaker for Guests

WOC (Davenport) has installed a loud speaker in the general reception room of the station where artists waiting their turn and spectators can listen-in on the program. The circuit is so arranged that the horn operates only when the studio door is closed. This prevents "feed back" on the microphone.

Saves Socket Expense in Five-Tube Neutrodyne Set

Tube sockets are unnecessary in neutrodyne sets. Since the tubes are to be a permanent part of the set, after neutralization, solder the wire connections direct to the tube prongs. If heavy bus bar wire is used it is sufficiently stiff to hold the tube rigid.

Lecture on Live Stock Over Radio

A radio lecture course on the live stock and meat industry which is an innovation in broadcasting programs, is to be sent out thru the air from Westinghouse station KYW (Chicago.)

Beginning this evening at 9:15, Central Standard time, and continuing at intervals of a week, a series of eight lectures on this important basic industry will be broadcast from this station. The series, which will be delivered by leaders in this field, has been made possible thru the efforts of the national live stock and meat board.

Howard Leonard, chairman of the national board, will send out thru the ether the opening words of introduction to the lectures to follow. At the close of his brief talk, which will deal with the importance of co-operation in the live stock and meat industry, Mr. Leonard will turn over the transmitter to Maj. Edward N. Wentworth, secretary of the committee on improved live stock breeding, Institute of American Meat packers, who will take as a most fitting subject for the opening, "The Origin and Development of the Live Stock Industry." The program for the remaining seven lectures is as follows:

Dec. 27—"Development of Live Stock Industry in the United States," by Leslie E. Troeger, managing editor, Daily Drovers Journal.

Jan. 3—"Live Stock Production on the Great Plains and in the Feed Lot," by James E. Poole, associate editor, Breeder's Gazette.

Jan. 10—"Live Stock from Ranch and Farm to Packers," by Everett C. Brown, treasurer, National Live Stock and Meat board.

Jan. 17—"Preparation of Live Stock for Human Consumption," by Thomas E. Wilson, vice chairman, National Live Stock and Meat board.

Jan. 24—"The Distribution of Meat Products to the Consumer," by John T. Russell, director, National Live Stock and Meat board.

Jan. 31—"Selection, Economical Buying and Preparation of Meat," by Miss Gudrun Carlson, director, bureau of economics, Institute of American Meat packers.

Feb. 7—"Twelve Minutes of Practical Meat Cooking," by Mrs. Grace Viall Gray, lecturer and writer, home economic specialist.

GIVES LESS INTERFERENCE

Single wire aerials pick up less interference.

How to Build "Old Reliable," the Editor's Own Personal Radio Receiver

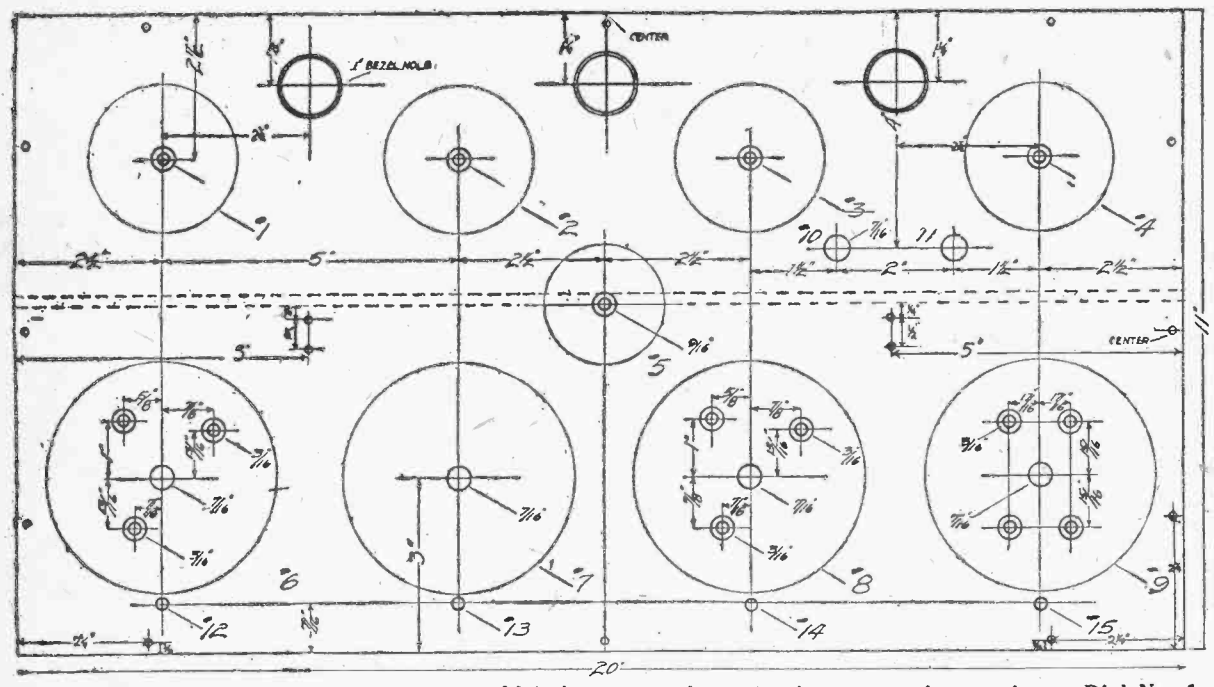


FIG. 1—Panel layout for "Old Reliable" Armstrong three-circuit regenerative receiver. Dial No. 1 —Upper left corner, primary series parrallel switch. Dial No. 2—Carter's detector filament control rheostat. Dial No. 3—Carter's first stage amplifier-control rheostat. Dial No. 4—Carter's second stage amplifier-control rheostat. Dial No. 5—Primary inductance switch. Dial No. 6—Primary condenser. Dial No. 7—Coupler. Dial No. 8—Secondary condenser. Dial No. 9—Plate variometer. No. 10—Phone jack. No. 11—Loud speaker jack. No. 12, 13, 14 and 15—Verniers.

THIS is the second of a series of articles on "Old Reliable," the editor's personal hook-up of the Armstrong Three-Circuit regenerative receiver. The panel layout for a deluxe set is given this week. Next week construction details, with notes on wiring, will appear.

By IVERSON C. WELLS.
Radio Editor The Post.

THERE are four outstanding features to the "Old Reliable." Armstrong three-circuit regenerative receiver pictured and described in last week's Post Radio Magazine. These are: Selectivity, long distance, volume and dependability.

That is about all a fellow could ask of any radio-receiving outfit, it seems to me.

The circuit is selective to an exceptional extent, if precision parts are employed. It loses its selectivity as cheaper parts are substituted. With the parts listed today this set has been operated within three blocks of WDAP and within four blocks of WJAZ and, while all Chicago stations were going full blast, either of the local stations was selected at will.

Also all the local stations have been tuned out and long-distance stations brought in with the accuracy of a five-tube neutrodyne, and the range compares favorably with any circuit used in long-distance work, with the exception, of course, of the super-hetrodyne.

Range Takes in Coast.

The range will cover any station in the United States and Canada, and owners of sets using the same hook-up bring in PWX (Havana, Cuba) with consistent regularity.

The volume is surpassed only by the Armstrong super. In my own personal set I have not used headphones for more than a year. All the tuning is done by a loud speaker.

A reader of The Post who had one of the sets constructed for him about three weeks ago has not had the phones connected to the receiver. I hope to publish a picture of his set with his loggings in a subsequent issue.

One of the most pleasing factors about the receiver is its dependability. Night after night, the year around, "Old Reliable" will bring in more stations on a wider range than any five-tube neutrodyne or radio-frequency set built. The other receiver may perform with startling efficiency on special occasions, but as a consistent performer will not approach "Old Reliable."

Precision Parts Urged On.

If precision parts are used, particularly in the variable condensers, the dials can be calibrated and stations logged according to the dial readings. As long as the antenna system is unchanged, a station will be brought in consistsently whenever it is on the air by these dial settings. A simple adjustment of the rheostat on the detector tube only is necessary to clear up the reception, just as it is necessary to do with the neutrodyne.

At this point I want to insert a letter thtat came into my mail since last week's issue. It is one of many of a similar nature received:

The Post radio section last Thursday is a real reliable set. I have used in the last six months about a dozen different hook-ups, and until last week I have been using a two-variometer three-circuit regenerative, but on reading your article changed it as described in The Post Radio magazine, and it sure is a humdinger. I wish some of these hardened radio bugs would give this one a trial. Last night, being silent night, I brought in the following stations between the hours of 5:45 and 11:15: KDKA, WOC, WCX, WFI, WDAF, WLAG, WGY, WWJ, WTAS, WSB, WCBD, WOS, WHAZ, WMC, WCAP, WOR, WOO, WOAW, WDAR, KEDL, KFKX and KFKB, counting in all twenty-two in number.

I think your radio section is the finest ever offered by any newspaper in the country. I can hardly wait for the next issue.—MARTIN DOMZALSKI, 8227 Coles avenue, South Chicago, Ill.

Panel Layout Described.

Today I am showing panel layout for a three-tube set. Study that over carefully. Buy the parts listed elsewhere, hook them up on your table as a test set for the rest of the week, and next week I will give you full construction details and illustrate "Old Reliable" inside and out so that any home builder can construct the set and make it work efficiently the first night he tries it out.

Mind you, I am not claiming any originality for this circuit. It is the standard Armstrong three-circuit regenerative, but, instead of using a variometer in the grid circuit, has forty-three-plate vernier variable condenser, shunted across the tuning coils, which are the primary and secondary of a varicoupler. There also is an extra forty-three-plate condenser of the same type in the aerial circuit. Those two spots are where it differs from the standard Armstrong.

I am reprinting the pictorial diagram of the circuit this week. A standard two-stage audio-amplifier is added to this receiver.

List of Parts Given.

Here is the list of parts that are in my personal set illustrated last week and which will appear in the special home set which will be illustrated next week:

One 43-plate plain Kellogg variable condenser. A vernier will add to the sharpness of the tuning. It will be necessary in either case to employ a dial vernier. This is for the aerial circuit.

One 43-plate vernier Kellogg variable condenser. It will be necessary to use a dial vernier—the friction type that moves the dial a fraction of a degree with a full turn of the knob. This is the tuning condenser and is very, very sharp in tuning. You will find that even within two blocks of a powerful local station it will be necessary to tune it in with the characteristic carrier wave whistle of an outside or long-distance station.

One Michigan, White, Fada or other good variocoupler of 180 degrees. Be sure you get a 180-degree coupler. It will not be necessary to use the unit taps. The ten taps are all that I utilize. This will be explained next week.

One Kellogg, White, Atwater-Kent or similar high inductance variometer with low capacity. The Estru variometer also works well in this circuit.

Four four-inch Kellogg dials. I specify these because of the Kellogg condensers. They have been calibrated. The dial readings will be correct.

One panel mounting inductance switch.

One Bradleystat, Fil-ko-stat, Unity vernier, Howard vernier or other dependable rheostat that has a vernier. This rheostat is for the detector tube. It is critical. If a good rheostat is used it will aid greatly in selectivity and range. This should be of six-ohm resistance, as a C-300 or a UV-200 detector tube is employed.

Two plain rheostats of twenty-five ohms resistance. These are for the amplifier circuit which will use C301A or UV-201A tubes. If VT-2 or 216A power tubes are used for amplification, the six-ohm rheostat will serve here.

Three Kellogg sockets.

One .001 fixed condenser, mica type tested. Don't buy cheap condensers. Half the trouble in sets is unreliable fixed condensers.

Two audio-frequency transformers. All-American, Thoradson, Kellogg or similar type transformers will answer. Use a 5-to-1 ratio in the first stage and a 3-to-1 ratio in the second stage.

Eight binding posts or telephone tip jacks. I prefer the tip jacks.

Three bezel windows.

One composition panel 11 by 20 inches for the front of the cabinet.

One composition panel 9¾ by 19 inches for the subbase panel.

One cabinet 11 by 20 by 10 inches.

Twelve pieces of bus bar wire.

Four feet of spaghetti insulation.

Necessary screws, bolts and nuts.

Finishing Off the Panels.

You may buy your panel and prepare it for the engraver if you wish to put on the finishing touch that engraved panels give a set. You understand, once you build this set, it will be permanent. Trick circuits may come and go but you will cling to "Old Reliable" whatever happens. So put your best efforts in what you build.

There are two drawings accompanying this article showing panel layouts. Fig. 1 is for the front, or mounting, panel. It is made to a scale. Redraw it on a sheet of stiff paper. Take pains to get the holes centered just as they should be. When this drawing is complete you can use it as a template.

Fig 2 is the subbase panel. On it will be mounted the three tubes and the two audio-frequency transformers. Also at the rear the battery phone tip jacks are mounted. Make your full-size drawing on stiff paper nad use this as your template.

Be Careful in Drilling.

With the templates completed paste them back down on the composition panels. Bore your holes with the sketches as your guide. If you are not familiar with panel drilling proceed cautiously. Be sure you are right and then go ahead.

After all the holes are drilled and the engraving done, if you engrave your panels, take a piece of fine emory cloth and rub the face of the two panels in one direction until you take off the glossy finish. Be careful to move the emery cloth in one direction. That keeps the panel from becoming grainy. After the gloss is taken off and with it any scratches that may have been made in drilling place a few drops of machine oil on the panel and again over with the emery paper. Finish up with a clean cloth and remove all the surplus oil.

The extra labor and pains given to this finish will be repaid in a true aristocrat panel equipment. Next week I will give you wiring instructions and pointers on the hook-up.

INCREASES SELECTIVITY.

Short antenna increases selectivity of a receiver, but volume is sacrificed.

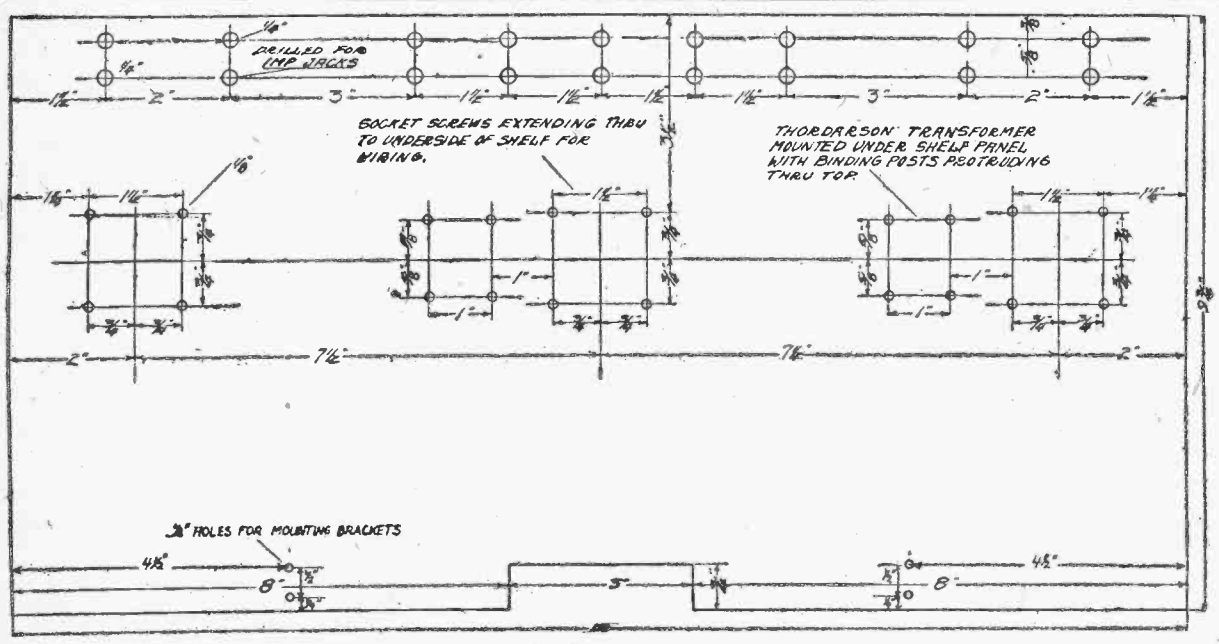


FIG. 2—Panel layout for subbase of "Old Reliable" Armstrong three-circuit. The holes shown here are for Thordarson transformers. If other makes are used, holes must be drilled accordingly.

RADIO EDITOR: Am writing to thank you for the Armstrong three-circuit regenerative hook-up given in The Post Radio Magazine for Dec. 13. It got me out of a hole. Am located only one mile from WJAZ and have been unable to get thru them with a hook-up of three stages untuned radio detector and two stages audio. Sunday night, Dec. 16, with your hook-up, we cut thru WJAZ to KYW, then thru WDAP and KYW to WHB, WEAF, WCAP, WOAW and WOC. Thanks—F. M. CONFER, 1425 Carmen Ave., Chicago.

Mr. Confer, you will note, had been unable to get away from WJAZ with a five-tube set until he hooked up "Old Reliable," and his first night's operation brought him in long-distance stations thru all the local stations.

Gets Distance with "Old Reliable."

Martin Domzalski, 8227 Coles avenue, South Chicago, tore down his old variometer hook-up and rebuilt it into an "Old Reliable" receiver. Here is what happened:

RADIO EDITOR: Just want to tell you that the set that you have described in

Long-Distance Records of Phans

Here are some more targets for you long-distance getters to shoot at. I call particular attention to the crystal fellows who have achieved some wonderful results with Hagerman's long-distance crystal set.

RADIO EDITOR: Following is the list of broadcasting stations that I have received up-to-date:

Davenport, Iowa, WOC; Milwaukee, Wis., WCAY; Schenectady, N. Y., WGY; Buffalo, N. Y., WGR; Atlanta, Ga., WSB; East Pittsburg, KDKA; Detroit, Mich., WCX; Detroit,, Mich., WWJ; Indianapolis, Ind., WOH; College Park Ga., WDAJ; Atlanta, Ga., WGM; Milwaukee, Wis., WAAK; Louisville, Ky., WHAS; McKeesport, Pa., WIK; Fort Worth, Texas, WPA; St. Louis, Mo., KSD; Madison, Wis., WHA; Kansas City, Mo., WHB; Kansas City, Mo., WDAF; Cleveland, Ohio, WHK; University Place, Neb., WJAC; North Plainfield, N. J., WEAM; Omaha, Neb., WIAK; South Bend, Ind., WBAQ; St. Joseph, Mo., WEAK; Dallas, Texas, WFAA; Birmingham, la., WSV; Cincinnati, Ohio, WLW; San Antonio, Texas, WJAE; Newark, N. J., WJZ; Washington, D. C., WJH; Springfield, Mass., WBZ; Denver, Colo., KFAF; Newark, N. J., WOR; Dearborn, Mich., WWI; South Bend, Ind., WGAZ; New York city, WEAF; Ames, Iowa, WOI; Minneapolis, WLB; Des Moines, Iowa, WGF; Fort Worth, Texas, WBAP; Oklahoma City, Okla., WMAB; Atlanta, Ga., WDAW; Savannah, Ga., WHAO; Rochester, N. Y.; WHAF; Superior, Wis., WFAC; West Lafayette, Ind., WBAA; Minneapolis, Minn., WLAG; Anthony, Kas., WBL; Milwaukee, Wis., WIAO; Schenectady, N. Y., 2X1; San Antonio, Texas, WOAI; Indianapolis, Ind., WLK; Calgary, Alta, Can., CFAC; Iroquois Falls, Ont., Can., CFCH; Duluth, Minn., WJAP; Denver, Colo., DN4; Syracuse, N. Y., WFAB; Winnipeg, Man., Can., CJCG; Parkeburg, Pa., WUAA; Los Angeles, Cal., KHJ; Denver, Colo., KLZ; Lincoln, Neb., WKAC; Waco, Texas, WJAD; Jefferson City, Mo., WOS; Havana, Cuba, PWX; Cedar Rapids, Iowa, WJAM; Anacostia, D. C., NOF; Columbus, Ohio, WEAO; Toronto, Can., CFCA; Nashville, Tenn., WNAE; Jacksonville, Fla., WDAL; New Orleans, La., WAAC; Rogers, Mich., WGAF; Boston, Mass., WNAC; Northfield, Minn., WCAL; Waco, Texas, WLAJ; Dallas, Texas, WRR; Chicago, Ill., KYW; Chicago, Ill., WJAZ; Chicago, Ill., WMAQ; Chicago, Ill., WGAS; Chicago, Ill., AB4; Chicago, Ill., WDAP; Chicago, Ill., WPAD; Chicago, Ill., WAAF; Chicago, Ill., WBU; Chicago, Ill., WSAH; Chicago, Ill., WSAX; Chicago, Ill., WWAY; Memphis, Tenn., WKN; Fargo, N. D., WDAY; Easton, Pa., WHAP; Charlotte, N. C., WBT; Charleston, W. Va., WPAZ; Webster Grove, Iowa, WOAL; Tulsa, Okla., WLAL; Pittsburg, Pa., WCAE; New York city, WBAY; University of Nebraska, WFAB; Stamford, Texas, WOAZ; Kansas City, Mo., WOQ; Wichita, Texas, WHAN; Troy, N. Y., WHAZ; St. Louis, Mo., WCK; Paducah, Ky., WJAR; Wichita, Kas., WAAP; Memphis, Tenn., WMC; Philadelphia, Pa., WOO; Dallas, Texas, WDAO; Lawrenceburg, Tenn., WOAN; Columbus, Ohio, WCAE; Milford, Kas., KFKB; Denver, Colo., KFEL; San Francisco, Cal., KPO; Los Angeles, Cal., KFI; New York city, WHF; Cleveland, Ohio, WTAM; Philadelphia, Pa., WIP; Washington, D. C., WRC; Washington, D. C., WCAP; Hastings, Neb., KFKX; Joliet, Ill., WWAE; Elgin, Ill., WTAS; Zion, Ill., WCBD; Medford Hillside, Mass., WGI; Minneapolis, Minn., WBAH; Waupaca, Wis., WPAH; New York city, WJZ; Fond Du Lac, Wis., KFIZ.

This list of stations, 129 in all, was received on a single circuit regenerative set employing only one tube. Some phans may wonder how I got such stations as WCAE located in Columbus, Ohio, but this was done in a period of over a year ago.—GEORGE S. NIELSEN, 7739 Luella avenue, Chicago, Ill.

DAVENPORT ON CRYSTAL.

RADIO EDITOR—Acting upon the suggestion of a radiophan, I am writing to advise you that at about five minutes of 9 Wednesday night, Dec. 12, my very simple crystal set, used with a Ducon plug inserted in a lamp socket, brought me Davenport, Iowa, where the Spanish-American veterans were celebrating the twenty-fifth anniversary of peace. I clearly heard the person making the announcements, and also "those present" sing "America," and I, too, stood at attention.—ROSE CUNEO PANERI, Chicago.

NO MONDAY NIGHTS HERE.

RADIO EDITOR—I have been reading your articles regularly in your splendid Radio Magazine on Thursdays, and I find a great many radiophans pick out Monday evenings to do their DX work, but what I want to find out is, Why pick on Mondays for this work. Aren't other nights just as good? I suppose a great many phans have interference from the Chicago stations, but what makes me write to you is this: I thought I might do a little DX work myself. I didn't pick on poor Monday evening. I grabbed off Prof. Friday night to see what I could fish out. I have a one-tube Reinartz circuit which I built myself. I picked out twenty-four stations on one tube. They came in like a gang of hungry wolves, and talk about your selectivity! I sure did have it. Here is a list of stations I picked out of the air when all of the Chicago stations were plowing up the ozone:

KDKA, East Pittsburg, Pa.; WBAN, Minneapolis; WCAE, Pittsburg, Pa.; WHB, Kansas City, Mo.; WOAW, Omaha; WRC, Washington, D. C.; WCX, Detroit; WGY, Schenectady; KFKB, Milford, Kan.; WCAH, Columbus, Ohio; WGR, Buffalo; WTAS, Elgin; WCBD, Zion; WJAD, Waco, Texas; WHAS, Louisville, Ky.; WEAF, New York city, N. Y.; WSB, Atlanta, Ga.; WOS, Jefferson City, Mo.; WOO, Philadelphia, Pa.; WOC, Davenport, Iowa; WFAA, Dallas, Texas; WMC, Memphis, Tenn.; WDAR, Philadelphia, Pa.; WRAP, Fort Worth, Texas.

The Philadelphia station, WOO, I picked out of the air when all three Chicago stations were on the air at the same time and it came in fine, with no interference. I have a single wire aerial sixty-five feet long and a twenty-foot lead-in, well insulated from the house.—E. O. KRESIN, 1250 South Hermitage avenue, Chicago.

HERE IS A GOOD LIST.

RADIO EDITOR—I wish to compliment your paper on its radio section, particularly the magazine that appears each Thursday. This magazine merits considerable praise and I eagerly read it from cover to cover each week. May I suggest that WWAE be added to the list of broadcasting stations, as published by you? This broadcasting station is located in Joliet, Ill.

I also wish to submit herewith a list of stations I clearly tuned in that night, Dec. 13, with a Westinghouse Areiola Senior receiver and two-stage amplifier. This set uses dry cell batteries, is very sensitive and selective, and there is apparently no station in the United States that one cannot tune in with it:

WDAP, Chicago; KYW, Chicago; WJAZ, Chicago; WHAS, Louisville, Ky.; KDKA, East Pittsburg, Pa.; WJAX, Cleveland, Ohio; WGY, Schenectady, N. Y.; WBZ, Springfield, Mass.; WNAC, Boston, Mass.; WHN, Ridgewood, N. J.; WSAI, Cincinnati, Ohio; WLW, Cincinnati, Ohio; WJY, New York city; WTAS, Elgin, Ill.; WOI, Ames, Iowa; WOAW, Omaha, Neb.; KFKX, Hastings, Neb.; WHB, Kansas City, Mo.; WDAF, Kansas City, Mo.; WBAP, Fort Worth, Texas; WBAH, Minneapolis, Minn.; WWAE, Joliet, Ill.; KFI, Los Angeles, Cal.; KHJ, Los Angeles, Cal.; KFLE, Denver, Colo.; CFCN, Calgary, Canada (test).

This is a good list, I think, in that the Chicago stations were on the air, and they offer about the same interference out here at the Great Lakes as they do among our Chicago phans. I have also tuned in (other evenings) KGW, Portland, Ore., and KPO, San Francisco.

If space is available in your magazine I would like to see this list published, as I have not read any results of owners of Westinghouse radio outfits similar to mine, and I have only had this set three weeks.—DR. C. R. WELLS, Great Lakes, Ill.

FROM COAST TO COAST.

RADIO EDITOR—I see quite often in The Post the record of one day's catch and they boast about it so I will do a little if you will permit. Monday night, Dec. 12, in four hours I had eleven states and eighteen outside stations thru a De Forest circuit, type D-10 from New York city to Los Angeles, Newark, N. J., over the loud speaker and could hear it plain in any of my four rooms. Will demonstrate at any time to disbelievers.

I think the Radio Magazine section of The Post is as near perfect as could be. I look forward every Thursday for The Post's Radio Magazine.—P. E. KEYES, 2035 Washington boulevard, Chicago.

HIS GREBE DID ALL, THIS.

RADIO EDITOR: I am inclosing my DX logging, showing a total of sixty-three stations. I tune the majority of them in regularly on a loud speaker. I am using a home-made Grebe with two steps of audio-frequency for amplification. Added the second step on Nov. 21, 1923, and all of these stations have been tuned-in both before and after adding the detector. Dec. 1 to 12, inclusive, I have tuned-in forty-three different out-of-town stations for a total of 133 separate loggings and in each case listened to the program. Here they are:

CFCN, Calgary, Can.; CKCK, Regina, Can.; KDKA, Pittsburg, Pa.; KFI, Los Angeles; KFKB, Independence, Mo.; KFKB, Milford, Kas.; KFKX, Hastings, Neb.; KHJ, Los Angeles; KLZ, Denver; KOP, Detroit; KPO, San Francisco; KSD, St. Louis; PWX, Havana; WAAW, Omaha; WBAH, Minneapolis; WBAP, Fort Worth; WBAV, Columbus, Ohio; WBAY, New York city; WBL, Anthony, Kas.; WCAE, Pittsburg; WCAP, Washington, D. C.; WCAY, Milwaukee, Wis.; WCBD, Zion; WCX, Detroit; WDAF, Night Hawk, Mo.; WDAR, Philadelphia; WEAF, New York city; WEAN, Providence, R. I.; WEB, St. Louis; WFAA, Dallas; WGR, Buffalo; WGY, Schenectady; WHAS, Louisville; WHAZ, Troy; WHB, Kansas City; WIP, Philadelphia; WJAX, Cleveland; WJZ, New York city; WKY, Oklahoma City; WLAG, Minneapolis; WLW, Cincinnati; WMAJ, Kansas City, Mo.; WMC, Down in Dixie; WNAC, Boston; WNAD, Norman, Okla.; WOAI, San Antonio; WOAO, Mishawaka, Ind.; WOAW, Omaha; WOC, Davenport; WOO, Philadelphia; WOQ, Kansas City; WOR, Newark; WOS, Jefferson City; WPAH, Waupaca, Wis.; WRAL, Stevens Point, Wis.; WRC, Washington, D. C.; WSAI, Cincinnati; WSB, Atlanta; WSY, Birmingham; WTAM, Cleveland; WTAS, Elgin; WWAE, Joliet; WWJ, Detroit.—E. G. TULLY, 7407 Rhodes Avenue, Chicago.

A POST HOOK-UP DX GETTER.

RADIO EDITOR—I would like you to know some of the stations I received on my radio that I made. I think I have had very good results with it so far.

The best part about it is its remarkably sharp tuning on distant stations. I have not had much success in tuning out Chicago stations, so I decided to try a wave trap which I am about to experiment with, the one which was in the famous Chicago Evening Post Radio Magazine. I think this is the best magazine on radio I have ever read, for its price and size, and eagerly look forward every Thursday night for its contents of sixteen pages of radio.

The reason this set works so good is because I got the diagram out of The Evening Post, copied it down and made my set from it. Monday, Nov. 28, I received twenty-two out-of-town stations on two bulbs between 8:02 and 10:14 p. m. When I left my set I could have still heard more stations because the ether was still full of them.

The stations were all on two bulbs in two hours and twelve minutes:

WTAS, Chicago; WCBD, Zion, Ill.; KDKA, Pittsburg; WOS, Jefferson, Mo.; WBAP, Forth Worth; WHB, Kansas City; WHAZ, Troy, N. Y.; WLW, Cincinnati, Ohio; WQY, Schenectady, N. Y.; WKN, Memphis, Tenn.; WOAW, Omaha, Neb.; WOO, Philadelphia, Pa.; WTAS, Elgin, Ill.; WKAM, Hastings, Neb.; WRC or WDM (?), Washington, D. C.; WCAE, Pittsburg; WWJ, Detroit; WGM, Atlanta; WGR, Buffalo; WCAY, Milwaukee; WDAF, Kansas City; WIP, Philadelphia.—BILL BYRNE, 6719 Greenview avenue, Chicago.

RADIO EDITOR—You ask for loggings for Sunday, and complying with your request I am listing mine for Dec. 16. Started tuning-in at 2:30 p. m., and signed off at 11:15 p. m. During that time I covered about 14,000 miles, all on a home-made Grebe three-tube, using Old Reliable horn (Seaman)? I am listing them in the order in which I turned them in, but did not keep a record of the time:

WOC, Davenport, orchestra; WCBD, Zion, services; KDKA, Pittsburg, orchestra; WTAS, Elgin, orchestra; WCAE, Pittsburg, orchestra; WHAS, Louisville, vocal; WDAF, Kansas City, orchestra; WSB, Atlanta, services; WFAA, Dallas, Bible class; WGY, Schenectady, services; WEAF, New York city, Capitol theater orchestra; WLW, Cincinnati, Santa Claus and speech; WHB, Kansas City, orchestra; KFIX, Independence, Mo., services; WTAQ, Ossed, Wis., reading; WSY, Birmingham, services; WWAE, Joliet, Wendell Hall and Harry Gelse; WLAG, Minneapolis, special orchestra program; WOAW, Omaha, services; WOAL, San Antonio, orchestra; CKCK, Regina Sask., Can., services; KLZ, Denver, services; KHS, Los Angeles, orchestra; KPO, San Francisco, orchestra.—ELMER G. TULLY, 7407 Rhodes avenue, Chicago.

EIGHTEEN IN TEN MINUTES.

RADIO EDITOR: Don't listen in so very much, but did listen in last Friday night, Dec. 14, for about ten minutes, at about 10:15 p. m. Am sending in a list of stations heard in that short time.

1AY, 1XAJ, 1CGO, 3CIS, 3WS, 3CWN, 5IW, 8UE, 8UF, 8AUE, 8BCP, 8WX and 8MR on phone. Very good modulation!

Following was heard without antenna or ground: 8WX, 8AZG, 8CRW, 9BUU and 9BHX.

The average distance of these stations is about 500 miles, altho a few are only in Detroit, and both ninth district stations are in Illinois. Am using a Zenith 1-R tuner with detector and one stage audio-amplifier for general listening in.—BEVERLY DUDLEY, 9BR, A. R. R. L. Assistant City Correspondent, 4909 Fletcher Street, Chicago.

RADIO EDITOR: I see that you are publishing the records made by receiving sets during one night, so I am sending in my list of thirty-three stations received on silent night, Monday, Dec. 17.

When I came home it was dusk. I turned on the old tubes and with a loud squawk in came the list of stolen autos in Detroit. When I went to dinner I had brought in eleven stations. After dinner was over I listened for nearly an hour to he larger stations and then turned in CKCK, Regina, Saskatoon, Canada. They were signing off until ten minutes after 9, when they were going to broadcast the score of the Victoria-Regina game. I signed off at 0:15. Here is my list of thirty-three stations, the call letters, the location of the tation and the kind of music played there:

KOP, Detroit, Mich., stolen auto report; WGR, Buffalo, N. Y., concert by orchestra; WOC, Davenport, Iowa, chimes; KDKA, East Pittsburg, Pa., vocal solo; WCAE, Pittsburg, Pa., dinner concert from William Penn hotel; WOR, Newark, N. J., announcing changes in orchestras; WFI, Philadelphia, Pa., Meyer-Davin Concert orchestra; WCX, Detroit, Mich., comparison of business between 1922-23; WDAF, Kansas City, Mo., Bishop William Cooper; WOAI, San Antonio, Texas, 6:15, news bulletins and stock reports; WLAG, Minneapolis and St. Paul, Minn., orchestra; WDAR, Philadelphia, Pa., soprano solo; WOAW, Omaha, Neb., Randall's orchestra; WOO, Philadelphia, Pa., orchestra music; WWJ, Detroit, Mich., quartet; WGY, Schenectady, N. Y., soprano solo; WBAP, Fort Worth, Texas, musical reading; WAAW, Omaha, Neb., stock reports; WLW, Cincinnati, Ohio, quartet; WOS, Jefferson City, Mo., the trio; WSB, Atlanta, Ga., "Trade Winds," barytone solo; WCAG, New Orleans, La., dance music; WMC, Memphis, Tenn., Hotel Gayoso orchestra; WHAZ, Troy, N. Y., barytone solo; WJAD, Waco, Texas, hotel orchestra; CKCK, Regina, Canada, announcing that they would sign off until they announced the score; I heard one piece by some orchestra; WFAA, Dallas, Texas, vocal solo; KFKB, Melvern, Kan., Brinkley-Jones Hospital association; WJZ, New York city, prize fight; WBAH, Minneapolis, Minn., vocal program; WNAD, Norman, Okla., announcement for the University of Oklahoma; KFAF, Denver, Colo., vocal solo, "Old Black Joe," last piece before signing off; KFEL, Denver, Colo., vocal concert.

I received Elgin and Zion and a few Chicago stations (WDAP, WMAQ, KYW), but those are local, so I didn't get them on my list. I think I got WCAP and WEAF broadcasting together, but I am not sure, so they do not go on my list. I lost many stations, but I am getting used to it. This won't beat Mr. Johnson's record, but watch me next Monday. I am 12 years old and operate my own two-tube set. Your radio page is great. I have heard Cuba (PWX), and Sunday night I heard Toronto (CFCA). I have heard ninety-one different stations in the United States. Los Angeles, KHC, is the only one on the Pacific coast.—JOHN SHELDON, 241 South Ave., Glencoe, Ill.

ONE-TUBE REINARTZ.

RADIO EDITOR: Here is my log for last night, Dec. 17. I received these stations on a Reinartz hook-up, using one WD-11 tube: KDKA, East Pittsburg; WHAZ, Troy, N. Y.; WLW, Cincinnati, Ohio; WHB, Kansas City; WBAP, Fort Worth; WCAP, Washington, D. C.; WEAF, New York; WCAE, Pittsburg; WOC, Davenport; WOS, Jefferson City; WSB, Atlanta, Ga.; WDAF, Kansas City; WOR, Newark, N. J.; WMC, Memphis, Tenn.; WPAH, Waupaca, Wis.; WAAC, New Orleans, La.; WCBD, Zion, Ill.; WGR, Buffalo, N. Y.; WTAS, Elgin, Ill.; KFKX, Hastings, Neb., WBAD, Minneapolis, Minn.; WBAV, Columbus, Ohio; KFEL, Denver, Colo.; KFKB, Milford, Kan.

Your Radio Magazine and page is a great thing. Your lists of programe are better than any other ones I have seen. Keep up the good work.—LESTER G. BESOLD, 934 Clinton avenue, Oak Park, Ill.

JUST THE DETECTOR UNIT.

RADIO EDITOR: Here is what the detector unit of my Rienartz three tubes got for me last Monday, Dec. 17. In order picked up:

Before 6:30 p. m.: WCX, Detroit, dance music; WIAG, Minneapolis, announcing; KDKA, Pittsburg, dinner concert.

After 7 p. m.: KSD, St. Louis, Grand Central theater; WOAW, Omaha, band; WGY, Schenectady, music; WOS, Jefferson City, dance music; WCBD, Zion, choir; WTAS, Elgin, Charlie Erbstein; WOC, Davenport, announcing; WCAE, Pittsburg, recitation; WSB, Atlanta, dance only; WAT, Detroit, solo; WPAH, Waupaca, Wis., mixed quartet; WHAZ, Troy, announcing; WDAF, Kansas City, announcing; WCAP, Washington, D. C., signing off (first broadcast with WEAF); WFAA, Dallas, announcing; WMC, Memphis, announcing; WJAD, Waco, Texas, dance music; WOI, Ames, Iowa, signing off; WBAP, Fort Worth, talking; WBAH, Minneapolis, announcing; WBAV, Columbus, signing off; WGR, Buffalo, dance music.

Your paper is real interesting, good work.

Previously I had also heard: KFDL of Denver; KFI, Los Angeles; WAAK, Milwaukee; WCAY, Milwaukee; WCAS, Minneolis; WEAP, New York; WEB, St. Louis; WHA, Madison, Wis.; WHAS, Louisville; WHB, Kansas City; WIAO, Milwaukee; WIAU, Le Mars, Iowa; WJZ (when in Newark); WUU, Philadelphia; WOR, Newark; WSY, Birmingham, Ala.

Chicago stations: KYW, WMAQ, WDAP, 9XU, WJAZ, 9XN, WBU, WAAF, WSAH, 9BA, 9US, 9BEF, 9BRN, 9BQA, 9CAS, deleted WAAY, WPAD. These amateurs were not code.—WARREN G. HENRY, 535 North Leamington, Chicago.

BEG YOUR PARDON!

RADIO EDITOR: I hereby apply for membership to the Order of Bone Pickers. About three weeks ago I sent in my list of DX stations heard. You used my name in your ad of Nov. 28, but failed to publish my list. It may be that it wasn't good enough. However, since then I have added a few more, which I believe will enable me to qualify. I haven't a very long list, but I covered the distance just the same. Here 'tis:

WGY, WOAW, WHAS, WJAX, WLW, WOR, WHAZ, WOC, WMAR, KLZ, WBAP, WFAA, WMC, WEAF, WOO, WWJ, WLAG, WBAH, WSAI, WDAF, KSD, WCAE, WOS, WLAC, WHB, WTAS, WBD and WFI.

A total of twenty-eight stations—coast to coast. I have a one-tube set (ultra-audion hook-up). In comparing the liste, please consider the difference in both cost and upkeep between the ultra-audion and one-tube reflex. You'll find quite a difference.—JOSEPH F. MISICKA, 1109 West 19th Place.

CRYSTAL TRULY LONG DISTANCE.

RADIO EDITOR: Logged thirty-seven stations last evening (Dec. 17) with detector and radio-frequency tubes of an Amrad set, the ones of DX pretensions being CHYC, CFCN, KGW, KFI and KFEL or KFDL of Denver. Why such similar stations in the same city?

Find your long-distance crystla hook-up very satisfactory; just what I wanted for Chicago stations. Altho my aerial and ground are not ideal for crystal set use, I have heard KDKA and WTAS, but mention of this brings forth loud laughs and remarks about radiation from near-by tube sets. It is more selective than any crystal set I have tried out.

Have no difficulty in reaching Los Angeles any night I try, but I simply cannot find PWX. WHAS on the same wave length is always in the way.—L. V. PHILLIPS, 610 North Spring Avenue, La Grange, Ill.

RADIO EDITOR: In accordance with your request for DX records I submit the following, heard Monday night, Dec. 17: WEAF, WCAP, KFKX, WBZ, KDKA, WTAS, WLW, WOS, WCBD, WCAE, WDAF, WOC, WFAA, WMC, WBAP, WOR.

I do not consider the above list of great importance, so have omitted names of pieces. However, I do believe that all stations received over a 1,000-mile radius should include the names of the pieces. Accordingly I submit the following, heard from station KFI, Los Angeles Examiner, Dec. 17: Orchestra, "Somebody's Wrong," 10:40; vocal, "Texarkana Rose," 10:46; vocal, "I Can't Forget," 11:08; vocal, "After the Dance," 11:15, sung by Gladys Cramer; vocal, "I Want to Know" and "Dear Old China," 11:30.

Also CQCN, Calgary, Dec. 17: Piano duet, "Melody of Love," 11:40; "Till the Sands of the Desert Grow Cold."—E. P. MORRILL, 5916 Parnell Avenue, Chicago.

Letter Box

SPANISH IN LOS ANGELES.

RADIO EDITOR: In the Dec. 15 issue of The Post you told of a perplexed radiophan who picked up a lecture or talk in Spanish and was unable to identify its source.

This was undoubtedly the Times, Los Angeles, broadcasting one of its frequent news digests for the benefit of its Mexican listeners. I got quite a thrill out of the first one I ever heard, as I knew PWX was not on the air and felt sure I must be getting South America.

May I commend you on the excellence of your Thursday Radio Magazine, as well as your daily radio section?—A. R. F., Drake Hotel, Chicago.

WANTS MORE VARIETY.

RADIO EDITOR: Have just finished reading this week's issue of The Post Radio Magazine, which is exceptionally good. While the matter is fresh in my mind I am writing a few lines in support of the letter written by Chas. A. Kunciz regarding result of listeners' vote. I believe he has the right dope when he says the average phan is tired of the mush we have served to us as entertainment by the local stations. Were it not for the fact that I can easily tune them out, I, too, would probably junk my milo-perplexer. Every little village in the sticks puts on an honest-to-goodness jazz program almost every night in the week, yet we inhabitants of the second city in the United States must tune-out the local stations to get the real stuff.

Where is the "I Will" spirit among our broadcasters? With one exception I believe the local stations are losing prestige. Why must we be reminded continually that "It Ain't Going to Rain No More"? Give us something new. Why break up a perfectly good concert every half hour to say that the world is at peace and there is no news, with the information that the news bulletin was furnished by the Bla-Bla News service. Let's have more light on the subject. There is only one station in this village where the meaning of courtesy is understood and worked out for the benefit of the radio public and you only have one guess as to the identity of the guilty one.—E. G. TULLY, 7407 Rhodes avenue.

OFFERS A SUGGESTION.

RADIO EDITOR: To add a little salt and pepper to your weekly magazine I suggest a "Radio's Biggest Lie" column. Here's the initial contribution:

In spite of all the data Ye Editor had given us about Havana, I had been unable to get them clear. So one Wednesday night I made up my mind I was going to get them. First I took a toothpick and wound ninety turns of the best tobacco on it, taking a tap off at every tenth turn.

Then I installed it in a cigar holder and used a diamond match for a detector. The cigar holder was of black composition so I used it as a phone receiver.

Last Wednesday evening I placed this cigar holder receiving set on the dining-room table, and thru an accident the holder came partly off the cigar. I was in the next room, and to my surprise I heard Havana clear. At first I thought it was the loud speaker of the radio shop next door, but upon investigation I found that when the holder was entirely off the cigar that the reception was so loud that we could not stay in the room and my ear drums have been sore ever since.—IRVING C. JOHNSON, 4551 North Clark Street, Chicago.

NOW READS HOME PAPER.

RADIO EDITOR: Thanks for copy of your paper mailed to me a few days ago (Thursday edition).

Have been in radio for a few years and have been taking the Pittsburg Post once a week of the Detroit News in order to keep up with the times, as our local papers seemed to think that "anything was good enough" and were behind the times.

You certainly did "scoop" the other papers in town and your circulation should show a remarkable jump on Thursday editions at least.

I have taken it from the start (so had two of the date you mailed me one, but gave it to another beginner in radio) and will be over for a cover at my earliest convenience.

Your magazine compares favorably with any other newspaper ones that I have seen, in fact, it is the best in several respects.

Much success to it, as it should be "boosted" by every "phan" and broadcast listener in town. I am glad I can let the Pittsburg Post go at the end of my subscription for "our own" "Post."—H. E. TURNER, 7040 Woodlawn Avenue, Chicago.

LIKES STORY-LIKE STYLE.

RADIO EDITOR: Three cheers for The Post! Three cheers for the Radio Magazine! I thoroly enjoy the Radio Magazine and eagerly wait for each Thursday edition. I like the story-like way in which you give the radio information.

I am a booster for The Post, as I am telling all my friends to subscribe. I wish you all the success you deserve.—IDA OHNSTEIN, 4715 Ellis Avenue, Chicago.

WAVE TRAP BRINGS IN CUBA.

RADIO EDITOR: Since adding a wave trap between my aerial and Radiola, Sr., receiving set I am capable of receiving further stations and better selectivity. As a matter of fact, I was able to hear Havana last night for the first time. The Post's wave trap added efficiency to my set and I congratulate your paper as the foremost for radiophans, not mentioning its leadership in other features.—HERMAN L. KLEIN, 1416 Garfield avenue, Belvidere, Ill.

MANY, MANY THANKS.

RADIO EDITOR: I have noticed right along in your section devoted to programs and schedules that you have Troy, N. Y., at 330 meters. This, of course, should be 380. Also, on the schedule of Wednesday, Dec. 12, you had Havana, Cuba, at 360 when it should be 400. After this little kick, I want to compliment you most sincerely on the way in which you are handling this department, which is far more complete than all the rest of the Chicago evenings' put together.—LOUIS GEYLER, 2635 South Wabash avenue, Chicago.

TALKING TUBES EXPLAINED.

RADIO EDITOR: Last week Ye Night Prowler broadcast his peculiar experience with a talking tube. I know several other cases where radio bugs who were perfectly sober had the same experience, only it was a talking transformer and not a tube. As I know of no reason why a tube should act as a built-in loud speaker, I am under the impression that it was the transformer that was doing the talking in your case.

There is a certain make of transformer on the market that is known to act as telephone receiver. This transformer has a figure 8 core, and has an iron shield in cylinder shape.

Were I a radio engineer I could probably explain the action that takes place in technical terms, but such not being the case, I will endeavor to do so in my own style.

The B plus or plate voltage magnetizes the core referred to above, which attracts and vibrates the circular ends of the case. These ends thus become regular diaphragms and your transformer is a built-in loud speaker.

The plate current for the detector tube is not strong enough to vibrate the stiff disks on the transformer and the talking referred to invariably occurs in the amplifying circuit of the set.—IRVING C. JOHNSON, 4551 North Clark street, Chicago.

Push-and-Pull Amplifier Construction Details for the Home Builder

THIS is the third of a series of articles on push-and-pull amplification. The first took up the theory of amplification, the second the application of the theory and today's article gives construction details.—The Editor.

By BENJAMIN E. FREUND.
(Cheif Engineer Radio Division, Crossland Pfaff Eng. Lab.)

IN order to assist those who are interested in the construction of a push-pull amplifier, as promised in last week's article, I will endeavor to furnish enough data that will enable anyone with the slightest technical knowledge to assemble and wire one with ease.

For the benefit of those who have built their own receiving sets, a conventional size of panel such as has been customary to use for the construction of receiving units has been used.

As most standard size panels are seven inches in height, a seven by nine-inch panel was used in the construction, as shown in figure 1.

Either one-eighth-inch or three-sixteenths-inch panel can be used, depending upon the thickness necessary to match the other members of your receiving set.

There are many radio enthusiasts who would like to construct their own sets, but feel that they lack the mechanical ability to make a neat-looking product when finished. Most of the trouble arises in the drilling of the panel and wiring of the various parts which the set is composed of.

As the drilling of the panel is the

BENJAMIN E. FREUND.

first operation to be performed, I will explain how a panel can be laid or marked out without scratching and drilled with ease.

Take a piece of paper, cut to the same size as the panel used and paste or fasten with mucilage to the side of the panel that is to be drilled. Then take a pencil, ruler and compass and draw on the paper the location of all the holes that are to be drilled. Figure 2 gives all of the dimensions necessary to lay out the drawing.

After this is completed take a center punch or any sharp implement and punch or prick the points that are to be drilled. Then take whichever drills are necessary for the various size holes and drill to your heart's content. Be sure that a drill such as is used for steel or other metal is used, as a wood drill will meet with failure when applied to formica or bakelite.

As sometimes the point of the larger drills, as used for the Carter rheostat shaft and the filament switch, are larger than the indentation made with the center punch, difficulty will be encountered in starting the hole in the desired spot. This difficulty can be avoided by first drilling a smaller-size hole and then applying the larger drill.

After the panel has been drilled the holes that have a ring or larger circle

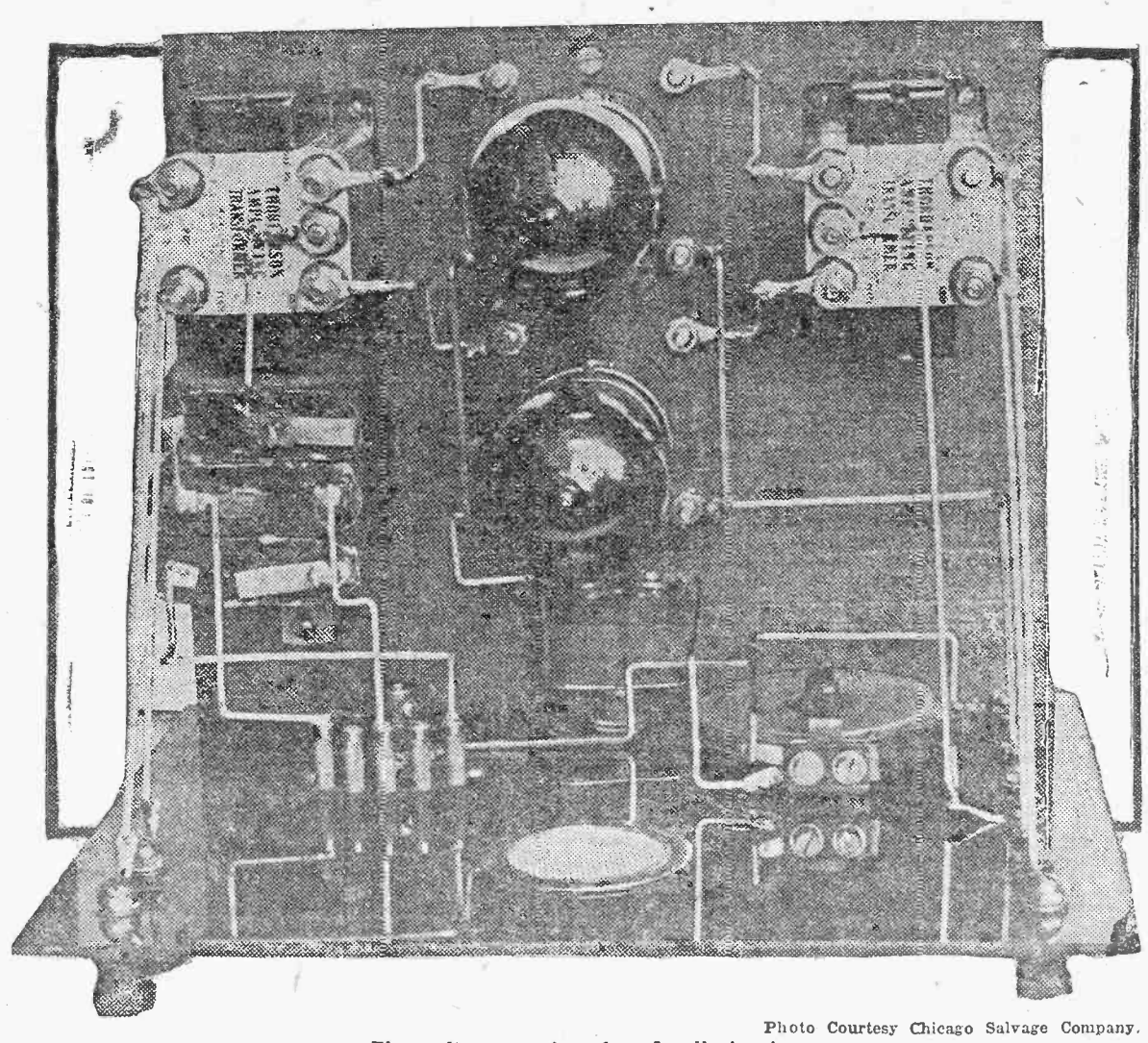


Photo Courtesy Chicago Salvage Company.

Photo diagram of push-and-pull circuit.

around, as in figure 2, must be countersunk. In this particular panel the only holes that need be contersunk are the mounting screw holes for the rheostat. Countersunk holes are for flat headscrews and the operation is done so that when the screw is applied to the panel the head of the screw is flat and fits to the panel without obstructing or protruding above the surface of the panel in an unbecoming fashion.

When the panel has been machined or completely drilled and countersunk, then remove the paper from the panel with a damp cloth. It will then be noticed that the machining was accomplished without a single mar or scratch on the panel, providing the builder is careful to a reasonable extent.

If a large hole for a screen bezel is desired, a fly cutter is necessary. If this cannot be obtained, a few holes forming any neat design will do and probably look as well. This bezel hole is only a peep-hole to affirm whether or not the filament is lit, and is not a necessity.

The panel now can be engraved if desired. There are various places about the town that do engraving on radio panels. It is not essential, but adds greatly to the appearance of the finished product.

We are now ready for the assembly of the various parts to the panel and baseboard.

The list of parts to be used is as follows:

1	7x9x⅛-inch Formica panel	$ .95
8	Binding posts	.80
1	Carter rheostat (6-ohm)	1.50
1	Cutler-Hammer switch	.65
1	Thordarson input transformer	6.50
1	Thordarson output transformer	6.50
1	Firco double socket	1.00
1	Baseboard for mounting	.25
1	Switch lever	.50
5	Switch points	.15
2	Stops	.10
3	Six-volt, three-cell each, flashlight batteries	1.20
	Total	$20.10

The writer found that time could be saved in the assembly and wiring of the set by the following routine:

First fasten the panel to a suitable-size baseboard. Then secure to the panel the binding posts, the rheostat, the filament switch, the switch lever and switch points in their proper places, as illustrated in the above photo.

A Carter rheostat was used because it was found capable of carrying the capacity of two VT-2 or 216-A power tubes without overheating if desired.

The switch lever, as shown on the left-hand side of the panel, controls the bias voltage applied to the grid, or what is more commonly known as the "C" battery voltage. By the use of this switch it is possible to use either one, two or all three of the "C" batteries, thus giving a range of 6 12 or 18 volts for grid bias. The first, third and fifth switch points are connected to the batteries as shown in Figure 1. The second and fourth points have no connection and are used solely as separators to prevent the switch blade from touching two connections at once and thus causing a short circuit across that particular battery which was connected to the switch points.

After the parts that belong on the panel have been connected to their proper places, then screw the sockets and transformers to the base in the position as shown in Figure 1. Looking at the rear of the set the input transformer is fastened to the right of the two sockets with the output transformer to the left. The transformer having the tapped secondary winding is the input transformer and the one with the tapped primary is the output transformer.

Several makes of transformers built for push-pull circuits were tried and used in the writer's experiments. Some of them amplified greatly, but the quality of the tone was very poor. Often the voice or music would blurt, amplifying in the medium-toned notes, but distorting in low or higher notes. By very careful adjustment of the filament and "B" and "C" batteries the tone sometimes improved.

The Thordarson transformers built for push-and-pull circuits were found to be free from these faults inasmuch as the regulation of the filament, grid or plate potentials was not critical. The greater the "B" battery or plate voltage applied the greater the potential on the grid or "C" battery was necessary. For 90 volts about 6 volts "C" battery was found to be best with 12 and 18 volts for 120 and 150 volts "B" battery, respectively.

With any of the above voltages pure, clear amplification was delivered with satisfying volume. The greater the voltage applied the greater was the volume delivered.

The transformers used in the set built by the writer amplified over the entire range of frequencies of the average musical note with even volume; the blurting and irregularities being entirely eliminated.

A Firco double socket was used because of its position of connections being well adapted for the wiring of this set. By referring to Figure 1, it will be noticed that the positions of the grid and plate terminals are placed so that the connections to the transformers are as short as possible. If single sockets are used it is advisable to place them so that their connections are as shown in Figure 1.

The wiring as shown in Figure 1 hes been drawn to as near a likeness as possible to the wiring of the set so that the shortest possible connections will be formed.

By following the connections as shown in Figure 1, and with the aid of the photograph, the wiring should be very easily accomplished.

In connecting the three flashlight batteries together they should be connected in series; the positive of one connected to the negative of the adjoining. The negative end of the three combined is connected to the center tap of the secondary of the input transformer. The arrangement of the polarities, as shown in Figure 1, will be of assistance if the connecting of the "C" batteries is a bit hazy.

The average flashlight cell has but two terminals. One is much longer than the other. Some manufacturers make the longer one as the positive terminal, and some the shorter; for this reason it is advisable to test the polarities with a voltmeter, unless the battery leads are marked.

If the wrong polarities are assumed, and connected wrongly, the set will not amplify evenly, and probably cause distortion. It is for this reason that great precaution should be taken in connecting them properly.

The two binding posts on the left of the panel, looking at the front of the set, are the input terminals, and are to be connected to the output of the second stage of amplification, used with the receiving set.

The upper two posts on the right-hand side of the front of the panel are the output of the third, or push-pull stage amplifier, and are to be connected to the loud speaker or horn being used.

The third binding post from the top is the positive "B" connection; the fourth from the top is the negative "B" connection, and the fifth and sixth from the top are the positive and negative "A" battery connections, respectively.

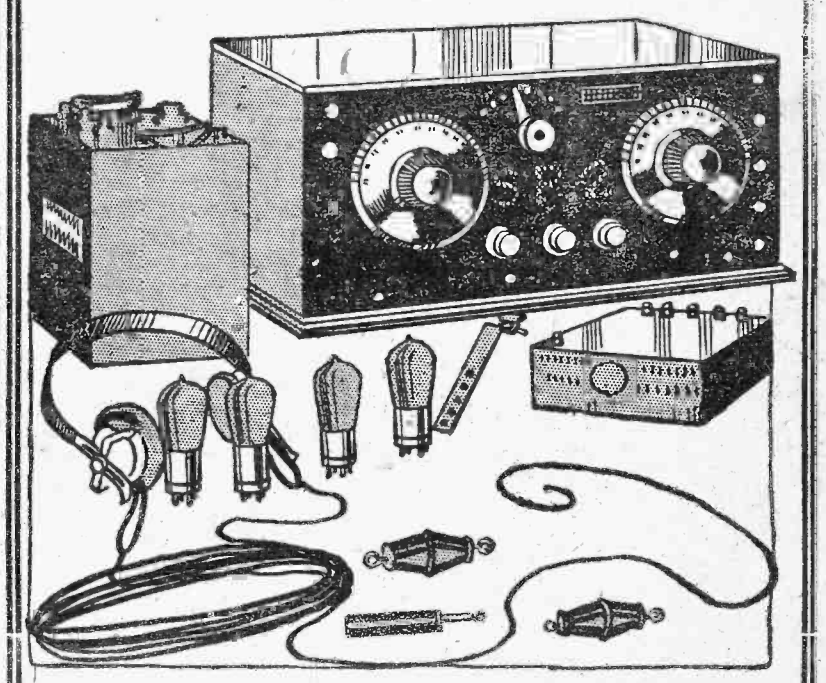
The UV-201A and C-301A tubes were found to give the best results up to 150 volts. For greater amplification the VT-2 or the 216A is advised, as these will stand greater voltage without endangering the tube. It is not advised to use more than 150 volts on UV-201A or C-301A tubes.

With the above information it is believed that the reader will find little difficulty in constructing the push-pull amplifier.

For those who cannot afford to purchase push-pull transformers, next week's article will deal with how to improve your regular two-stage amplifier to get the most volume out of it with the clearest possible reproduction of voice or music.

Belgian King Aids Big Relay Wireless Station

BRUSSELS, Dec. 20.—King Albert laid the corner stone of a wireless station at Tuysselede that will have sufficient power to communicate with all the big stations of the world. In addition, there will be built a relay station on the outskirts of Brussels able to receive three different stations at once.



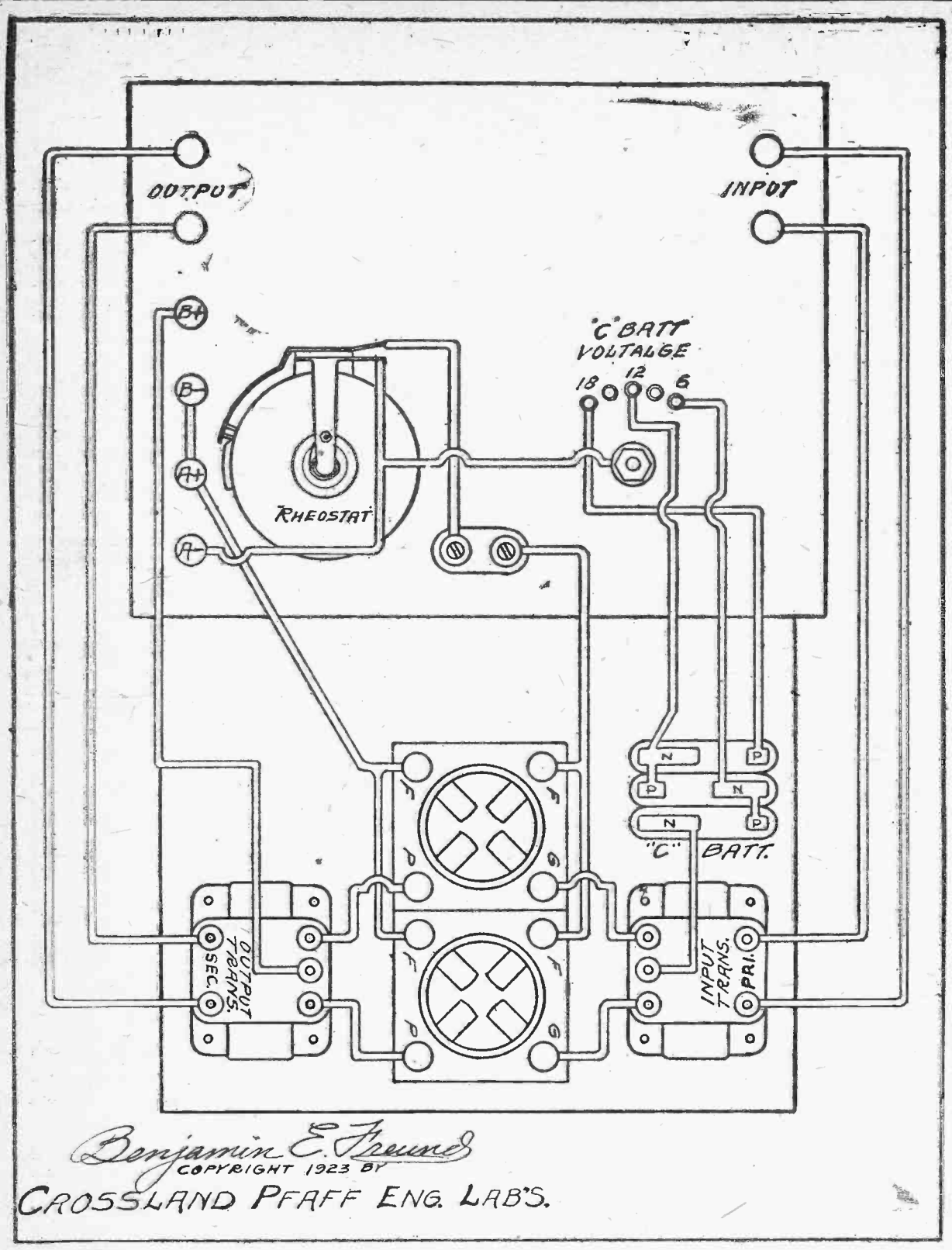


Diagram showing wiring details of push-and-pull amplifier, as described by Mr. Freund.

Give Crystal Alcoholic Bath to Aid Detection

In receiving circuits employing crystal detectors the effective range depends to a great extent on the sensitivity of the detector. Some crystals are more sensitive than others, but even a sensitive crystal may be ruined by improper care.

There are many times when the action of the air on the surface of these crystals starts oxidation and prevents them from functioning properly; but a more serious trouble is caused by handling the surface of the crystal with the fingers. Where this has been done and the surface of the crystal found to be less sensitive after continued use, it should be cleaned.

Sometimes a bath in alcohol will create a sensitive spot. If a crystal detector can be inclosed in glass where the hands cannot touch it, sensitivity can be maintained with greater ease.

Loud Talkers

The "loud talker" is a greater nuisance that the "loud speaker" is a help when one is striving to tune in a distant station—referring, of course, to the casual visitor who drops in to say, "Hello."

Makes Best Aerial

Flat copper ribbon, copper stranded cable and large size single copper wires make the best aerial for broadcast reception.

Tube Signals Danger

When your vacuum tube begins to turn blue it is a warning of too much plate voltage. Reduce your "B" battery voltage immediately.

USE FULL PLATE VOLTAGE.

In long distance reception better volume will be obtained if the full rated voltage for the plate of the amplifier tubes is used. High "B" battery voltage means volume.

HELPS TONE OF RECEPTION.

Shunt the primary of the first stage of audio-amplifier transformer with a fixed condenser of .001 mfd. capacity. It improves the tone of your amplified signal.

PROPER HEIGHT FOR AERIAL.

The most effective height for an aerial is about thirty feet. This means that the distance stated is measuring from the roof if the aerial is located on a building.

SOLDER BATTERY LEADS.

Soldered leads on the battery terminals, instead of the usual clips, insure perfect connections which are essential for good reception.

Reinartz to Be Guest of Dixie Radio Meeting

ATLANTA, Dec. 20.—John Reinartz, discoverer of a circuit widely used by the broadcast and amateur public, and Prof. A. M. Jansky, University of Minnesota radio authority, will be among numerous wireless celebrities attending the Fourth-District East Gulf Radio convention in Atlanta Dec. 27-28-29. The convention is the first in the history of southeastern radio.

Three Generations Conduct Dixie Station Program

ATLANTA, Dec. 20.—Three generation of a Georgia family featured a recent broadcast by WSB. Mrs. C. J. Allen, 82 years old, displaying surprising dexterity as a pianist, played melodies popular half a century ago, while her daughter, Mrs. M. A. Cox, and two granddaughters, Mrs. George Tarlton and Mrs. Victor Taylor, assisted with violin, cello and banjo.

LEAD IN STRIP FOR WINDOW.

A thin, narrow strip of copper covered by insulating tape will make a good lead-in connection between aerial and receiver. Laid on the window sill it will permit the window to be closed and obviates the necessity of boring a hole in the frame as required when the porcelain tubes are used.

Amplifier By-Pass

Shunt the primary of the first stage in an amplifier with a fixed condenser of .001 capacity. It affords a by-pass for the radio-frequency.

Use audio-transformers of low ratio when building three-tage amplifier. A 3-to-1 ratio on all three transformers is best.

ONE of the largest retail radio stores in Chicago opened its doors for the first time this week when the Royal Radio Store, at 217 West Madison street, threw open its portals and bade the radiophan welcome. The photo above was taken within a few minutes after the doors swung open. There was a rush that kept up all day. Evidently the Royal folks knew the power of "staging a thing," as opaque windows with a small card quietly announcing that one of the largest retail radio establishments in the country was going to occupy the quarters drew a throng of peepers every day to the windows and cleverly erased spots here and there in the window permitted the curious to see just so much and no more.

Carl D. Cohen, who has been connected with the Electric Service Products, is in charge of the establishment. He is the same gentleman who merchandised and made famous the Casey "Radio Demon." Mr. Cohen says he has something up his sleeves now that is going to be a knockout. He promises to let The Post in on this newest ultra-audion and you may expect to see it blaze out in all its glory shortly.

Prize Fighting, Religion, Meet in "Square Arena"

C. H. Linn, 214 5th street, Wilmette, Ill., reports rather a rare combination of broadcasting the other night. While listening-in on KDKA (Pittsburg), which was broadcasting a prize fight, suddenly WCBD (Zion, Ill.), broke thru just as the KDKA announcer informed a waiting world that Kid Somebody had landed a left hook on Young Aryonis' jaw, and the WCBD announcer said with startling clearness: "Peace be with you!"

Swinging Aerials

An aerial that is permitted to swing will produce jerky and uncertain reception. The tighter the wire is stretched the better it is for receiving clear signals.

POWER TUBES IN AMPLIFIER.

The use of a five-watt tube in the second stage of an amplifier will greatly increase the volume in your loud speaker. It should have the proper "C" battery voltage.

QUESTIONS AND ANSWERS

By LEWIS HAGERMAN.
(Technical Editor of The Chicago Post.)

FIVE-TUBE NEUTRODYNE.

287—CHICAGO: I am about to build a five-tube neutrodyne set and would like to know if you would answer the following questions: (1) Would a shielded panel be advisable? (2) What length aerial should be used? (3) Could a 3½-to1 transformer be used instead of a 3-to1? (4) Can All-American transformers be used? (5) I am inclosing an amplifying hook-up which I wish you would check for correction if any.

(1) Yes. (2) 100 feet of No. 14 copper wire. (3) Yes. (4) Yes. (5) Your amplifier hook-up is not definite enough. Your trouble lies in your "B" batteries. Use hook-up given in this issue of The Post Radio Magazine.

MORE NEUTRODYNE.

292—CHICAGO: I am very much interested in the neutrodyne circuits you have been featuring in your Radio Magazine section. In the Nov. 28 issue you showed the Fada hook-up using filament control jacks and two rheostats. I wish you would kindly send me this same circuit with double jacks in place of filament control and three rheostats in place of two. I wish to control detector, radio-frequency and audio-frequency.

The diagram you wish appears in the current issue of The Radio Magazine.

RECEIVING UNITS.

295—CHICAGO: (1) I am working on plans for a line of radio units, e. g. (1) a combined tuner and crystal detector. A vacuum tube unit to be used with No. 1 to combine it into a tuner and detector. Would this outfit be regenerative? (2) In case I should offer for sale a separate unit consisting of a variometer to be placed in the grid circuit and another to be placed in the plate circuit, would I be infringing on the Armstrong patents? (3) In case this line of radio units should fall under the Armstrong patents could you advise me how much the royalties would be?

(1) No. It could be made so. (2) You would not be infringing on the Armstrong patents unless you sold a set with a tuned plate circuit, said set being fully assembled. (3) This information must be obtained from the holder of the patents.

REGENERATIVE SET.

291—CHICAGO: Would you kindly inform me at your earliest convenience whether the following taps taken off a vario-coupler would give good and efficient tuning and if not, could you suggest one that will? I contemplate building a set with two variometers, plate and grid, one vario-coupler together with the necessary condensers, sockets and tube. I suppose this is what is called a modification of the Armstrong super-regenerative set. What range has been obtained by this style of connecting up? Is it selective and sharp tuning? Can you suggest any simpler set which will give about the same results? Is it any advantage to use heavier wire, say No. 20, in winding coils regardless of the space it would occupy by using this wire instead of No. 22 or No. 24? Is it advantageous to have the coils as free from contact with any surface as possible. Your Weekly Radio Section certainly is an innovation and grand, which I trust will prove an immense success.

The coupler you describe will be O. K. You are building what is commonly called the Armstrong regenerative set. It has a great range, but is not related to a super-regenerative set. There are few sets, if any, that are much better than a well-constructed three-circuit set. It is fine tuning and comparatively easy to handle after a little practice. When winding coils mentioned use No. 22 D. C. wire. It is advantageous to use as little dielectric as possible in the construction of either variometers or vario-couplers.

ONE-STEP AMPLIFIER.

295—CHICAGO: I have a Reinartz set with one step and would like to use WD-12 tubes. We made a one-step with a six-volt tube diagram and it would not work only the one-step tube, lighted. Will you please send a one-step digram using WD-12 tubes?

An amplifier built for six-volt tubes should work with WD-12 tubes. Diagram has been mailed you.

ONE-TUBE ERLA.

294—CHICAGO: (1) Do you think that the one-tube Erla will deliver enough volume to operate a loud speaker on local stations? I have heard quite a lot about it and was thinking about making one. (2) Would you advise me to do so? Does a lot of trouble arise when making it? (3) Will the two-tube operate a loud speaker on outside stations. I think your department the best of all. I eagerly wait for the paper on Thursdays.

(1) Yes. (2) If you wish the maximum volume with clarity, yes. (3) Not necessarily. (4) Yes.

THREE-TUBE REFLEX NEUTRODYNE.

293—CHICAGO: Kindly send me the answers to the following questions if possible? (1) What do you think of the three-tube Reflex Neutrodyne set? (2) Is it too complicated for one to build who is graduating from the homemade crystal set? (3) Is it superior to the five-tube Neutrodyne? (4) Which is better for all-round everyday set or what hook-up would you suggest? How is the selectivity and range of the first-mentioned set? (6) Will it operate a loud speaker on distant stations? (7) Which are the best dry cell tubes to use with this set or what tubes would you suggest? (8) If possible, send me a diagram and some information regarding the three-tube Reflex Neutrodyne. I wouldn't care to make a set using over three tubes.

This set has not been developed to the point where one can pass judgment as to its merits, relatively or otherwise. We would not advise any inexperienced man to build a reflex neutrodyne, as to obtain satisfactory results it requires a certain amount of knowledge as to the characteristics of tube sets. A very suitable set for your needs would be the three-circuit regenerative, as described in the Dec. 13 issue of the Radio Magazine.

FREE SERVICE

QUESTIONS asked on any subject pertaining to radio will be answered in this department in either the daily edition or The Radio Magazine section published each Thursday. No charges are made for this service. If personal reply is desired by return mail enclose self-addressed and stamped envelope. Write on only one side of the sheet, and where a check is desired on a faulty circuit be sure to send legible diagram as used in the hook-up.

TYPE VARIOMETER.

289—CHICAGO: Will you please send me by return mail how to wind a variometer, 180-700 meter. What size tube, what size wire and how many turns of wire on both rotor and stator? This is for your crystal long-distance set. I have a good crystal, but yours looks better.

A variometer such as you speak of would not work efficiently in the Hagerman crystal set. A good moulded variometer must be used.

ERLA REFLEX.

288—CHICAGO: I am writing you in regard to attaching amplifiers on Erla one-tube reflex set. I have one-tube set as per enclosed diagram, also two-step audio-amplifier. So far I have not been successful in attaching amplifier so it will work.

Crystal amplifier as shown in Dec. 27 issue of the Radio Magazine will work efficiently on your set.

NO DISTANCE.

286—CHICAGO: I have an ailment in my machine (?) which I would like to have you fix up.. I am using the "Casey" one-tube ultra-audion hook-up with a four-inch coil (my own winding) of 150 turns turns, tapped as follows: 0, 25, 35, 45, 55, 65, 75, 85, 100, 125 and 150 turns. I can get Chicago stations as loud and as clear as could be desired with great selectivity. I can get KYW easily for the grand opera, and have no trouble in tuning out WJAZ or WDAP. I am using a single wire antenna, ninety feet long, north and south, and twenty-foot lead-in wire, and grounded on the kitchen sink. I cannot get any DX at all on Monday nights, not even WCBD, Zion, Ill., or WTAS, Elgin. Before using my own coil, I used a three-inch coil, which was tapped and wound the same as my present one, and I could get Zion and nothing else. Now, I cannot even get them. How come? About thirty feet away on the roof, and parallel to mine, is an antenna of a neighbor. Would this have any effect? His guy wires, lead-in or antenna posts, or the antenna itself are not anywhere near mine.

From your information it seems as tho your hook-up is O. K. Would suggest that you use a new tube or try more voltage on the plate of your present one. Another aerial on your roof should have no effect on the distance you receive.

CRYSTAL AMPLIFIER.

162—CHICAGO: Please send me diagram showing one step of audio-frequency hooked to a crystal detector, giving values of all parts used. I have a WD-12, which I wish to use as amplifier.

Hookup mailed you.

LACKS AMPLIFIER.

290—CHICAGO: Inclosed is a diagram for one-tube (ultra-audion set) which works fine and loud but as a true radiophan, I am a glutton for greater distance and loudness. I am trying to find out if a transformer or what besides amplification will make it louder. Please send me a diagram by mail. As Christmas is near amplifiers cost too much.

Seeing as it is so near Christmas, we would advise waiting until after Christmas and buy an amplifier. Perhaps Santa Claus may supply your needs.

ONE-TUBE HOOK-UP.

285—CHICAGO: Would you please send me a simple one-tube hook-up? I want this hook-up to be simple in operating and tuning and be able to bring in the Chicago stations fairly loud.

Hook-up mailed. List of parts necessary are as follows:. Variometer, 23-plate condenser, socket, variable grid leak, .00025 grid condenser, rheostat, eight binding posts, 7x14x3-16 panel, two dials, baseboard, screws, wire.

REFLEX CRYSTAL.

311—CHICAGO: I wish to construct a single-tube circuit, using one dry cell WD-12 tube; a circuit that will bring in DX loud and clear without so much tube distortion. I want to construct the set so that later on I can utilize a six-volt tube if I desire. Please submit blueprint and wiring diagram of a single tube, long-range dry-cell circuit; a circuit that will be free from the customary tube cracks and distortion. Please send me details of an efficient antenna system to be used for the circuit that you submit. May I ask something about crystal reception? What length single-wire aerial is recommended for a crystal receiver? What is the minimum height that the aerial could be placed and the minimum length? Is six feet of half-inch pipe all right for earth connections? Is it essential that lead-in wire be insulated and soldered at point of connections? Should the ground wire be insulated? What ohm phones are best for crystal receivers?

A single-tube reflex set will give you satisfactory results using parts named. Antenna for the above set should be of the L type, single No. 14 wire, 100 feet long, exclusive of lead-in, and at lesat six feet above all obstacles. This also applies to a crystal set. A ground, as you mention, is questionable. Use a cold water pipe. Lead-in wire must be insulated and soldered. The ground wire can be bare. For a crystal set good double magnet receivers are essential of from 2,000 to 3,000 ohms resistance.

TUNING REGENERATIVE SET.

304—CHICAGO: Please explain how to tune a two-variometer, 43-plate condenser set. In my set the plate variometer seems to have no effect on the tuning of the set. My aerial runs parallel with the "L" track and street car, about five doors away. Would this interfere with distance reception? I receive local stations very well.

To tune in your set, light filament of detector tube almost to a hissing point. Turn plate variometer almost to howling point, then tune with primary condenser and variometer. If this set does not oscillate (by that I mean does not have a regenerative howl), would advise using more plate voltage on tube, or trying a different tube.

Parallel street car wires or "L" structures might cause noises, but would not affect distance received.

THREE CIRCUIT REGENERATIVE SET.

327—Chicago: I am not very familiar with the different receiving sets that are on the market and for which different claims are made. I would thank you very kindly if you would give me the benefit of your experience as to what set to select. The most widely advertised are the Erla reflex, Neutrodyne, Ultra-Audion and the regenerative receiver. I would greatly appreciate any information as to which of these are best suited to my needs.

For your requirements I would advise using the three circuit regenerative set, as described in the Dec. 13 issue of the Radio Magazine. Full construction details and hook-up were given.

TWO-TUBE REGENERATIVE SET.

320—CHICAGO: I want to congratulate ou on your wonderful Radio Section. Would you be so kind as to send me a diagram of a regenerative set with one stage of audio-frequency amplification? Below is given a list of parts I intend to use. If there are any corrections to be made kindly let me know what they are: Two pigtailed variometers, one variocoupler, two switches, switch points, four switch stops, three dials, 7x21 panel, binding posts, grid condenser, two sockets, two rheostats and whatever tubes and transformer you specify.

The diagram you wish was mailed. Your list of parts does not show a variable grid leak, which is very necessary. Use WD12 tubes and 5-1 audio-frequency transformer.

NOT ENOUGH PRIMARY INDUCTANCE.

322—CHICAGO: I have a standard short wave regenerative set on which I am able to get WDAP with satisfying volume. However I cannot tune in KYW or WJAZ loud enough to be free from interference when WDAP is broadcasting. I have found that by placing my hand on the positive terminal of the "B" battery it is possible to increase the volume of KYW and WJAZ appreciably but not sufficiently so that WDAP ceases to be an annoyance. Can you suggest something to make this set more selective and louder on KWY and WMAQ and WJAZ as I am particularly interested in the opera.

Would advise using loading coil in antenna circuit or The Post wave trap, as described in our Dec. 13 Radio Magazine.

TROUBLE FROM AN ODD SOURCE.

323—Table Grove, Ill.: In our building we have a doctor who uses a violet ray machine In the treatment of patients, and the machine cuts off all radio reception as long as it is operating. What can be done to relieve the situation? Can the machine be grounded or fixed in any way to stop the roar created when it operates? I have a Grebe CR No. 12 which is a fine actor. Will the suit of the American Radio company have any effect on the Grebe people?

You are confronted with a very peculiar problem. A possible solution might be to use The Post wave trap, as described in our Dec. 13 Radio Magazine. The effect the suit of the American Radio company will have on the Grebe people will depend on the decision of the United States court.

INSIDE AERIAL ON CRYSTAL.

325—CHICAGO: I have constructed a long-distance crystal receiving set as per your hook-up in the Radio Magazine, about three weeks ago, using the exact equipment specified. In testing the set in Winnetka, using an outside aerial, I was able to satisfactorily reach the several Chicago broadcasting stations. However, in my mother's apartment in Edgewater, where this set is installed with an inside aerial and grounded to a water pipe, WJAZ is the only station that can be reached. I inclose a rough sketch of the set. Will you kindly advise me if I have the set properly wired, and what, if any, changes can be made in order to reach the several Chicago broadcasting stations?

Your hook-up on the long-distance crystal receiving set is O. K. Your present trouble lies in the fact that you are using an inside aerial. Would advise trying a lamp socket attachment, which can be bought at any radio store. If this is not sufficient, drop a wire out of the window.

Tuning Your Set to Get Best Program Reception

By L. W. CHUBB.
(Westinghouse Electric and Manufacturing Company.

MOST of the users of the regenerative receiver know that it has an Armstrong circuit, and that by the adjustment of a "tickler," "intensity regulator," "plate variometer," or "regenerator," whichever it may be called, the signal can be increased greatly.

They know also that at a certain point the detector will commence to oscillate and the receiver will emit whistling noises or beat notes, as they are called, when the tuning is run thru an incoming wave.

Few of those using this type of receiver, however, know that these whistling noises can be heard in a neighbor's receiver and that similar noises which are heard when a set is not being adjusted are caused by a near-by receiver that is improperly adjusted.

As renegeration is increased the amount of reradiation from an antenna increases until, at the point just below oscillation, the reradiation is equal to the absorption, the loudest clear signal is received, and the receiver neither disturbs a neighbor nor absorbs any appreciable energy, which can pass on to the more distant listeners.

What Oscillations Do.

The most common infractions of radio etiquette are the use of regenerative receivers while oscillating and the hunting of signals by picking up the carrier wave with the detector tube oscillating.

Most radio operators have found that by careful adjustment the "beat note" can be lowered in pitch to a central point where the noises stop and a signal can be heard with the tube oscillating. This adjustment is known as the method of "zero beat reception." Under this condition, a receiver radiates more energy than it absorbs so that the station can be considered as a booster station which will reinforce a passing radio signal.

If such booster stations were properly located and the adjustments could be made so as not to produce any distortion, this method of receiving might help reception conditions. This, however, is not the case and zero beat reception should be avoided.

It will be found that the quality of signal is greatly impaired under this condition of adjustment. It is evident also that getting in and out of the "zero beat" adjustment will cause disagreeable noises in the neighborhood and even when the adjustment has been obtained many snorts and grunts are produced by the slightest change in the wave length of either the transmitting station or the receiver.

Tells How to Tune.

In hunting signals it is a common practice to have the detector tube oscillating and then, after finding a carrier wave, to lower the regeneration to a point below oscillation to clear up the signals. This practice disturbs others who may be tuned to the same wave and is an unsportsmanlike procedure that ruins their enjoyment of radio broadcasting.

I should like to suggest the following method of receiving broadcasting programs with regenerative receivers:

After adjusting the filament currents of the vacuum tubes to a point which has been found to be satisfactory increase the regeneration to a point just below oscillation. Now tune the set slowly up or down the scale, keeping the regeneration adjusted just below oscillation until the desired signal is heard or a breathing sound is noticed, indicating the presence of a carrier wave from a station which may not be operating at the instant.

If the receiver is well designed the adjustment for regeneration will be practically the same thruout the range of broadcasting wave lengths and any worth while signal easily can be tuned in, after which the volume can be increased by a final adjustment of the regeneration.

Means Improved Programs.

You soon will be able to pick up signals just as easily by this method as you can by the beat note method. If everyone will hunt signals and listen to the music with the detector tube adjusted in this way, the quality of broadcast programs will be very much improved. The gurgling, rough, and distorted music which is heard, in a large part due to the reradiation from many oscillating receivers, will disappear. The whistling noises which go up and down the scale, due to a neighbor's hunting signals with an oscillating receiver, will be eliminated.

The steady screaming notes which are heard at or around the signal from a broadcasting station are due to interference between two or more broadcasting stations and cannot be eliminated until a great number of these stations are closed up or are given individual and separated wave lengths.

Drake Radio to Broadcast Songs of Chicago Writer

Four songs composed by Pauline Garton Funk, daughter of Dr. and Mrs. L. L. Funk of the Palmer house, who uses the non de plume of Paula Garton, will be broadcast over WDAP (Drake hotel) Friday evening, Dec. 21, by Alice Meissner, soprano pupil of Jane Alberta Lowrie, Fine Arts building. The songs, "Eyes of Love," "I Think of You," "Tennessee Lullaby" and "Sometime," have been indorsed and sung by the late Enrico Caruso, Marie Claessens, Cryena Van Gordon of the Chicago Opera company and are being published by the Jack Mills company of New York.

Miss Funk is a member of the Junior Friends of Art, Eastern Star Club of Illinois and the League of American Plu Women.

Reverse Phone Polarity

It is sometimes an advantage to reverse the polarity of phones. Some phones will work much better with the current running thru them in one direction.

Alphabetical List of U. S. Radio Stations

ABERDEEN, Wash.—KNT.
ABILENE, Texas—WQAQ.
AGRICULTURAL COLLEGE, N. D.—WPAK.
AKRON, Ohio—WOE.
ALBANY, N. Y.—WNJ.
ALEXANDRIA, La.—KFFY.
ALLENTOWN, Pa.—WCBA.
ALLENTOWN, Pa.—WSAN.
ALTADENA, Cal.—KGO.
AMARILLO, Texas—WDG.
AMARILLO, Texas—WQAC.
AMARILLO, Texas—WRAU.
AMES, Iowa—WOI.
AMSTERDAM, N. Y.—WPAS.
ANDERSON, Ind.—WABC.
ANN ARBOR, Mich.—WQAJ.
ANTHONY, Kas.—WBL.
ARDMORE, Okla.—WOAA.
ARLINGTON, Ore.—KFGL.
ASHEVILLE, N. C.—WFAJ.
ATLANTA, Ga.—WGM.
ATLANTA, Ga.—WSB.
ATLANTIC CITY, N. J.—WHAR.
ATWOOD, Kas.—WEAD.
AUBURN, Ala.—WMAV.
AUSTIN, Texas—WCM.
AUSTIN, Texas—WNAS.

BAKER, Ore.—KFDA.
BAKERSFIELD, Cal.—KDZB.
BALTIMORE, Md.—WCAO.
BALTIMORE, Md.—WEAR.
BALTIMORE, Md.—WKC.
BALTIMORE, Md.—WNAY.
BANGOR, Me.—WABI.
BANGOR, Me.—WPAY.
BATON ROUGE, La.—KFGC.
BAUDETTE, Minn.—KFGY.
BAY CITY, Mich.—WTP.
BEAUMONT, Texas—WMAM.
BELLINGHAM, Wash.—KDZR.
BELLOWS FALLS, Vt.—WLAK.
BELOIT, Kas.—WPAR.
BELOIT, Wis.—WKAW.
BELVIDERE, Ill.—WOAQ.
BERKELEY, Cal.—KQI.
BERKELEY, Cal.—KRE.
BERRIEN SPRINGS, Mich.—KFGZ.
BILLINGS, Mont.—KFCH.
BINGHAMTON, N. Y.—WIAV.
BIRMINGHAM, Ala.—WSY.
BOISE, Idaho—KFAU.
BOISE, Idaho—KFDD.
BOISE, Idaho—WFFB.
BOONE, Iowa—KFGQ.
BOSTON, Mass.—WNAC.
BOULDER, Colo.—KFAJ.
BOWLING GREEN, Ky.—WNAB.
BOZEMAN, Mont.—KFDO.
BRIDGEPORT, Conn.—WKAX.
BROOKINGS, S. D.—KFDY.
BROOKVILLE, Ind.—WSAL.
BUFFALO, N. Y.—WGR.
BURLINGTON, Iowa— WIAS.
BURLINGTON, Iowa—WLAT.
BURLINGTON, Vt.—WCAX.
BUTLER, Mo.—WNAR.
BUTTE, Mont.—KFAP.

CAMDEN, N. J.—WRP.
CAMERON, Mo.—WFAQ.
CANTON, N. Y.—WCAD.
CANTON, Ohio—WWB.
CAPE GIRARDEAU, Mo.—WSAB.
CARTHAGE, Ill.—WCAZ.
CASPER, Wyo.—KFDF.
CAZENOVIA, N. Y.—WMAC.
CEDAR RAPIDS, Iowa—WJAM.
CEDAR RAPIDS, Iowa—WKAA.
CENTERVILLE, Iowa—WDAX.
CHARLESTON, S. C.—WNAQ.
CHARLESTON, S. C.—WOAH.
CHARLESTON, W. Va.—WPAZ.
CHARLOTTE, N. C.—WBT.
CHENEY, Kas.—KFGP.
CHICAGO, Ill.—KYW.
CHICAGO, Ill.—WAAF.
CHICAGO, Ill.—WBU.
CHICAGO, Ill.—WDAP.
CHICAGO, Ill.—WJAZ.
CHICAGO, Ill.—WLAG.
CHICAGO, Ill.—WMAQ.
CHICAGO, Ill.—WPAD.
CHICAGO, Ill.—WSAH.
CHICKASHA, Okla.—KFGD.

CINCINNATI, Ohio—WAAD.
CINCINNATI, Ohio—WHAG.
CINCINNATI, Ohio—WIZ.
CINCINNATI, Ohio—WLW.
CINCINNATI, Ohio—WMH.
CINCINNATI, Ohio—WSAI.
CLARKSBURG, W. Va.—WHAK
CLEARFIELD, Pa.—WPI.
CLEMSON COLLEGE, S. C.—WSAC.
CLEVELAND, Ohio—KDPM.
CLEVELAND, Ohio—WHK.
CLEVELAND, Ohio—WJAX.
COLLEGE PARK, Ga.—WDAJ.
COLLEGE STATION, Texas—WTAW.
COLORADO SPRINGS, Colo.—KFCK.
COLORADO SPRINGS, Colo.—KFFQ.
COLUMBIA, Mo.—WAAN.
COLUMBUS, Ohio—WBAV.
COLUMBUS, Ohio—WCAH.
COLUMBUS, Ohio—WEAO.
COLUMBUS, Ohio—WMAN.
COLUMBUS, Ohio—WPAL.
CORVALLIS, Ore.—KFDJ.
COUNCIL BLUFFS, Iowa—WPAF.
CRANSTON, R. I.—WKAP.

DALLAS, Texas (portable)—KFFZ.
DALLAS, Texas—WDAO.
DALLAS, Texas—WFAA.
DALLAS, Texas—WRR.
DARTMOUTH, Mass.—WMAF.
DARTMOUTH, Mass.—WSAQ.
DAVENPORT, Iowa—WHAI.
DAVENPORT, Iowa—WOC.
DAVID CITY, Neb.—WRAR.
DAYTON, Ohio—WABD.
DAYTON, Ohio—WJAJ.
DEARBORN, Mich.—WWI.
DECATUR, Ill.—WBAO.
DECATUR, Ill.—WHAP.
DENVER, Colo.—KDZQ.
DENVER, Colo.—KFAF.
DENVER, Colo.—KFDL.
DENVER, Colo.—KFEL.
DENVER, Colo.—KFEP.
DENVER, Colo.—KFIC.
DENVER, Colo.—KFLE.
DENVER, Colo.—KLZ.
DES MOINES, Iowa—KFDP.
DES MOINES, Iowa—WGF.
DETROIT, Mich.—WCX.
DETROIT, Mich.—WWJ.
DETROIT, Mich.—KOP.
DOUGLAS, Wyo.—KFEV.
DUBUQUE, Iowa.—WQAK.
DULUTH, Minn.—WJAP.
DULUTH, Minn.—WMAT.

EAST LANSING, Mich.—WKAR.
EASTON, Pa.—WMAP.
EAST PITTSBURG, Pa.—KDKA.
EAST PROVIDENCE, R. I.—WKAD.
EDGEWOOD, R. I.—WEAG.
ELGIN, Ill. (Near)—WTAS.
EL MONTE, Cal.—KUY.
EL PASO, Texas—WDAH.
EL PASO, Texas—WPAT.
EMPORIA, Kan.—WAAZ.
ERIE, Pa.—WOAV.
EUGENE, Ore.—KFAT.
EVANSVILLE, Ind.—WNAM.
EVERETT, Wash.—KFBL

FAIRBANKS, Alaska—WLAY.
FALL RIVER, Mass.—WSAR.
FALL RIVER, Mass.—WTAB.
FARGO, N. D.—WDAY.
FAYETTEVILLE, Ark.—KFDV.
FLINT, Mich.—WEAA.
FORT DODGE, Iowa—KFKB.
FORT DODGE, Iowa—WEAB.
FORT MONROE, Va.—WNAW.
FORT SMITH, Ark.—WGAR.
FORT WORTH, Texas—WFAP.
FRANKFORT, Ky.—WOAK.
FREMONT, Neb.—WOAE
FRESNO, Cal.—KMJ.
FROSTBURG, Md.—WPAQ.

GAINESVILLE, Ga.—WKAY.
GALVESTON, Texas—WHAR.
GALVESTON, Texas—WIAC.
GLADBROOK, Iowa—KFIK.
GLOUCESTER CITY, N. J.—WRAX.
GRAND FORKS, N. D.—WOAB.
GRAND ISLAND, Neb.—KFJA.

GRANVILLE, Ohio—WJD.
GREAT FALLS, Mont.—KDYS
GREELEY, Colo.—KFJD.
GREELEY, Colo.—KFKA.
GREENCASTLE, Ind.—WLAX.
GREENSBORO, N. C.—WQAZ.
GREENVILLE, Ohio—WCBB.
GREENVILLE, S. C.—WQAV.
GRIDLEY, Cal.—KFU.
GROVE CITY, Pa.—WSAJ.
GUNNISON, Colo.—KFHA.

HAMILTON, Ohio—WBAU.
HAMILTON, Ohio—WRK.
HARRISBURG, Pa.—WABB.
HARTFORD, Conn.—WDAK.
HASTINGS, Neb.—WQAX.
HAVRE, Mont.—KFBB.
HILLSBORO, Ore.—KFFO.
HOLLYWOOD, Cal.—KFAR.
HONOLULU, Hawaii—KDYX.
HONOLULU, Hawaii—KGU.
HONOLULU, Hawaii—KYQ.
HOOD RIVER, Ore.—KFHB.
HOOD RIVER, Ore.—KQP.
HOULTON, Maine—WLAN.
HOUSTON, Texas—KFCV.
HOUSTON, Texas—WCAK.
HOUSTON, Texas—WEAY.
HOUSTON, Texas—WEV.
HOUSTON, Texas—WRAA.
HUNTINGTON, Ind.—WHAY.
HUTCHINSON, Kan.—KFHX.
HUTCHINSON, Minn.—WFAN.

INDEPENDENCE, Mo.—KFIX.
IOLA, Kan.—KFID.
IOWA CITY, Iowa—WHAA.
ITHACA, N. Y.—WEAI.

JACKSONVILLE, Fla.—WABG.
JACKSONVILLE, Fla.—WDAL.
JEFFERSON CITY, Mo.—WOS.
JOHNSTOWN, Pa.—WTAC.
JOPLIN, Mo.—WHAH.
JUNEAU, Alaska—KFIU.

KALAMAZOO, Mich.—WLAQ.
KALAMAZOO, Mich.—WOAP.
KANSAS CITY, Mo.—WDAF.
KANSAS CITY, Mo.—WMAJ.
KANSAS CITY, Mo.—WHB.
KANSAS CITY, Mo.—WOQ.
KEARNEY, Neb.—KFHP.
KELLOGG, Idaaho—KFEY.
KENOSHA, Wis.—WOAR.
KNOXVILLE, Tenn.—WNAV.

LACEY, Wash.—KGY.
LACONIA, N. H.—WKAV.
LA CROSSE, Wis.—WABN.
LAKE FOREST, Ill.—WABA.
LAKESIDE, Colo.—KFKH.
LAMONI, Iowa—KFFV.
LANCASTER, Pa.—WDBC.
LANCASTER, Pa.—WGAL.
LANSING, Mich.—WHAL.
LAPORTE, Ind.—WRAF.
LARAMIE, Wyo.—KFBU.
LAREDO, Texas—WWAX.
LAWRENCEBURG, Tenn.—WMC.
LE MARS, Iowa—KFCY.
LE MARS, Iowa—WIAC.
LEXINGTON, Ky.—WQAH.
LIHUE, Hawaii—KFHS.
LIMA, Ohio—WOAC.
LINCOLN, Neb.—KFDU.
LINCOLN, Neb.—WFAV.
LINCOLN, Neb.—WJAB.
LINCOLN, Neb.—WKAC.
LINCOLN, Neb.—WMAH.
LINDSBORG, Kan.—WDAD.
LITTLE ROCK, Ark.—WCAV.
LOCKPORT, N. Y.—WMAK.
LONG BEACH, Cal.—KSS.
LOS ANGELES, Cal.—KDZF.
LOS ANGELES, Cal.—KFI.
LOS ANGELES, Cal.—KHJ.
LOS ANGELES, Cal.—KJS.
LOS ANGELES, Cal.—KNR.
LOS ANGELES, Cal.—KNV.
LOS ANGELES, Cal.—KNX.
LOS ANGELES, Cal.—KUS.
LOS ANGELES, Cal.—KWH.
LOS GATOS, Cal.—KFHQ.
LOUISBURG, Kan.—KFIL.
LOUISVILLE, Ky.—WHAS.

LOUISVILLE, Kan.—WLAP.
LOWELL, Mass.—WQAS.

MACON, Ga.—WMAZ.
MADISON, Wis.—WGAY.
MADISON, Wis.—WHA.
MANHATTAN, Kan.—WTG.
MARIETTA, Ohio—WBAW.
MARIETTA, Ohio—WSAA.
MARION, Ind.—WIAQ.
MARION, Kan.—WRAD.
MARSHALL, Mo.—WJAT.
MARSHALLOWN, Iowa—KFJB.
MATTOON, Ill.—WQAL.
MAYVILLE, N. D.—KFHU.
McKEESPORT, Pa.—WIK.
McLEANSBORO, Ill.—WRAS.
MEDFORD, Ore.—KFAY.
MEDFORD HILLSIDE, Mass.—WGI.
MEMPHIS, Tenn.—WMC.
MIAMI, Fla.—WQAM.
MIDDLEPORT, Ohio—WSAK.
MIDDLETOWN, Conn.—WOAS.
MILWAUKEE, Wis.—WAAK.
MILWAUKEE, Wis.—WCAY.
MILWAUKEE, Wis.—WHAD.
MILWAUKEE, Wis.—WIAO.
MINNEAPOLIS, Minn.—KFDZ.
MINNEAPOLIS, Minn.—KFEX.
MINNEAPOLIS, Minn.—WBAD.
MINNEAPOLIS, Minn.—WBAH.
MINNEAPOLIS, Minn.—WCAS.
MINNEAPOLIS, Minn.—WCE.
MINNEAPOLIS, Minn.—WLAG.
MINNEAPOLIS, Minn.—WLB.
MISHAWAKA, Ind.—WOAO.
MOBERLY, Mo.—KFFP.
MOBILE, Ala.—WEAP.
MODESTO, Cal.—KXD.
MONTEREY, Cal.—KLN.
MONTGOMERY, Ala.—WKAN.
MOORESTOWN, N. J.—WBAF.
MOOREHEAD, Minn.—WPAU.
MORGANTOWN, W. Va.—WHD.
MOSCOW, Idaho—KFAN.
MOUNT VERNON, Ill.—WABF.
MUNCIE, Ind.—WJAF.

NEAH BAY, Wash.—KFHH.
NEENAH, Wis.—WIAJ.
NEWARK, N. J.—WAAM.
NEWARK, N. J.—WBS.
NEWARK, N. J.—WOR.
NEWARK, N. J.—WRAZ.
NEWARK, Ohio—WBBA.
NEW BEDFORD, Mass.—WDAU.
NEW HAVEN, Conn.—WPAJ.
NEW LEBANON, Ohio—WPG.
NEW ORLEANS, La.—WAAB.
NEW ORLEANS, La.—WAAC.
NEW ORLEANS, La.—WCAG.
NEW ORLEANS, La.—WGV.
NEW ORLEANS, La.—WIAF.
NEW ORLEANS, La.—WWL.
NEWTON, Iowa—WIAH.
NEW YORK, N. Y.—WBAY.
NEW YORK, N. Y.—WEAF.
NEW YORK, N. Y.—WJX.
NEW YORK, N. Y.—WJY.
NEW YORK, N. Y.—WJZ.
NEW YORK, N. Y.—WLAW.
NEW YORK, N. Y.—WQAO.
NEW YORK, N. Y.—WSAP.
NEW YORK, N. Y.—WWZ.
NORFOLK, Neb.—WJAG.
NORMAN, Okla.—WNAD.
NORTHFIELD, Minn.—WCAL.
NORTH PLAINFIELD, N. J.—WEAM.

OAK, Neb.—KFEQ.
OAKLAND, Cal.—KLS.
OAKLAND, Cal.—KLX.
OAKLAND, Cal.—KZM.
OCEAN CITY, N. J.—WIAD.
OGDEN, Utah—KFCP.
OKLAHOMA CITY, Okla.—WMAB.
OKLAHOMA CIY, Okla.—WKY.
OKMULGEE, Okla.—WPAC.
OMAHA, Neb.—KFCZ.
OMAHA, Neb.—KFFX.
OMAHA, Neb.—WAAW.
OMAHA, Neb.—WIAK.
OMAHA, Neb.—WNAL.
OMAHA, Neb.—WOAW.
ORANGE, Texas—KFGX.
OSKALOOSA, Iowa—KFHL.

PADUCAH, Ky.—WIAR.
PARKESBURG, Pa.—WQAA.
PARSONS, Kan.—WOAJ.
PATERSON, N. J.—WBAN.
PENDLETON, Ore.—KFFE.
PENSACOLA, Fla.—WGAN.
PENSACOLA, Fla.—WLAV.
PEORIA, Ill.—WJAN.
PEORIA, Ill.—WQAX.
PHILADELPHIA, Pa.—WCAU.
PHILADELPHIA, Pa.—WDAR.
PHILADELPHIA, Pa.—WFI.
PHILADELPHIA, Pa.—WGL.
PHILADELPHIA, Pa.—WIP.
PHILADELPHIA, Pa.—WNAT.
PHILADELPHIA, Pa.—WOO.
PHILADELPHIA, Pa.—WWAD.
PHOENIX, Ariz.—KDYW.
PHOENIX, Ariz.—KFAD.
PINE BLUFF, Ark.—WOK.
PITTSBURG, Kan.—KFIV.
PITTSBURG, Pa.—KQV.
PITTSBURG, Pa.—WCAE.
PITTSBURG, Pa.—WJAS.
PLAINVIEW, Texas—WSAT.
PLATTE, S. D.—KFIJ.
PORT ARTHUR, Texas—WFAH.
PORTLAND, Ore.—KDYQ.
PORTLAND, Ore.—KFEC.
PORTLAND, Ore.—KFIF.
PORTLAND, Ore.—KGG.
PORTLAND, Ore.—KGN.
PORTLAND, Ore.—KGW.
PORTSMOUTH, Va.—WOAQ.
POUGHKEEPSIE, N. Y.—WFAF.
PROVIDENCE, R. I.—WEAN.
PROVIDENCE, R. I.—WJAR.
PROVIDENCE, R. I.—WRAH.
PROVIDENCE, R. I.—WSAD.
PROVIDENCE, R. I.—WTAG.
PULLMAN, Wash.—KFAE.

RALEIGH, N. C.—WLAC.
RAPID CITY, S. D.—WCAT.
READING, Pa.—WBBD.
READING, Pa.—WRAW.
REEDLEY, Cal.—KMC.
RENO, Nev.—KDZK.
RICHMOND, Cal.—KFCM.
RICHMOND, Va.—WQAT.
RIDGEWOOD, N. Y.—WHN.
ROCHESTER, N. Y.—WABO.
ROCHESTER, N. Y.—WHAM.
ROCKFORD, Ill.—WIAB.
ROCKPORT, Mo.—WMAD.
ROSWELL, N. M.—KNJ.

SACRAMENTO, Cal.—KFBK.
SAGINAW, Mich.—WABM.
SAGINAW, Mich.—WIAW.
S. CLOUD, Minn.—WFAM.
ST. CROIX FALLS, Wis.—WRAL.
ST. JOSEPH, Mo.—KFHD.
ST. JOSEPH, Mo.—WEAK.
ST. LOUIS, Mo.—KFEZ.
ST. LOUIS, Mo.—KFGJ.
ST. LOUIS, Mo.—KFIB.
ST. LOUIS, Mo.—KSD.
ST. LOUIS, Mo.—WCK.
ST. LOUIS, Mo.—WEB.
ST. LOUIS, Mo.—WEW.
ST. LOUIS, Mo.—WMAY.
ST. LOUIS, Mo.—WRAO.
ST. PAUL, Minn.—WAAH.
ST. PETERSBURG, Fla.—WSAG.
SALEM, Ore.—KFCD.
SALT LAKE CITY, Utah—KDYL.
SALT LAKE CITY, Utah—KZN.
SAN ANTONIO, Cal.—KFCL.
SAN ANTONIO, Texas—WCAR.
SAN ANTONIO, Texas—WOAI.
SAN DIEGO, Cal.—KDPT.
SAN DIEGO, Cal.—KDYM.
SAN DIEGO, Cal.—KFBC.
SAN DIEGO, Cal.—KFFA.
SANDUSKY, Ohio—WABH.
SANDUSKY, Ohio—WQAF.
SAN FRANCISCO, Cal.—KFDB.
SAN FRANCISCO, Cal.—KPO.
SAN FRANCISCO, Cal.—KUO.
SAN JOSE, Cal.—KFAQ.
SAN JOSE, Cal.—KQW.
SAN JOSE, Cal.—KSC.
SAN JUAN, P. R.—WKAQ.
SAN LUIS OBISPO, Cal.—KFBE.
SANTA ANA, Cal.—KFAW.
SANTA BARBARA, Cal.—KFHJ.

Broadcasting Stations and Schedule of Programs

Continued from Poge 2.

company, 380 meters.
WHA—Madison, Wis., University of Wisconsin, 360 meters.
WHAA—Iowa City, Iowa, State University of Iowa, 283 meters.
WHAB—Galveston, Texas, Clark W. Thompson, 360 meters.
WHAC—Waterloo, Iowa, Cole Brothers Electric company, 360 meters.
WHAD—Milwaukee, Wis., Marquette university, 280 meters.
WHAG—Cincinnati, Ohio, University of Cincinnati, 222 meters.
WHAH—Joplin, Mo., Hafer Supply company, 360 meters.
WHAI—Davenport, Iowa, Radio Equipment and Manufacturing company, 360 meters.
WHAK—Clarksburg W. Va., Roberts Hardware company, 360 meters.
WHAL—Lansing, Mich., Lansing Capital News, 248 meters.
WHAM—Rochester, N. Y., University of Rochester (Eastman School of Music), 360 meters.
WHAP—Decatur, Ill., Otta & Kuhn, 360 meters.
WHAQ—Washington, D. C., Semmes Motor company, 360 meters.
WHAR—Atlantic City, N. J., Paramount Radio and Electric company (W. H. A. Paulus), 231 meters.
WHAS—Louisville, Ky., Courier-Journal and Louisville Times, 400 meters.
WHAV—Wilmington, Dela., Wilmington Electrical Special company, 360 meters.
WHAZ—Troy, N. Y., Rensselaer Polytechnic Institute, 380 meters.
WHB—Kansas City, Mo., Sweeney School company, 411 meters.
WHD—Morgantown, W. Va., West Virginia University, 360 meters.
WHK—Cleveland, Ohio, Radiovox company (Warren R. Cox), 360 meters.
WHN—Ridgewood, N. Y., George Schubel, 360 meters.
WIAB—Rockford, Ill., Joslyn Automobile company, 252 meters.
WIAC—Galveston, Texas, Galveston Tribune, 360 meters.
WIAD—Ocean City, N. J., Ocean City Yacht club (Howard R. Miller), 254 meters.
WIAF—New Orleans, La., 139 North Alexander street, Gustav A. DeCortin, 234 meters.
WIAH—Newton, Iowa, Continental Radio and Manufacturing company, 258 meters.
WIAJ—Springfield, Mo., Heer Stores company, 360 meters.
WIAJ—Neenah, Wis., Fox River Valley Radio Supply company (Quinn Brothers), 224 meters.
WIAK—Omaha, Neb., Journal-Stockman company, 278 meters.
WIAO—Milwaukee, Wis., School of Engineering of Milwaukee, 360 meters.
WIAQ—Marion, Ind., Chronicle Publishing company, 226 meters.
WIAR—Paducah, Ky., Paducah Evening Sun, 360 meters.
WIAS—Burlington, Iowa, Home Electric company, 360 meters.
WIAT—Tarkio, Mo., Leon T. Noel, 360 meters.
WIAU—Le Mars, Iowa, American Trust and Savings bank, 360 meters.
WIK—McKeesport, Pa., K. & L. Electric company (Herbert F. Kelso and Hunter J. Lohman), 360 meters.
WIL—Washington, D. C., Continental Electric Supply company, 360 meters.
WIP—Philadelphia, Pa., Gimbel Brothers, 509 meters.
WJAB—Lincoln, Neb., American Electric company, 360 meters.
WJAD—Waco, Texas, Jackson's Radio Engineering laboratories, 360 meters.
WJAF—Muncie, Ind., Press Publishing company, 360 meters.
WJAG—Norfolk, Neb., Norfolk Daily News (Huse Publishing company), 360 meters.
WJAK—Greentown, Ind., Clifford L. White, 254 meters.
WJAM—Cedar Rapids, Iowa, 302 3d avenue, West, D. M. Perham, 268 meters.
WJAN—Peoria, Ill., Peoria Star, 280 meters.
WJAQ—Topeka, Kan, Capper Publications, 360 meters.
WJAR—Providence, R. I., The Outlet company (J. Samuels and Brother), 360 meters.
WJAS—Pittsburg, Pa., Pittsburg Radio Supply house, 360 meters.
WJAT—Marshall, Mo., Kelly-Vawter Jewelry company, 360 meters.
WJAX—Cleveland, Ohio, Union Trust company, 390 meters.
WJAZ—Chicago, Ill., Chicago Radio laboratory, 448 meters.
WJD—Granville, Ohio, Richabrd H. Howe, 229 meters.
WJH—Washington, D. C., White & Boyer company, 273 meters.
WJX—New York, N. Y., Deforest Radio Telephone and Telegraph company, 360 meters.
WJY—New York, N. Y., R. C. A. 405 meters.
WJZ—New York, N. Y., R. C. A. 455 meters.
WKAA—Cedar Rapids, Iowa, 1444 2d avenue, East, H. F. Paar, 268 meters.
WKAD—East Providence, R. I., Charles Loof (Cresent park), 240 meters.
WKAF—Wichita Falls, Texas, W. S. Radio Supply company, 360 meters.
WKAN—Montgomery, Ala., United Battery Service company, 226 meters.
WKAP—Cranston, R. I., Dutee W. Flint, 360 meters.
WKAQ—San Juan, P. R., Radio Corporation of Porto Rico, 360 meters.
WKAR—East Lansing, Mich., Michigan Agriculture college, 280 meters.
WKAS—Springfield, Mo., L. E. Lines Music company, 360 meters.
WKAV—Laconia, N. H., Laconia Radio club, 254 meters.
WKAW—Beloit, Wis., Turner Cycle company, 242 meters.
WKAX—Bridgeport, Conn., 1789 Park avenue, William A. MacFarlane, 231 meters.
WKAY—Gainesville, Ga., Brenau college, 280 meters.
WKC—Baltimore, Md., Joseph M. Zamoiski company, 360 meters.
WKY—Oklahoma, Okla., WKY Radio Shop, 360 meters.
WLAC—Raleigh, N. C., North Carolina State college, 360 meters.
WLAG—Minneapolis, Minn., Cutting and Washington Radio corporation, 417 meters.
WLAH—Syracuse, N. Y., 425 Brownell street, Samuel Woodworth, 234 meters.
WLAJ—Waco, Texas, Waco Electrical Supply company, 360 meters.
WLAK—Bellows Falls, Vt., Vermont Farm Machine corporation, 360 meters.
WLAL—Tulsa, Okla., Naylor Electric company, 360 meters.
WLAN—Houlton, Maine, Putnam Hardware company, 283 meters.
WLAP—Louisville, Ky., 306 West Breckenridge street, W. V. Jordon, 360 meters.
WLAQ—Kalamazoo, Mich., 108 Elm street, Arthur E. Schilling, 360 meters.
WLAT—Burlington, Iowa., Radio and Specialty company, 360 meters.
WLAV—Pensacola, Fla., Electric Shop, 254 meters.
WLAW—New York, N. Y., police department, City of New York, 360 meters.
WLAX—Greencastle, Ind., Putnam Electric company (Greencastle Community Broadcasting station), 231 meters.
WLB—Minneapolis, Minn., University of Minneosta, 360 meters.
WLW—Cincinnati, Ohio, Crosley Manufacturing company, 309 meters.
WMAB—Oklahoma, Okla., Radio Supply compnay, 360 meters.
WMAC—Cazenovia, N. Y., Fernwood street, J. Edw. Page (Olive B. Meredith), 261 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WMAH—Lincoln, Neb., General Supply company, 254 meters.
WMAJ—Kansas City, Mo., Drovers Telegram company, 275 meters.
WMAK—Lockport, N. Y., Norton Laboratories, 360 meters.
WMAL—Trenton, N. J., Trenton Hardware company, 256 meters.
WMAM—Beaumont, Texas, Beaumont Radio Equipment company, 360 meters.
WMAP—Easton, Pa., Utility Battery service, 246 meters.
WMAQ—Chicago, Ill., Chicago Daily News, 448 meters.
WMAV—Auburn, Ala., Alabama Polytechnic institute, 250 meters.
WMAY—St. Louis, Mo., Kingshighway Presbyterian church, 280 meters.
WMAZ—Macon, Ga., Mercer university, 268 meters.
WMC—Memphis, Tenn., "Commercial Appeal" (Commercial Publishing company), 500 meters.
WMH—Cincinnati, Ohio, Precision Equipment company, 248 meters.
WMU—Washington, D. C., Doubleday-Hill Electric company, 261 meters.
WNAC—Boston, Mass., Shepard stores, 278 meters.
WNAD—Norman, Okla, University of Oklahoma, 360 meters.
WNAL—Omaha, Neb., 5019 Capitol avenue, R. J. Rockwell, 242 meters.
WNAM—Evansville, Ind., Ideal Apparatus company, 360 meters.
WNAN—Syracuse, N. Y., Syracuse Radio Telephone company, 286 meters.
WNAP—Springfield, Ohio, Wittenberg college, 231 meters.
WNAQ—Charleston, S. C., Charleston Radio Electric company, 360 meters.
WNAR—Butler, Mo., C. C. Rhodes, 231 meters.
WNAS—Austin, Texas, Texas Radio Corporation and Austin Statesman, 360 meters.
WNAT—Philadelphia, Pa., Lemmig Brothers company (Frederick Lennig), 360 meters.
WNAV—Knoxville, Tenn., Peoples Telephone and Telegraph company, 236 meters.
WNAW—Fort Monroe, Va., Peninsular Radio club (Henry Kunzmann), 360 meters.
WNAX—Yankton, S. D., Dakota Radio Apparatus company, 244 meters.
WNJ—Albany, N. Y., Shotton Radio Manufacturing company, 360 meters.
WOAA—Ardmore, Okla., Dr. Walter Hardy, 360 meters.
WOAC—Lima, Ohio, Maus Radio company, 266 meters.
WOAD—Sigourney, Iowa, Friday Battery and Electric corporation, 360 meters.
WOAE—Fremont, Neb., Midland college, 360 meters.
WOAF—Tyler, Texas, Tyler Commercial college, 360 meters.
WOAG—Belvidere, Ill., Apollo theater (Belvidere Amusement company), 224 meters.

Continued on Page 15.

BROADCASTING STATIONS AND SCHEDULE OF PROGRAMS

Continued from Page 14.

WOAH—Charleston, S. C., Palmetto Radio corporation, 360 meters.
WOAI—San Antonio, Texas, Southern Equipment company, 385 meters.
WOAJ—Parsons, Kan., Ervins Electrical company, 258 meters.
WOAK—Frankfort, Ky., Collins Hardware company, 240 meters.
WOAL—Webster Groves, Mo., 4 Jefferson road, William E. Woods, 229 meters.
WOAN—Lawrenceburg, Tenn., Vaughn Conservatory of Music (James D. Vaughn), 360 meters.
WOAO—Mishawka, Ind., Lyradion Manufacturing company, 360 meters.
WOAP—Kalamazoo, Mich., Kalamazoo college, 240 meters.
WOAQ—Portsmouth, Va., Portsmouth Kiwanis club, 360 meters.
WOAT—Wilmington, Del., 215 Market street, Boyd M. Hamp, 360 meters.
WOAV—Erie, Pa., Pennsylvania National Guard, 2d Battalion, 112th Infantry, 242 meters.
WOAW—Omaha, Neb., Woodmen of the World, 526 meters.
WOAX—Trenton, N. J., 600 Ingham avenue, Franklyn J. Wolff, 240 meters.
WOAZ—Stamford, Texas, Penick Hughes company, 360 meters.
WOC—Davenport, Iowa, Palmer School of Chiropractic, 484 meters.
WOI—Ames, Iowa, Iowa State college, 360 meters.
WOK—Pine Bluff, Ark., Pine Bluff company, 360 meters.
WOO—Philadelphia, Pa., 13th and Market streets, John Wanamaker, 509 meters.
WOQ—Kansas City, Mo., Western Radio company, 360 meters.
WOR—Newark, N. J., L. Bamberger & Co., 405 meters.
WOS—Jefferson City, Mo., Missouri State Marketing bureau, 441 meters.
WPAB—State College, Pa., Pennsylvania State college, 360 meters.
WPAC—Okmulgee, Okla., Donaldson Radio company, 360 meters.
WPAD—Chicago, Ill., W. A. Wieboldt & Co., 360 meters.
WPAH—Waupaca, Wis., Wisconsin department of markets, 360 meters.
WPAJ—New Haven, Conn., Doolittle Radio corporation, 268 meters.
WPAK—Agricultural College, N. D., North Dakota Agricultural college, 360 meters.
WPAL—Columbus, Ohio, Superior Radio and Telegraph Equipment company, 286 meters.
WPAM—Topeka, Kan., Auerbach & Guettel, 360 meters.
WPAP—Winchester, Ky., 222 Lexington avenue, Theodore D. Phillips, 360 meters.
WPAQ—Frostburg, Md., General Sales and Engineering company, 360 meters.
WPAR—Beloit, Kan., Ward Battery and Radio company, 360 meters.
WPAT—El Paso, Texas, St. Patrick's cathedral, 360 meters.
WPAU—Moorhead, Minn., Concordia college, 360 meters.
WPAZ—Charleston, W. Va., Dr. John R. Koch, 273 meters.
WPG—New Lebannon, Ohio, Nushawg Poultry farm, 234 meters.
WQAA—Parkersburg, Pa., Horace A. Beale, Jr., 360 meters.
WQAB—Springfield, Mo., Southwest Missouri State Teachers' college, 236 meters.
WQAC—Amarillo, Texas, 108 East 8th street, E. B. Gish, 360 meters.
WQAD—Waterbury, Conn., Whitall Electric company, 242 meters.
WQAE—Springfield, Vt., Moore Radio News station (Edmund B. Moore), 275 meters.
WQAF—Sandusky, Ohio, Sandusky Register, 240 meters.
WQAH—Lexington, Ky., Brock-Anderson Electrical Engineering company, 254 meters.
WQAL—Mattoon, Ill., Coles County Telephone and Telegraph company, 258 meters.
WQAM—Miami, Fla., Electrical Equipment company, 360 meters.
WQAN—Scranton, Pa., Scranton Times, 280 meters.
WQAO—New York, N. Y., Calvary Baptist church, 360 meters.
WQAQ—Abilene, Texas, West Texas Radio company, 360 meters.
WQAS—Lowell, Mass., Prince-Walter company, 266 meters.
WQAV—Greenville, S. C., Huntington and Guerry (Inc.), 258 meters.
WQAW—Washington, D. C., Catholic university, 236 meters.
WQAX—Peoria, Ill., Radio Euipment company, 360 meters.
WQAZ—Greensboro, N. C., Greensboro Daily News, 360 meters.
WRAA—Houston, Texas, Rice institute, 360 meters.
WRAD—Marion, Kan., Taylor Radio shop (G. L. Taylor), 360 meters.
WRAF—Laporte, Ind., The Radio club (Inc.), 224 meters.
WRAH—Providence, R. I., Stanley N. Read, 231 meters.
WRAL—St. Croix Falls, Wis., Northern States Power company, 248 meters.
WRAN—Waterloo, Iowa, Black Hawk Electrical company, 236 meters.
WRAO—St. Louis, Mo., Radio Service company, 360 meters.
WRAP—Winter Park, Fla., Winter Park Electrical Construction company, 360 meters.
WRAU—Amarillo, Texas, Amarillo Daily News, 360 meters.
WRAV—Yellow Springs, Ohio, Antioch college, 360 meters.
WRAW—Reading, Pa., Avenue Radio shop (Horace D. Good), 238 meters.
WRAX—Gloucester City, N. J., Flaxon's garage, 268 meters.
WRAY—Scranton, Pa., Radio Sales corporation, 280 meters.
WRAZ—Newark, N. J., Radio Shop of Newark (Herman Lubinsky), 233 meters.
WRC—Washington, D. C., Radio Corporation of America.
WRK—Hamilton, Ohio, Doron Bros. Electric company, 360 meters.
WRL—Schenectady, N. Y., Union college, 360 meters.
WRM—Urbana, Ill., University of Illinois, 360 meters.
WRR—Dallas, Texas, City of Dallas (police and fire signal department), 360 meters.
WRW—Tarrytown, N. Y., Tarrytown Radio Research laboratory, 273 meters.
WSAB—Cape Girardeau, Mo., Southeast Missouri State Teachers' college, 360 meters.
WSAC—Clemson College, S. C., Clemson Agricultural college, 360 meters.
WSAD—Providence, R. I., J. A. Foster company, 261 meters.
WSAG—St. Petersburg, Fla., City of St. Petersburg (Loren V. Davis), 244 meters.
WSAH—Chicago, Ill., 4801 Woodlawn avenue, A. J. Leonard, Jr., 248 meters.
WSAI—Cincinnati, Ohio, United States Playing Cards company, 309 meters.
WSAJ—Grove City, Pa., Grove City college, 360 meters.
ESAK—Middleport, Ohio, Foster Egner (Daily News, Pomeroy, Ohio), 258 meters.
WSAL—Brookville, Ind., Franklin Electric company, 246 meters.
WSAN—Allentown, Pa., Allentown Radio club, 229 meters.
WSAP—New York, N. Y., Seventh Day Adventist church, 360 meters.
WSAR—Fall River, Mass., Doughty & Welch Electrical company, 254 meters.
WSAT—Plainview, Texas, Donohoo-Ware Hardware company, 268 meters.
WSAU—Chesham, N. H., Camp Marienfeld, 229 meters.
WSAW—Canandaigua, N. Y., Curtice and McElwee, 275 meters.
WSAX—Chicago, Ill., Chicago Radio laboratory, 268 meters.
WSAY—Port Chester, N. Y., Port Chester Chamber of Commerce, 233 meters.
WSB—Atlanta, Ga., Atlanta Journal, 429 meters.
WSI—Utica, N. Y., J. and M. Electrical company, 273 meters.
WSY—Birmingham, Ala., Alabama Power company, 360 meters.
WTAB—Fall River, Mass., Fall River Daily Herald Publishing company, 248 meters.
WTAC—Johnstown, Pa., Penn Traffic company, 360 meters.
WTAD—Carthage, Ill., First Presbyterian church, 229 meters.
WTAF—New Orleans, La., Louis J. Gallo, 242 meters.
WTAH—Belvidere, Il., Carmen Ferro, 236 meters.
WTAG—Providence, R. I., Kern Music company, 258 meters.
WTAJ—Portland, Me., The Radio shop, 236 meters.
WTAL—Toledo, Ohio, Toledo Radio and Electric company, wave length unrecorded.
WTAM—Cleveland, Ohio, Willard Storage Battery company, 390 meters.
WTAN—Mattoon, Ill., Orndorff Radio shop, 240 meters.
WTAP—Cambridge, Ill., Cambridge Radio and Electric company, 242 meters.
WTAQ—Osseo, Wis., S. H. Van Gordon and Son, 226 meters.
WTAR—Norfolk, Va., Reliance Electric company, 226 meters.
WTAS—Elgin, Ill., (near) R. F. D. 6, Box 75, Charles E. Erbstein, 275 meters.
WTAT—Boston, Mass., Edison Electric Illuminating company, portable, 244 meters.
WTAU—Tecumseh, Neb., Ruegg Battery and Electric company, 360 meters.
WTAW—College Station, Texas, Agricultural and Mechanical college of Texas, 280 meters.
WTAX—Streator, Ill., Williams Hardware company, 231 meters.
WTAY—Oak Park, Ill., Iodar-Oak Leaves Broadcasting station, 226 meters.
WTAZ—Lambertville, N. J., Thomas J. McGuire, 283 meters.
WTG—Manhattan, Kans., Kansas State Agricultural college, 485 meters.
WWAB—Trenton, N. J., Hoenig, Swern & Co 226 meters.
WWAC—Waco, Texas, Sanger Brothers, 360 meters.
WWAD—Philadelphia, Pa., Wright & Wright (Inc.), 360 meters.
WWAX—Laredo, Texas, Wormser Brothers, 360 meters.
WWB—Canton, Ohio, Daily News Printing company, 268 meters.
WWI—Dearborn, Mich., Ford Motor company, 273 meters.
WWJ—Detroit, Mich., Detroit News (Evening News association), 517 meters.
WWL—New Orleans, La., Loyola university, 280 meters.
WWZ—New York, N. Y., John Wanamaker, 360 meters.
WZAZ—Pomeroy, Ohio, Chase Electric, 258 meters.

Today's Programs

Continued from Page 6.

This station broadcasts only on Sundays at 2:30 p. m. to 6 p. m.

WJZ—New York city; 455 meters. No silent night.

Day—2 p. m., organ recital on the Hotel Astor organ by Leo Riggs, by direct wire from the Hotel Astor; 3:45 p. m., concert; 4 p. m., address.

Evening—6 p. m., bedtime story; 7 p. m., special musical program.

WOO—Philadelphia; 509 meters. Silent Sunday, Tuesday, Thursday, Friday and Saturday evenings.

Day—10 a. m., grand organ; 10:30 a. m., United States weather forecast; 10:55 a. m., United States naval observatory time signal; 11 a. m., luncheon music by the Tea Room orchestra; 4:15 p. m., grand organ, Christmas carols and trumpets.

Evening—Silent.

WOR—Newark, N. J.; 405 meters:

Day—1:30 p. m., program by Carrol Clark, negro barytone of New York, recording artist, "The Trees Have Grown So" (Burleigh), "Road to Mandalay" (Speaks); 1:45 p. m., Edna Craig Bianchi, contralto of New York; 2 p. m., continuation of barytone solos by Carrol Clark, "Deep River" (Burleigh), "By the Waters of the Minnetonka" (Lieurance); 2:15 p. m., Eve Stuyvesant, scenarist and caster, will speak on "Just What Opportunity the Motion-Picture Industry Offers Today"; 2:45 p. m., continuation of contralto solos by Edna Craig Bianchi; 5:15, p. m., "Icicle," Santa Claus' assistant at his toy factory, will speak to the children; 5:30 to 6:30 p. m., "Music While You Dine," Tom Cooper's Country Club orchestra.

Evening—Silent.

WRC—Washington, D. C., 469 meters: Silent Tuesday, Thursday and Saturday evenings.

Day—4:15 p. m., instructions in code practice; 5 p. m., children's hour, by Peggy Albion.

WRW—Tarrytown, N. Y., 273 meters:

WDAR—Philadelphia, Pa.; 395 meters:

Day—11 a. m., organ recital from the Stanley theater; features from the studio; Arcadia Concert orchestra. Fery Sarkozi, director; 1 p. m. to 2 p. m., Arcadia Concert orchestra; artist recital from the studio; Mrs. Anna B. Scott will give the second of her talks on "The Christmas Market Basket"; 5:30 p. m., artist recital-talk; 6:30 p. m., "Dream Daddy with the Boys and Girls."

Midwest Programs.

WCX—Detroit, Mich.; 517 meters: Silent Saturdays.

Day—1 p. m., news bulletins; 1:15 p. m., stock quotations; 1:20 p. m., Rev. Gains Glenn Atkins, D. D., speaker, a twenty-minute exposition of the international Sunday school lesson; 1:50 p. m., government weather forecast; 3:15 p. m., music; 5 p. m., dinner concert, Pete Boutsema's orchestra, broadcast from Hotel Tuller; 6 p. m., musical program, under direction of Sante Slade.

WEAO—Ohio State university, Columbus, Ohio; 360 meters:

8 p. m., Christmas program by the Trinity Church choir, under the direction of Carl Hoenig. They will sing twelve carols. Reading by Miss Helen Jones, "Why the Chimes Rang," by Raymond Alden. Mrs. B. F. Babbitt, pianist, will play the musical setting. Prof. Alfred C. Hottes of the Columbus Horticulture society will talk on "Mistletoe, Holly and Evergreens."

WJAX—Cleveland; 390 meters: Silent every night except Tuesday and Thursday.

WLAG—Minneapolis, Minn.; 417 meters: No silent nights.

Day—9:30, 10 and 10:30 a. m., markets, news bulletins; 10:45 a. m., household hints; 11:35 a. m., surprise program; 2 p. m., dancing lesson 4 by Tess Cooperman; 2:35 p. m., musical program, Archibald Sowden violin, Mrs. W. A. Sowden accompanist, Babette Millspaugh, pianist, reader to be announced; 4 p. m., magazine reading "The Dark City," by Aiken; 5:30 p. m., children's hour, stories by Tess Cooperman.

Evening—6 p. m., sport program; 7:30 p. m., lecture by W. F. Webster, "Safeguarding Your Child's Health"; 9:15 p. m., weather report.

WLW—Cincinnati; 309 meters: Silent Friday, Saturday and Sunday.

Day—10:30 a. m., weather forecast and business reports.

Evening—1:30 p. m., market reports; 4 p. m., piano selections by Adelaide Apfel, speaker from the Cincinnati League of Women Voters, Mrs. Robert Taft, subject, "Why I Am a Member of the League of Women Voters and a Republican"; 10 p. m., special Christmas program, Dickens' Christmas Carol, read by Prof. Van Wye of the University of Cincinnati, and Christmas carols from the class of Thomas Kelly of the Cincinnati Conservatory of Music, (1) opening carols from the conservatory of music, (2) reading of Dickens' Christmas Carol by Prof. Van Wye. Stave one: Marley's Ghost. Stave two: The First of the Spirits. Stave three: The Second of the Spirits. Stave four: The Third of the Spirits. Christmas carols from the conservatory of music.

WOC—Davenport, Iowa; 481 meters: Silent Tuesdays.

Evening—7:30 to 8:30 p. m., concert presented by Sam S. Losh, barytone, featuring a group of his artist pupils. (E. L. O. announcing.) 9:30 to 10:45 p. m., concert by George Freeman's Sooner Serenaders, the Texas Hotel orchestra. (G. C. A. announcing.)

WTAM—Cleveland; 390 meters: Broadcasts only Wednesday and Saturday evenings at 7 to 8 p. m.

WWJ—Detroit, Mich.; 517 meters: Silent Saturday.

Day—12 m., music by Jean Goldkette's orchestra, broadcast from the Graystone ballroom.

Evening—7:30, the Detroit News orchestra; program by Marcus Kellerman.

Southern Programs.

KSD—St. Louis; 546 meters: Silent Friday.

Evening—8 p. m., program given by choir of Westminster Presbyterian church, W. M. Jenkins director, Lewis H. Williamson tenor, broadcast direct from the church.

WBAP—Fort Worth, Texas; 476 meters:

Day—10 a. m. to 4 p. m., markets and financial review.

Evening—7:30 to 8:30 p. m., concert by a group of Fort Worth artists (E. L. O. announcing); 9:30 to 10:45 p. m., concert by the Knights of Pythias Girls' Mandolin club, Weatherford, Texas. (The Hired Hand announcing.)

WDAF—Kansas City, Mo.; 411 meters:

Day—3:30 to 4:30 p. m., musical matinee, the D. Ambert Haley Dance and Concert orchestra.

Evening—6 to 7 p. m., tuning-in piano number on the Duo-Art; marketgram, weather forecast and road report; address, speaker from the William Jewell college, Liberty, Mo.; the children's story and information period music, Fritz Hanlein's Trianon ensemble. Hotel Muehlbach: 11:45 p. m. to 1 a. m., "The Merry Old Chief" and the Coon-Sanders Novelty-Singing orchestra, Plantation grill, Hotel Muehlebach.

WFAA—Dallas, Texas; 447 meters: Silent Wednesday.

Day—12:30 to 1, address, L. F. McKay, publicity director, Texas Farm Bureau Cotton association.

Evening—8:30 to 9:30, Dallas Harmony Five orchestra, Tom D. Collins director.

WGM—Atlanta, Ga.; 429 meters:

Evening—6 to 7 p. m., concert; 9:30 to 10:30 p. m., concert.

WGV—New Orleans; 359 meters:

Evening—7 to 8 p. m., concert.

WHAS—Louisville; 400 meters: Silent Mondays.

Evening—7:30 to 9 p. m., concert by the Ella Sharrard Violin quintet (Walter Bodeman, first violin; Christine Jansing, second violin; Dorothty Neat, third violin; Theodore Williams, fourth violin); four-minute digest of international Sunday-school lesson for Sunday, Dec. 23; four-minute radio forum talk; late important news bulletins; official central standard time announced at 9 o'clock.

WHB—Kansas City, Mo.; 411 meters: Silent Monday, Wednesday, Friday and Saturday.

Evening—7 to 7:45 p. m., instrumental solos by members of the Sweeney Radio orchestra; mandolin solo, selected, V. H. Harrell, Mrs. Harrell accompanist; 8 to 10 p. m., regular Thursday evening concert, first half consisting of classical selections, second half of requested popular music; overture, "William Tell" (Rossini), Sweeney Radio orchestra; selections from "The Wizard of the Nile" (Herbert), Sweeney Radio orchestra; talk on "Early Christmas Mailing," by W. S. Salisbury, representative of the superintendent of mails; three French songs, (a) "Hindu Song" (Bemberg), (b) "At Evening" (Debussy), (c) "Open Thy Blue Eyes" (Massenet), Sweeney Radio orchestra; piano solo, "Erotikon" (Sjogren), George Parrish; "Bandananna Sketches" (White), (a) "Nobody Knows the Trouble I've Seen," (b) "I'm Troubled in Mind," (c) "A Slave Song" ("Many Thousand Gone"), (d) "Negro Dance"; popular dance music as requested; Sweeney Radio orchestra.

WMC—Memphis; 500 meters: Silent Wednesday.

Evening—8:30 p. m., program arranged by the Gayoso Hotel Concert orchestra.

WMAY—Knoxville, Tenn., 236 meters:

Evening—7:30 to 8:30 p. m., musical; 9 to 9:45 p. m., mixed musical.

WOAI—San Antonio, Texas; 385 meters; Silent night. Mondays, Wednesdays and Thursdays.

WSB—Atlanta, Ga., 428 meters:

Evening—8 to 9 p. m., musical entertainment presenting Mrs. Lottie Burnett Ewing, soprano, and Miss Elese Wall, pianist, of Norcross, Ga., and Carlyle Brooks, evangelistic singer; 10:45 p. m., transcontinental Radiowl organ concert from the First Presbyterian church, presenting Dr. Charles A. Sheldon.

WHAR—Galveston, Texas; 360 meters: Evening—Silent.

Pacific Coast Concerts.

KDZE—Seattle, Wash.: 455 meters: Silent nights Tuesday, Thursdays and Sundays.

KFDR—San Francisco; 509 meters:

Evening—10 to 12 p. m., a costume program will be given under the direction of the Pacific Musical society, by direct wire from the Palace hotel. Midnight to 1 a. m., vocal.

KHJ—Los Angeles; 395 meters;

Evening—10:45, 11:30 p. m., to 1 a. m.

KPO—San Francisco; 423 meters; 500 watts: Crair F. Morrison, station director; Ada Morgan O'Brien, program director. Friday nights silent:

Day—2 p. m., time signals; 3 to 4 p. m., Rudy Seiger's Fairmont Hotel orchestra, by remote control.

Evening—6:30 to 7:30 p. m., Rudy Seiger's Fairmont Hotel orchestra, by remote control; 6 to 7 p. m., dinner concert by George Lipschultz and Music Masters. 8 to 9 p. m. The evening's program is under the auspices of Mme. Cailleau, and a number of her talented pupils will be on the air. Those participating on the program are: Miss Eilen Harrison, "Valle"; Miss Myrtle McLaughlin, "Mother Machree" (Olcott); Miss Elizabeth Magee, aria, "La Boheme" (Puccini); Miss Sue Thorne, "Pirate Dreams" (Heurter); Miss Alice Wilson, "Caro me bambino mio" (Child); Martin O'Brien, tenor, "Duna"; Miss Geraldine Watt, "Elegie" (Masenet); Mrs. Jane Webb, "Tes Yeux (Rabey); Miss Madeline O'Brien, aria, "Louise" (Charteniier). Miss Hazel Nickels will be the accompanist for the evening. She will also be heard in a number of piano solos. Walter Dupre, well-known barytone, will sing a number of selections.

Our Guarantee

Nothing but brand new radio parts—tested and approved by our qualified radio experts—guaranteed to give complete satisfaction in service—guaranteed to be the greatest value in merchandise that you can get for your money—that's what "Salvage" really means.

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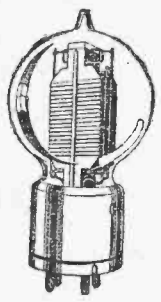
5-Watt "E"
Type CW-931

$12.00 VALUES

$7.45



All Other Tubes at Reduced Prices

$40.00 List John Firth DETECTOR and 2-STEP

$12.45

A value truly extraordinary!

YOUR Christmas money will go further when invested in GOOD RADIO equipment at Chicago's GREATEST RADIO STORE

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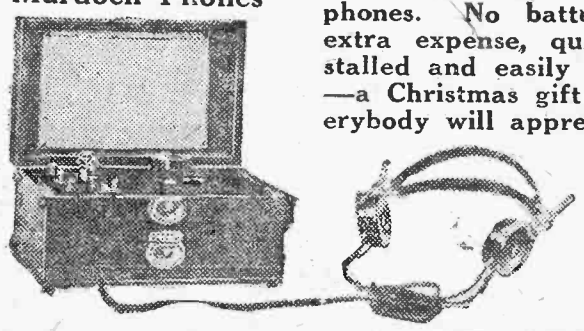
Of the 3,000 $25.00 Crystal Receivers, which we bought from the Radio Corporation of America, only 620 sets are left. $9.45 for a genuine $25.00 Radio Set that will bring the opera, jazz, news and entertainments nightly is a remarkable purchase! It makes an ideal Christmas gift! The receiver comes in a special mahogany cabinet, complete with a pair of Murdoch headphones. No batteries, no extra expense, quickly installed and easily operated—a Christmas gift that everybody will appreciate.

Complete With Murdoch Phones



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Pick those KELLOGG Parts here for a Good 3-CIRCUIT TUNER

11-Plate Vernier Condenser with 4-inch bakelite dial and knob	$4.95
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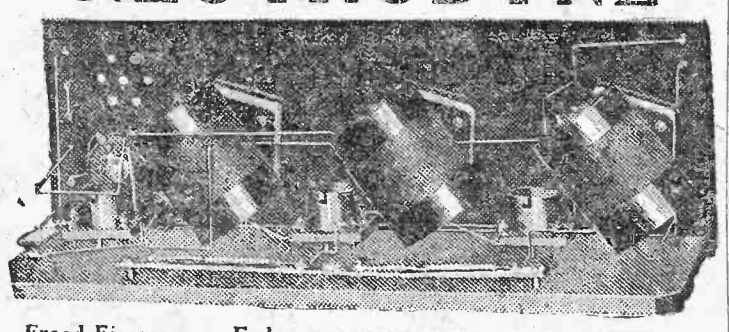
3-Inch Bakelite Dials	65c
4-Inch Bakelite Dials	95c
Bakelite Sockets	55c
Grid Condensers	55c
Double Mountings	60c
Transformers (high or low ratio)	$2.95

For Description of a Good Three-Circuit Tuner, See Preceding Pages of this Section

Build Your Own Sets With Tested Parts

HAZELTINE NEUTRODYNE



Freed-Eiseman or Fada Licensed Parts

1 7x21x3-16 drilled Formica panel.
1 Howard rheostat.
3 4-inch Radion dials.
3 John Firth bakelite sockets.
8 Binding posts.
3 23-plate variable condensers.
1 Wave control neutroformer.
2 R.-F. amp'fy'g neutroformers.
2 Grid neutralizing condensers.
1 .00025 micon grid condenser.
1 Marco variable grid leak.
1 Baseboard for mounting.
25 feet tinned copper bus bar wire and complete instructions for assembling and wiring.

3-TUBE Our Price $28.60

4-Tube $44.65
5-Tube $46.25

For description of Neutrodyne Receiver, see preceding pages of this section.

Complete Parts for 2-STAGE AMPLIFIER

To amplify Ultra-Audion, Reinartz, Flewelling, Knocked-Down Short-Wave Receiver, Crystal or any receiving set so that loud speaker or phonograph can be used in place of headset.

1 7x9 Formica Panel (other suitable size).
1 High-Ratio All-American or Thordarson Transformer.
1 Low-Ratio All-American or Thordarson Transformer.
2 Howard Rheostats.
2 Bakelite Sockets.
3 Double Pacent Jacks.
13 Binding Posts.
1 Baseboard.

$21.00 Value

Our Price $12.95

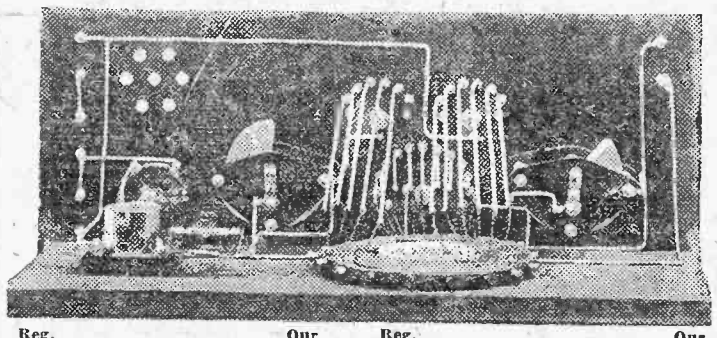
Complete Parts for AUTOPLEX

9½x13¼x⅛-inch	Formica Panel, drilled and machined	$1.89
9½x13¼x¾-inch	Mahogany Cabinet with hinged top	2.95
1	John Firth Socket	.35
1	Frost Plain Rheostat	1.00
2	Moulded Autoplex Variometers	7.30
2	3-inch Bakelite Dials	.50
6	Binding Posts	.30
1	Single Circuit Pacent Jack	.35
1	1,250 or 1,500 Turn Honeycomb Coil	1.50
1	4x4x⅛-inch Formica sub base panel, drilled	.25
1	2¼x2¼x⅛-inch Formica Panel, Coil, clamp drilled	.07
1	Complete set machine screws for assembling various parts	(no charge)
1	Hook-up for assembling and wiring	(no charge)
4	Lengths square bus bar wire	.10

Our Special Price $16.45

Build Your Own Sets With Tested Parts

REINARTZ DETECTOR



Reg. Price.		Consisting of	Our Price.
$1.89		7x18 Formica Panel	$1.70
1.00		Bakelite Socket	.45
1.50		Howard Vernier Rheostat	1.35
3.30		23-Plate Variable Condenser	1.45
3.10		11-Plate Variable Condenser	1.35
1.50	3	Switch Levers	.75
.80	2	Dozen Switch Points	.40
3.00	1	Schoonhoven Reinartz Coil	1.95
1.00		Freshman Variable Grid Leak and Condenser combined	.75
.80	8	Binding Posts	.40
.30		25 Feet Tinned Wire	.15

Reg. Price.	Consisting of	Our Price.
.50	Baseboard for mounting	.25
1.00	Blueprint with Complete Instructions for Assembly and Wiring	.50

Regular Price $21.69

Our Price $11.45

Complete parts for Detector and two-step with Vernier Condensers $29.95

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Any individual part (except the drilled panels) in any of the six outfits below may be purchased separately at the special reduced prices listed under column headed "Our Price."

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Specially drilled panels are included with each of the sets illustrated and described below. We give this free service only on panels included with complete sets.

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Complete instructions for assembling and blueprints for wiring are included with each outfit. Instructions written so everyone can understand them. No special skill or technical knowledge required—a few hours and you're ready to tune-in New York, Los Angeles—any of 'em!

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6x10½	Drilled Panel	$ .95
	23-Plate Condenser	1.35
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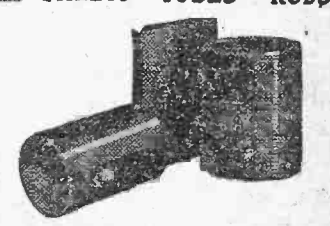
	Rheostat	.35
	John Firth Socket	.35
	Freshman Grid Leak and Condenser	.65
2	Bakelite Dials	.50
	Switch Lever	.25
3	Binding Posts	.40
	Switch Points and Stops	.15
	Baseboard and Instructions and 25 feet Hook-Up Wire	.25

Our Price $5.95

FORMICA

Made from Anhydrous Redmanol Resins
SHEETS TUBES RODS



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3-16-inch Formica, square inch 2c
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Tubing (2 to 4-inch diameter), per running inch 10c

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1 Set of Push and Pull Thordarson or All-American Power Transformers.
1 Double Firth Socket.
1 Howard Power Rheostat.
8 Binding Posts.
5 Switch Points and Stops.
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1 Cutler-Hammer Filament Switch.
1 7x9 Panel.
Baseboard and instructions for assembling and mounting.

$25.00 Elsewhere

Our Price $16.95

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1,500	Turns	$1.50
1,250	Turns	1.50
1,000	Turns	1.25
750	Turns	1.00
250	Turns	.75
150	Turns	.60
100	Turns	.50
75	Turns	.40
50	Turns	.40
35 and 25	Turns	.40

Special Cabinets

7x21 in. and 7x18 in.

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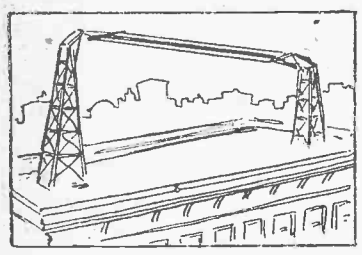
$6.00	value, 11-Plate Vernier	2.95
$1.75	value, 3-Plate Vernier	1.15
$4.30	value, 43-Plate, NOW	1.75
$3.70	value, 23-Plate, NOW	1.45
$3.30	value, 11-Plate, NOW	1.35
$2.25	value, 5-Plate, NOW	1.25

THE CHICAGO EVENING POST

RADIO MAGAZINE



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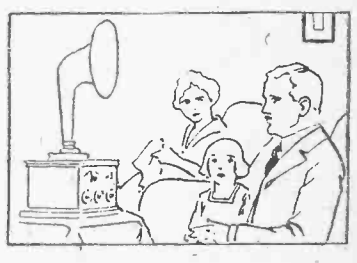


THURSDAY, DECEMBER 27, 1923.

Issued as a Supplement to
The Chicago Evening Post

BROADCASTING

HOME RADIO

RADIO SETS

HOOK-UPS

AMATEUR RECEPTION

HOME-WORKSHOP

RADIO SCIENCE-

RADIO PROGRAMS

LOCAL NEWS

U.S. RADIO NEWS

HOME LABORATORY

AMATEUR TRANSMISSION

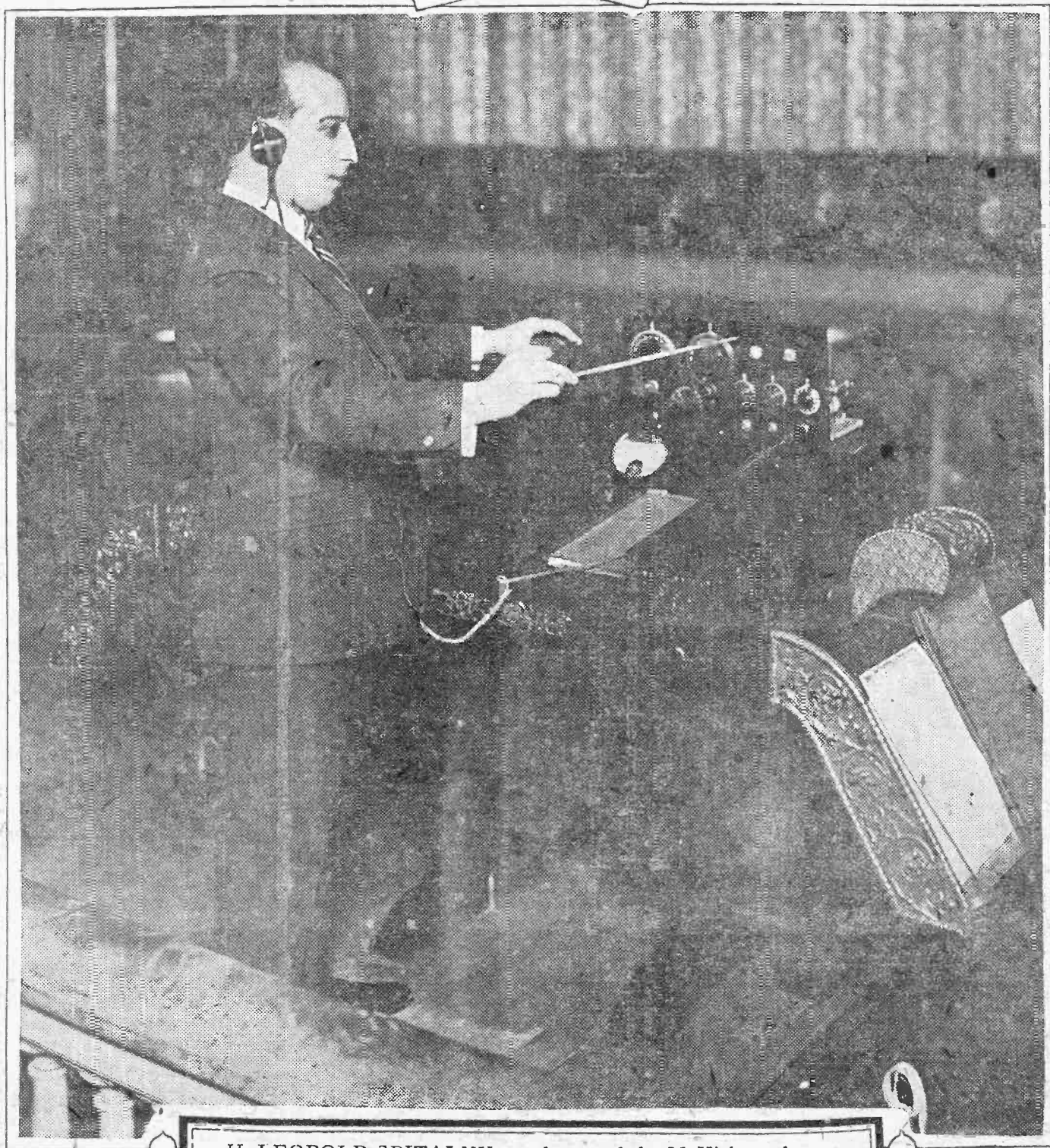
RADIO STATIONS

INVENTIONS

D.X. RECORDS

RADIO PRACTICE-

COMMERCIAL



H. LEOPOLD SPITALNY, conductor of the McVickers theater orchestra, has installed a receiving set right in his director's stand, and when his programs are racing thru the ether via station KYW, he knows exactly how his orchestra is being broadcast.

FOREIGN RADIO NEWS

MANUFACTURERS NEWS

NEW EQUIPMENT-

DEALERS NEWS

JOBBER NEWS

IN THIS ISSUE

Hook-Up and Construction Details of Miner's Superdyne Circuit—How to Build an "Old Reliable" Armstrong Three-Circuit Receiver—New York Society Girls Build Radio Sets for Charity—Two-Stage Amplifier for Long-Distance Crystal Set.

Broadcasting Stations and Schedules

Central, or Chicago time, is shown on all stations. If necessary to ascertain local time on any station deduct two hours from time shown for Pacific coast stations, one hour from time shown for the Rocky mountain stations and add one hour to those stations using eastern time. Hawaiian island time is four hours and a half slower than Chicago time. In the list the call number of the station is first given, followed by the location, the owner's name, wave length used and broadcasting schedule in order named. THE POST is making a thoro canvass of all stations in order that this directory may be complete and accurate. Changes are so frequent in stations and schedules that no list can be satisfactory which is not corrected frequently. Corrections and additions to this list will be made from week to week. Stations are urged to co-operate by sending information of changes in schedule to Radio Editor, The Chicago Evening Post.

KDKA—East Pittsburg, Westinghouse Electric and Manufacturing company, 326 meters.
KDPM—Cleveland, Ohio. Westinghouse Electric and Manufacturing company, 270 meters.
KDPT—San Diego, Calif., Southern Electrical company, 244 meters.
KDYL—Salt Lake City, Utah, Telegram Publishing company, 360 meters.
KDYM—San Diego, Calif., Savoy theater, 252 meters.
KDYQ—Portland, Ore., Oregon Institute of Technology, 360 meters.
KDYS—Great Falls, Mont., The Tribune, 360 meters.
KDYW—Phoenix, Ariz., Smith Hughes & Co., 360 meters.
KDYX—Honolulu, Hawaii, Star Bulletin, 360 meters.
KDZB—Bakersfield, Calif., 1402 20th street, Frank E. Siefert, 240 meters.
KDZE—Seattle, Wash., The Rhodes company, 455 meters.
KDZF—Los Angeles, Calif., Automobile Club of Southern California, 278 meters.
KDZI—Wenatchee, Wash., Electric Supply company, 360 meters.
KDZK—Reno, Nev., Nevada Machinery and Electric company, 360 meters.
KDZQ—Denver, Colo., Nichols Academy of Music, 360 meters.
KDZR—Bellingham, Wash., Bellingham Publishing company, 261 meters.
KDZT—Seattle, Wash., Seattle Radio association, 360 meters.
KFAD—Phoenix, Ariz., McArthur Bros. Mercantile company, 360 meters.
KFAE—Pullman, Wash., State College of Washington, 360 meters.
KFAF—Denver, Colo., Western Radio corporation, 360 meters.
KFAJ—Boulder, Colo., University of Colorado, 360 meters.
KFAN—Moscow, Idaho, The Electric shop, 360 meters.
KFAP—Butte, Mont., Standard Publishing company, 360 meters.
KFAR—Hollywood, Calif., Studio Lighting Service company (O. K. Olsen), 280 meters.
KFAU—Boise, Idaho, Independent School District of Boise City, Boise High school, 270 meters.
KFAV—Venice, Calif., Abbot Kinney company, 224 meters.
KFAW—Santa Ana, Calif., The Radio Den (W. B. Ashford and H. T. White), 280 meters.
KFAY—Medford, Ore., Virgin's Radio service, 283 meters.
KFBB—Havre, Mont., F. A. Buttrey & Co., 360 meters.
KFBC—San Diego, Calif., W. K. Azbill, 278 meters.
KFBE—San Luis Obispo, Calif., Reuben H. Horn, 360 meters.
KFBG—Tacoma, Wash., First Presbyterian church, 360 meters.
KFBK—Sacramento, Calif., Kimball-Upson company, 283 meters.
KFBL—Everett, Wash., Leese Bros., 224 meters.
KFBS—Trinidad, Colo., Trinidad Gas and Electric Supply company and the Chronicle News, 360 meters.
KFBU—Laramie, Wyo., The Cathedral (Bishop N. S. Thomas), 283 meters.
KFCB—Phoenix, Ariz., Nielsen Radio Supply company, 238 meters.
KFCD—Salem, Ore., Salem Electric company, 360 meters.
KFCF—Walla Walla, Wash., 707 Baker building, Frank A. Moore, 360 meters.
KFCH—Billings, Mont., Electric Service station (Inc.), 360 meters.
KFCK—Colorado Springs, Colo., Colorado Springs Radio company, 258 meters.
KFCL—San Antonio, Calif., Los Angeles Union Stock yards, 360 meters.
KFCM—Richmond, Calif., Richmond Radio shop (Frank T. Doeing), 360 meters.
KFCP—Ogden, Utah, 2421 Jefferson avenue, Ralph W. Flygare, 360 meters.
KFCV—Houston, Texas, Fred Mahaffey, Jr., 360 meters.
KFCY—Le Mars, Iowa, Western Union college, 252 meters.
KFCZ—Omaha, Neb., Omaha Central High school, 258 meters.
KFDA—Baker, Ore., Adler's Music store, 360 meters.
KFDD—Boise, Idaho, St. Michael's cathedral, 252 meters.
KFDH—Tucson, Ariz., University of Arizona, 360 meters.
KFDJ—Corvallis, Ore., Oregon Agricultural college, 360 meters.
KFDL—Denver, Colo., Knight-Campbell Music company, 360 meters.
KFDO—Bozeman, Mont., 420 West Koch street, H. Everett Cutting, 248 meters.
KFDP—Des Moines, Iowa, Hawkeye Radio and Supply Co., 278 meters.
KFDR—York, Neb., Bullock's Hardware and Sporting Goods (Robert G. Bullock), 360 meters.
KFDU—Lincoln, Neb., Nebraska Radio Electric company, 240 meters.
KFDV—Fayetteville, Ark., Gilbrech & Stinson, 360 meters.
KFDX—Shreveport, La., First Baptist church, 360 meters.
KFDY—Brookings, S. D., South Dakota State College of Agriculture and Mechanic Arts, 360 meters.
KFDZ—Minneapolis, Minn., 2510 South Thomas avenue, Harry O. Iverson, 360 meters.
KFEC—Portland, Ore., Meier & Frank company, 360 meters.
KFEJ—Tacoma, Wash., 1724 South Jay street, Guy Greason, 360 meters.
KFEL—Denver, Colo., Winner Radio corporation, 360 meters.
KFEP—Denver, Colo., Radio Equipment company (Joseph L. Turre), 240 meters.
KFEQ—Oak, Neb., J. L. Scroggin, 360 meters.
KFER—Fort Dodge, Iowa, Auto Electric Service company, 231 meters.
KFEV—Douglas, Wyo., Radio Electric Shop, 263 meters.
KFEX—Minneapolis, Minn., Augsburg Seminary, 261 meters.
KFEY—Kellogg, Idaho, Bunker Hill and Sullivan Mining and Concentrating company, 360 meters.
KFEZ—St. Louis, Mo., American Society of Mechanical Engineers (F. H. Schubert), 360 meters.
KFFA—San Diego, Cal., 3443 5th street, Dr. R. O. Shelton, 243 meters.
KFFB—Boise, Idaho, Jenkins Furniture company, 240 meters.
KFFE—Pendleton, Ore., Eastern Oregon Radio company, 360 meters.
KFFO—Hillsboro, Ore., Dr. E. H. Smith, 229 meters.
KFFP—Moberly, Mo., First Baptist church, 275 meters.
KFFQ—Colorado Springs, Colo., Marksheffel Motor company, 360 meters.
KFFR—Sparks, Nev., Nevada State Journal (Jim Kirk), 226 meters.
KFFV—Lamoni, Iowa, Graceland college, 360 meters.
KFFX—Omaha, Neb., McGraw company, 278 meters.
KFFY—Alexandria, La., Pincus & Murphy, 275 meters.
KFFZ—Dallas, Tex. (portable), Al. G. Barnes Amusement company, 226 meters.
KFGG—Baton Rouge, La., Louisiana State university, 254 meters.
KFGD—Chickasha, Okla., Chickasha Radio and Electric company, 248 meters.
KFGH—Stanford University, Cal., Leland Stanford university, 360 meters.
KFGJ—St. Louis, Mo., Missouri National guard, 138th infantry, 266 meters.
KFGL—Arlington, Ore., Arlington garage, 234 meters.
KFGP—Cheney, Kan., Cheney Radio company, 229 meters.
KFGQ—Boone, Iowa, Crary Hardware company, 226 meters.
KFGV—Utica, Neb., Heidbreder Radio Supply company, 224 meters.
KFGX—Orange, Texas, First Presbyterian church, 250 meters.
KFGZ—Berrien Springs, Mich., Emmanuel Missionary college, 268 meters.
KFHA—Gunnison, Colo., Colorado State Normal school, 252 meters.
KFHB—Hood River, Ore., Rialto theater (P. L. Beardwell), 280 meters.
KFHD—St. Joseph, Mo., Utz Electric Shop company, 226 meters.
KFHF—Shreveport, La., Central Christian church, 266 meters.
KFHH—Neah Bay, Wis., Ambrose A. McCue, 283 meters.
KFHJ—Santa Barbara, Cal., Fallon & Co., 360 meters.
KFHQ—Los Gatos, Cal., Curtis Brothers Hardware store, 242 meters.
KFHR—Seattle, Wash., Star Electric and Radio company, 270 meters.
KFHS—Lihue, Hawaii, Clifford J. Dow, 275 meters.
KFHU—Mayville, N. D., M. G. Sateren, 261 meters.
KFHX—Hutchinson, Kan., 407 East 1st street, Robert W. Nelson, 229 meters.
KFI—Los Angeles, Cal., Earle C. Anthony (Inc.), 469 meters.
KFIB—St. Louis, Mo., 5666 Vernon avenue, Franklin W. Jenkins, 244 meters.
KFID—Iola, Kan., Ross Arbuckle's garage, 246 meters.
KFIF—Portland, Ore., Benson Polytechnic institute, 360 meters.
KFIK—Gldabrook, Iowa, Gladbrook Electric company, 234 meters.
KFIL—Louisburg, Kan., Windisch Electric Farm Equipment company, 234 meters.
KFIO—Spokane, Wash., North Central high school, 252 meters.
KFIQ—Yakima, Wash., Yakima Valley Radio Broadcasting association, 224 meters.
KFIU—Juneau, Alaska, Alaska Electric Light and Power company, 226 meters.
KFIV—Pittsburg, Kan., 706 East 10th street, V. H. Broyles, 240 meters.
KFIX—Independence, Mo., Reorganized Church of Jesus Christ of Latter Day Saints, 240 meters.
KFIY—Seattle, Wash., Brott Laboratories, 236 meters.
KFIZ—Fond du Lac, Wis., Daily Commonwealth, 237 meters.
KFJA—Grand Island, Neb., Central Power company, 244 meters.
KFJB—Marshalltown, Iowa, Marshalltown Electrical company, 248 meters.
KFJC—Seattle, Wash., Post Intelligencer, 233 meters.
KFJD—Greeley, Colo., Weld County Printing and Publishing company, 236 meters.
KFJF—Oklahoma City, Okla., National Radio Manufacturing company, 252 meters.
KFJH—Selma, Cal., The Sugar Bowl (H. R. Shaw), 273 meters.
KFJI—Astoria, Oreg., Liberty theater (E. B. Marsh), 252 meters.
KFJJ—Carrollton, Mo., Carrollton Radio shop, 236 meters.
KFJK—Bristow, Okla., Delano Radion and Electric company, 233 meters.
KFJL—Ottumwa, Iowa, Hardsacg Manufacturing company, 242 meters.
KFJM—Grand Forks, N. D., University of North Dakota, 229 meters.
KFJQ—Grand Forks, N. D., Electric Construction company (portable), 252 meters.
KFJR—Stevensville, Mont., Ashley C. Dixon and Son, 258 meters.
KFJV—Dexter, Iowa, Thomas H. Warren, 224 meters.
KFJW—Towanda, Kan., Le Grand Radio company, 226 meters.
KFJX—Cedar Falls, Iowa, State Teachers' college, 229 meters.
KFJY—Fort Dodge, Iowa, Tunwall Radio company, 246 meters.
KFJZ—Fort Worth, Texas, Texas National Guard, 112th Cavalry, 254 meters.
KFKA—Greeley, Colo., Colorado State Teachers' college, 248 meters.
KFKB—Milford, Kas., Brinkley-Jones Hospital association, 266 meters.
KFKH—Lakeside, Colo., Denver Park and Amusement company, 248 meters.
KFKQ—Conway, Ark., Conway Radio laboratories, 224 meters.
KFKV—Butte, Mont., F. F. Gray, 283 meters.
KFKX—Hastings, Neb., Westinghouse Electric and Manufacturing company, 286 meters.
KFKZ—Colorado Springs, Colo., Nassour Bros. Radio company, 234 meters.
KFLA—Butte, Mont., Abner R. Wilson, 283 meters.
KFLB—Menominee, Mich., Signal Electric Manufacturing company, 248 meters.
KFLD—Franklinton, La., Paul E. Greenlaw, 234 meters.
KFLE—Denver, Colo., National Educational Service, 268 meters.
KFLH—Salt Lake City, Utah, Erickson Radio company, 261 meters.
KFLP—Cedar Rapids, Ohio, Everette M. Foster, 240 meters.
KFLQ—Little Rock, Ark., Bizzell Radio shop, 261 meters.
KFLR—Albuquerque, N. M., University of New Mexico, 254 meters.
KGB—Tacoma, Wash., Wm. A. Mullins Electric company, 360 meters.
KGG—Portland, Ore., Hallock & Watson Radio service, 360 meters.
KGN—Portland, Ore., Northwestern Radio Manufacturing company, 360 meters.
KGU—Honolulu, Hawaii, Waikiki Beach, Marion A. Mulrony, 360 meters.
KGW—Portland Ore., Portland Morning Oregonian, 492 meters.
KGY—Lacy, Wash., St. Martins college (Rev. Sebastian Ruth), 258 meters.
KHJ—Los Angeles, Cal., Times-Mirror company, 395 meters.
KHQ—Seattle, Wash, 419 13th avenue, Louis Wasmer, 360 meters.
KJQ—Stockton, Cal., 615 East Main street, C. O. Gould, 360 meters.
KJR—Seattle, Wash., Northwest Radio Service company, 270 meters.
KJS—Los Angeles, Cal., Bible Institute of Los Angeles, 360 meters.
KLN—Monterey, Cal., Monterey Electric Shop, 360 meters.
KLS—Oakland, Cal., 2201 Telegraph avenue, Warner Brothers, 360 meters.
KLX—Oakland, Cal., Tribune Publishing company, 360 meters.
KLZ—Denver, Colo., Reynolds Radio company, 360 meters.
KMJ—Fresno, Cal., San Joaquin Light and Power corporation, 360 meters.
KMO—Tacoma, Wash., Love Electric company, 360 meters.
KNJ—Roswell, New Mexico, Roswell Public Service company, 250 meters.
KNT—Aberdeen, Wash., Grays Harbor Radio company (Walter Hemrich), 263 meters.
KNV—Los Angeles, Cal., Radio Supply company, 360 meters.
KNX—Los Angeles, Cal., Electric Lighting Supply company, 360 meters.
KOB—State College, New Mexico, New Mexico College of Agriculture and Mechanic Arts, 360 meters.
KOP—Detroit, Mich, Detroit Police department, 286 meters.
KPO—San Francisco, Cal., Hale Brothers, 423 meters.
KQI—Berkeley, Cal., University of California, 360 meters.
KQP—Hood River, Ore., Apple City Radio club, 360 meters.
KQV—Pittsburg, Pa., Doubleday-Hill Electric company, 360 meters.
KQW—San Jose, Cal., 467 1st street, Charles D. Herrold, 360 meters.
KRE—Berkeley, Cal., Berkeley Daily Gazette, 278 meters.
KSD—St. Louis, Mo., Post Dispatch (Pulitzer Publishing company), 546 meters.
KSS—Long Beach, Cal., Prest & Dean Radio company and Radio Research Society of Long Beach, Cal., 360 meters.
KTW—Seattle, Wash., First Presbyterian church, 360 meters.
KUO—San Francisco, Cal., Examiner Printing company, 360 meters.
KUS—Los Angeles, Cal., City Dye Works and Laundry company, 360 meters.
KUY—El Monte, Cal., Coast Radio company, 360 meters.
KWG—Stockton, Cal., Portable Wireless Telephone company, 360 meters.
KWH—Los Angeles, Cal., Los Angeles Examiner, 360 meters.
KXD—Modesto, Cal., Modesto Herald Publishing company, 360 meters.
KYQ—Honolulu, Hawaii, Electric Shop, 360 meters.
KYW—Chicago, Ill., Westinghouse Electric and Manufacturing company, 345 meters.
KZM—Oakland, Cal., 13th and Harrison streets, Preston D. Allen, 360 meters.
KZN—Salt Lake City, Utah, The Deseret News, 360 meters.
KZV—Wenatchee, Wash, Wenatchee Battery and Motor company, 360 meters.
WAAB—New Orleans, La., 137 South St. Patrick street, Valdemar Jensen, 268 meters.
WAAC—New Orleans, La., Tulane university, 360 meters.
WAAD—Cincinnati, Ohio, Ohio Mechanics institute, 360 meters.
WAAF—Chicago, Ill., Chicago Daily Drovers Journal, 360 meters.
WAAH—St. Paul, Min., Commonwealth Electric company, 360 meters.
WAAK—Milwaukee, Wis., Gimbel Brothers, 280 meters.
WAAM—Newark, N. J., I. R. Nelson company, 263 meters.
WAAN—Columbia, Mo., University of Missouri, 254 meters.
WAAW—Omaha, Neb., Omaha Grain Exchange, 360 meters.
WAAZ—Emporia, Kans., Hollister-Miller Motor company, 360 meters.
WABB—Harrisburg, Pa., Dr. John B. Lawrence, 266 meters.
WABC—Anderson, Ind., Fulwider-Grimes Battery company, 229 meters.
WABD—Dayton, Ohio, Parker high school, 283 meters.
WABE—Washington, D. C., Young Men's Christian association, 283 meters.
WABF—Mount Vernon, Ill., Mount Vernon Register-News company, 234 meters.
WABG—Jacksonville, Fla., Arnold Edwards Piano company, 248 meters.
WABH—Sandusky, Ohio, Lake Shore Tire company, 240 meters.
WABI—Bangor, Me., Bangor Railway and Electric company, 240 meters.
WABA—Lake Forest, Ill., Lake Forest college, 266 meters.
WABJ—South Bend, Ind., The Radio Laboratories, 240 meters.
WABK—Worcester, Mass., First Baptist church, 252 meters.
WABL—Storrs, Conn., Connecticut Agricultural college, 283 meters.
WABM—Saginaw, Mich., F. E. Doherty Automotive and Radio Supply company, 254 meters.
WABN—La Crosse, Wis., Waldo C. Grover, 234 meters.
WABO—Rochester, N. Y., Lake Avenue Baptist church, 252 meters.
WBAA—West Lafayette, Ind., Purdue university, 360 meters.
WBAD—Minneapolis, Minn., Sterling Electric company, 360 meters.
WBAH—Minneapolis, Minn., The Dayton company, 360 meters.
WBAN—Paterson, N. J., Wireless Phone corporation, 244 meters.
WBAO—Decatur, Ill., James Millikin university, 360 meters.
WBAP—Fort Worth, Texas, Worthan-Carter Publishing company (Star-Telegram), 476 meters.
WBAV—Columbus, Ohio, Erner & Hopkins company, 390 meters.
WBAW—Marietta, Ohio, Marietta college, 246 meters.
WBAX—Wilkesbarre, Pa., 66 Gildersleeve street, John H. Stenger Jr., 360 meters.
WBAY—New York, N. Y., Western Electric company, 492 meters.
WBBA—Newark, Ohio, Newark Radio Laboratories, 240 meters.
WBBC—Sterling, Ill., Sterling Radio Equipment company, 229 meters.
WBBD—Reading, Pa., Barbey Battery Service, 234 meters.
WBL—Anthony, Kan., T & H. Radio company, 261 meters.
WBS—Newark, N. J., D. W. May, Inc., 360 meters.
WBT—Charlotte, N. C., Southern Radio corporation, 360 meters.
WBU—Chicago, Ill., City of Chicago, 286 meters.
WBZ—Springfield, Mass., Westinghouse Electric and Manufacturing company, 337 meters.
WCAD—Canton, N. Y., St. Lawrence university, 280 meters.
WCAE—Pittsburg, Pa., Kaufmann & Baer company, 462 meters.
WCAG—New Orleans, La., 2813 Calhoun street, Clyde R. Randall, 268 meters.
WCAH—Columbus, Ohio, Entrekin Electric company, 286 meters.
WCAJ—University Place, Neb., Nebraska Wesleyan university, 360 meters.
WCAK—Houston, Texas, 2504 Bagby street, Alfred P. Daniel, 360 meters.
WCAL—Northfield, Minn., St. Olaf college, 360 meters.
WCAM—Villanova, Pa., Villanova college, 360 meters.
WCAO—Baltimore, Md., Sanders & Stayman company, 360 meters.
WCAP—Washington, D. C., Chesapeake & Potomac Telephone company, 469 meters.
WCAR—San Antonio, Texas, Alamo Radio Electric company, 360 meters.
WCAS—Minneapolis, Minn., William Hood Dunwoody Industrial institute, 360 meters.
WCAT—Rapid City, S. D., South Dakota State School of Mines, 240 meters.
WCAU—Philadelphia, Pa., Durham & Co., 286 meters.
WCAV—Little Rock, Ark., J. C. Dice Electric company, 360 meters.
WCAX—Burlington, Vt., University of Belmont, 360 meters.
WCAY—Milwaukee, Wis., Kesselman O'Driscoll company, 261 meters.
WCAZ—Carthage, Ill., Carthage college, 246 meters.
WCBA—Allentown, Pa., 1015 Allen street, Charles W. Heimbach, 280 meters.
WCBB—Greenville, Ohio, K. & K. Radio Supply company (Charles H. Katzenberger) 240 meters.
WCBD—Zion, Ill., Wilbur G. Voliva, 345 meters.
WCE—Minneapolis, Minn., Findley Electric company, 360 meters.
WCK—St. Louis, Mo., Stix, Baer & Fuller Dry Goods company, 360 meters.
WCM—Austin, Texas, University of Texas, 360 meters.
WCX—Detroit, Mich., Detroit Free Press, 517 meters.
WDAD—Lindsborg, Kans., Central Kansas Radio Supply company (Wm. L. Harrison), 360 meters.
WDAE—Tampa, Fla., Tampa Daily Times, 360 meters.
WDAF—Kansas City, Mo., Kansas City Star, 411 meters.
WDAG—Amarillo, Texas, J. Laurance Martin, 360 meters.
WDAH—El Paso, Texas, Trinity Methodist church (South), 360 meters.
WDAI—Syracuse, N. Y., Hughes Radio corporation, 246 meters.
WDAK—Hartford, Conn., The Courant, 261 meters.
WDAL—Jacksonville, Fla., Florida Times-Union, 360 meters.
WDAO—Dallas, Texas, Automotive Electric company, 360 meters.
WDAP—Chicago, Ill., Board of Trade, 360 meters.
WDAR—Philadelphia, Pa., Lit Brothers, 395 meters.
WDAS—Worcester, Mass., 692a Main street, Samuel A. Waite, 360 meters.
WDAU—New Bedford, Mass., Slocum Kilburn, 360 meters.
WDAX—Centerville, Iowa, First National bank, 360 meters.
WDAY—Fargo, N. D., Fargo Radio Service company, 244 meters.
WDBC—Lancaster, Pa., Kirk, Johnson & company, 258 meters.
WDBF—Youngstown, Ohio, 254 West Federal street, Robert G. Phillips, 261 meters.
WDM—Washington, D. C., Church of the Covenant, 360 meters.
WDT—Stapleton, N. Y., Ship Owners Radio Service, 405 meters.
WDZ—Tuscola, Ill., Star Store building, James L. Bush, 278 meters.
WEAA—Flint, Mich., Fallain & Lathrop, 280 meters.
WEAB—Fort Dodge, Iowa, Standard Radio Equipment company, 360 meters.
WEAF—New York, N. Y., American Telephone and Telegraph company, 492 meters.
WEAG—Edgewood, R. I., Nichols-Hineline-Bassett Laboratory, 231 meters.
WEAH—Wichita, Kans., Witchita Board of Trade, 244 meters.
WEAI—Ithaca, N. Y., Cornell university, 286 meters.
WEAJ—Vermilion, S. D., University of South Dakota, 360 meters.
WEAM—North Plainfield, N. J., Borough of North Plainfield (W. Gibson Buttfield), 250 meters.
WEAN—Providence, R. I., Shepard company, 273 meters.
WEAO—Columbus, Ohio, Ohio State University, 360 meters.
WEAP—Mobile, Ala., Mobile Radio company, 360 meters.
WEAR—Baltimore, Md., Baltimore American and News Publishing company, 360 meters.
WEAS—Washington, D. C., Hecht company, 360 meters.
WEAU—Sioux City, Iowa, Davidson Brothers company, 360 meters.
WEAV—Houston, Texas, Iris theater (Will Horowitz Jr.), 360 meters.
WEB—St. Louis, Mo., Benwood company, 360 meters.
WEV—Houston, Texas, Hurlburt-Still Electrical company, 360 meters.
WEW—St. Louis, Mo., St. Louis University, 261 meters.
WFAA—Dallas, Texas, Dallas News and Dallas Journal, 476 meters.
WFAB—Syracuse, N. Y., 802 McBride street, Carl F. Woese, 234 meters.
WFAF—Poughkeepsie, N. Y., H. C. Spratley Radio company, 360 meters.
WFAH—Port Arthur, Texas, Electric Supply company, 360 meters.
WFAJ—Asheville, N. C., Hi-Grade Wireless Instrument company, 360 meters.
WFAM—St. Cloud, Minn., Times Publishing company, 360 meters.
WFAN—Hutchinson, Minn., Hutchinson Electric Service company, 360 meters.
WFAQ—Cameron, Mo., Missouri Wesleyan college, 360 meters.
WFAT—Sioux Falls, S. D., Daily Argus-Leader, 360 meters.
WFAV—Lincoln, Neb., University of Nebraska, department of electrical engineering, 360 meters.
WFI—Philadelphia, Pa., Strawbridge & Clothier, 395 meters.
WGAL—Lancaster, Pa., Lancaster Electric Supply and Construction company, 248 meters.
WGAN—Pensacola, Fla., 216 West Romana street, Cecil E. Lloyd, 360 meters.
WGAQ—Shreveport, La., Glenwood Radio corporation (W. G. Patterson), 360 meters.
WGAR—Fort Smith, Ark., Southwest American, 360 meters.
WGAU—Wooster, Ohio, Radio Manufacturing and Service company (Marcus C. Limb), 226 meters.
WGAW—Altoona, Pa., 1918 West Chestnut street, Ernest C. Albright, 261 meters.
WGAY—Madison, Wis., Northwestern Radio company, 360 meters.
WGAZ—South Bend, Ind., South Bend Tribune, 360 meters.
WGI—Medford Hillside, Mass., American Radio and Research corporation, 360 meters.
WGL—Philadelphia, Pa., 2303 North Broad street, Thomas F. J. Howlett, 360 meters.
WGR—Buffalo, N. Y., Federal Telephone and Telegraph company, 319 meters.
WGV—New Orleans, La., Interstate Electric company, 360 meters.
WGY—Schenectady, N. Y., General Electric

THE CHICAGO EVENING POST TABLOID RADIO SCHEDULES

These stations are those most commonly tuned in evenings by the Chicago broadcast listeners. The time given is central standard. Pacific coast time is two hours earlier than that shown here. Mountain time is one hour earlier, and eastern time one hour later. Evening program schedules only are given. This list was compiled by The Chicago Evening Post Radio Department and is protected by copyright.

STATION	Miles	Met	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Chicago—									
KYW, Comm. Edison Bldg.		536		6:30- 9:30	6:30-12:00	6:30- 9:30	6:30- 9:30	6:30-12 m.	6:30- 9:30
WAAF, Union Stock Yards		286	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00		
WMAQ, Hotel La Salle		448		7:00- 9:55	7:00- 9:55	7:00- 9:55	7:00- 9:55	8:00-10:00	
WDAP, Drake Hotel		360		7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	9:15-10:30
WJAZ, Edgewater Beach Hotel		448		10:00-12:30	10:00-12:30	10:00-12:30	10:00-12:30	10:00- 2:00	6:00- 9:00
Suburban—									
WCBD, Zion, Ill.	39	345	8:00- 9:00				8:00- 9:00		
WIAB, Rockford, Ill.	77	252			8:00- 9:00				
WRM, Urbana, Ill.	120	360			8:50- 9:30				
WTAS, Elgin, Ill.	37	275			7:30-10:00				
Eastern—									
KDKA, East Pittsburg	430	326	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WBZ, Springfield, Mass.	802	337	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	
WEAF, New York City	733	495	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00
WGI, Medford Hillside, Mass.	875	360	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	7:30- 9:00
WHAZ, Troy, N. Y.	748	380	8:00- 9:30						
WGY, Schnectady, N. Y.	698	280	6:45-11:30	6:45- 9:00	6:45- 9:00	6:45- 9:00	6:45-11:30	6:45- 9:00	
WGR, Buffalo	472	319	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	
WJY, New York City	733	405							2:30- 6:00
WJZ, New York City	733	455	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	
WOO, Philadelphia	677	509	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	
WRC, Washington, D. C.	612	469	8:00-10:00		8:00-10:00		8:00-10:00		
Midwest—									
WCX, Detroit	245	517	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00		
WJAX, Cleveland	323	390		7:30- 9:30		8:00-10:30			
WLAG, Minneapolis	358	417	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	
WLW, Cincinnati	262	309	8:00-10:00	10:00-12:00	8:00-10:00	10:00-12:00			
WOC, Davenport	105	481	7:00-11:00		7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WTAM, Cleveland	323	300	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30
WWJ, Detroit	245	517	8:30-10:00	8:30-10:00	8:30-10:00	8:30-12 m.	8:30-10:00		
Southern—									
KSD, St. Louis	270	546	8:00-11:00	8:00-11:00	8:00-11:00		8:00-11:00	8:00-11:00	
WBAP, Fort Worth, Texas	855	476	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00		
WDAF, Kansas City, Mo	430	411	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	
WFAA, Dallas, Texas	853	476	6:45- 9:30	6:45- 9:30	6:45- 9:30	6:45- 7:30	6:45- 9:30	6:45- 9:30	9:30-11:00
WGV, New Orleans	858	350	7:00- 8:00		7:00- 8:00			7:00- 8:00	
WHAS, Louisville	271	400			7:30- 9:00				4:00- 5:00
WHB, Kansas City, Mo	430	411		7:00- 9:00		7:00- 9:00	7:00- 9:00		8:00-10:00
WMC, Memphis	480	500		11:00-12:00			11:00-12:00	8:00-10:00	8:00-10:00
WOAI, San Antonio, Texas	1,080	385		9:30-10:30				9:30-10:30	
WOS, Jefferson City, Mo	337	441	8:00- 9:30		8:00- 9:30		8:00- 9:30		
WSB, Atlanta, Ga	605	428	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	7:30- 9:00
Pacific Coast—									
KFDB, San Francisco	1,910	509	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30
KGW, Portland, Ore	1,805	492	1:00-2 a.m.	10:00-11:00	10:00-11:00	10:00-11:00	1:00-2 a.m.	10:00-11:00	9:00-10:00
KHJ, Los Angeles	1,795	395	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	10:00-12:00
KPO, San Francisco	1,910	423	6:30-12 m.	6:30-12 m.		6:30-12 m.		6:30-12 m.	10:30-12 m.

Continued on Page 14.

IVERSON C. WELLS
EDITOR

Assisted by a Staff of Regular and Special Contributing Writers.

The RADIO MAGAZINE Section is edited with the view of giving authentic news of the radio broadcasting field and authoritative information on the subjects of home construction of receiving and transmission sets, of the operation and maintenance of apparatus, and as an exchange of opinion for its readers.

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Works on 'Superduc' Hook-Up

By THE NIGHT PROWLER.

All of us fellows here in The Post experimental laboratory have been working with a new twist to the ultra-audion circuit.

Lewis Hagerman, who made long distance crystal reception popular the last few weeks with his special hook-up, and who is our technical editor, has run across something that looks mighty good in this ultra-adion circuit.

We've had the little fellow going thru the jumps for a week or more—speaking, of course, of the new hook-up, and not Hagerman, who also is small in stature but not in radio knowledge.

It looks as if Hagerman had found something. He calls it the "Superdcu." There isn't much to the darn thing—that is, in the way of parts, cost to construct and the effort to operate. In fact it is just about the last word in simplicity.

Very Simple in Construction.

The "Superduc" is not much more than a clay pipe and hairpin when it comes to instruments. There's a variometer, a variable condenser, a grid leak and a tube. That doesn't sound very much, does it? Nope, you're right. Everything that usually goes on a panel has been left off, except the screws and bolts.

You tune with the grid leak about as much as you do with the variable condenser. In fact the bench set that I am using in my tests is tuned almost completely with the leak.

We're giving the circuit its final rub this week. Next week we expect to have it ready for you. However, it has got to get a real showdown test before we give it to you, so rest assured it won't be released until we know it is right.

"Old Reliable" Junior Coming.

I might let you in on another little laboratory secret. We're working on an "Old Reliable Junior" hook-up. It's a fast runnerup to the original—the one that brings them in seven days a week and right thru WJAZ, WDAP, KYW and WMAQ.

It's a one-tuber—but, oh, my, how she do percolate. Two of the sets have been built in The Post laboratory. One has been placed within a few block of WJAZ an dthe other is out on the far west side. We're checking up on results.

The set doesn't cost quite so much as "Old Reliable" to construct and it is a little more simple in operation. Using a WD-12 tube, a dry cell battery and a toothpick aerial you can carry the receiver around with you and feel at home wherever you may be.

Where did you DX-ers go this week? Didn't get half the list of loggings I got last week. Aren't you bringing them in at all, at all? Turn over to the DX page in the rear and see what some of these boasters are doing. If you have done better let the wide, wide world know about it thru The Radio Post.

Need of an Aerial Maker.

I wasn't working the radio receiver last night. Had some laboratory work to do and had to pass up the programs. And it was a shame, too, because I've got that west side listening-in station going fine, all but for an aerial.

By the way, why doesn't some fellow that likes and understands radio open up an aerial construction department? Some of us haven't time to climb on top of a six-story apartment building; some are too fat if they have the time, others are too darn lazy and the rest don't know how.

If I didn't have this princely (?) income from writing this daily outburst I'd get into the aerial construction game myself.

Howsomever, I'll have that aerial working shortly and then look out for me.

Radio Programs

Below are given the complete schedules of all the Chicago and suburban broadcasting stations and those of the out-of-town stations which are most commonly tuned by local radiophans.

These schedules are a regular daily feature in The Chicago Evening Post.

On Thursday of each week a complete list and schedule of every broadcasting station in the United States is published in The Chicago Evening Post's sixteen-page Radio Magazine section.

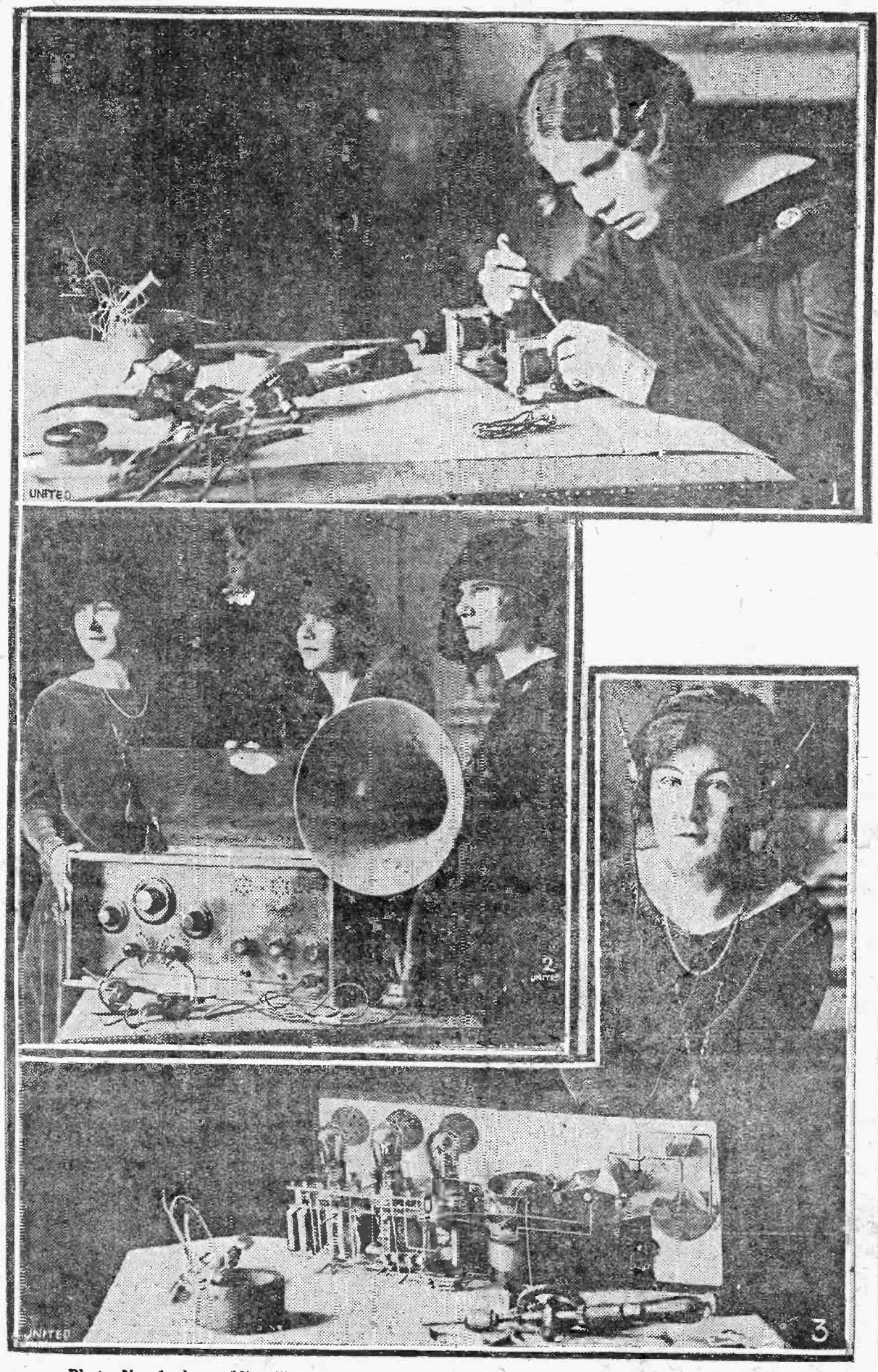


Photo No. 1 shows Miss Margaret Hennessey, daughter of Mrs. Daniel Hennessey of Park avenue, testing a set for incorrect circuits. Photo No. 2 show, left to right, Miss Margaret Hennessey, Miss Margaret L. Stout and Miss Edith McCoon listening to their completed set and thoroly enjoying the fruits of their labor. Below, photo No. 3, is Miss Edith McCoon, daughter of Mrs. James Hy McCoon of New York and Newport, wiring the amplifier.

CHICAGO STATIONS

(Central Time Is Shown.)

KYW—Located in Commonwealth Edison building; 536 meters; Wilson J. Wetherbee, director.

Day—9:30 a. m., news and markets; 10 a. m., market reports; 10:30 a. m., financial news and comment; 10:58 a. m., naval observatory time signals; 11 a. m., market reports; 11:05 a. m., weather report; 11:30 a. m., news and comment of the financial and commercial market; 11:35 a. m., table talk by Mrs. Anna J. Peterson; 5:30 p. m., children's bed-time story; 2:35 p. m., studio program.

Evening—6:50 p. m., children's bedtime story; 8 to 8:20 p. m., twenty minutes of good reading, by Rev. C. J. Pernin, S. J., head of department of English, Loyola university, Chicago; 8:20 p. m., musical program: "Air of Salome," from "Herodiade" (Massenet), and "At Dawning" (Cadman), by Margaret Martin; popular selections by Sammy Steward's orchestra; "Liebesfreud" (Kreisler), by Lila Groff; "Be Still, Blackbird" (Sander), by Alma Robertson; popular dance selection, selected, by Sammy Steward's orchestra; "Longing, Dear, for You" (Densmore), and "I Can't Find a Name" (Snyder), by Margaret Martin; popular dance selections, selectde, by Sammy Steward's orchestra; "The Hellgate of Sissons" (Kaufmann), by Everett Opie; "Iriago—Aria" (Momuscko), by Stanislawa Josywicy; popular dance selections, selected, by Sammy Steward's orchestra.

WAAF—Located at Union stock yards; 286 meters.

Day—Live stock reports at 8:40, 10:30, 10:45 a. m., 12:30, 12:45, 3, 4:30 p. m.

Evening—No schedule.

WMAQ—Located on Hotel LaSalle; 447.5 meters. Miss Judith C. Waller, station director.

Day—1:30, to be announced.

Evening—7:00, Babson report. Talk on automobile topics, by Rockwell Stephens; 7:30 p. m., Elinor Kaplan, violinist; 8:30 p. m., WMAQ orchestra; 9:15 p. m., Mrs. Hilda Butler Farr, pianist, Douglas Malloch, poet.

WJAZ—Located on Edgewater Beach hotel; 447.7 meters. E. Warren Howe, program director.

Day—This station has no regular day schedule.

Evening—10 p. m. to 2 a. m., "In a Covered Wagon With You and "Pekin," by Oriole Orchestra; tenor solos, selected, by Arthur C. Colby; "Sonata" (Scarlatti), by Evelly Richards; contralto solos, selected, by Henrietta Blackwell; "Misfortune Blues" and "Sunshine of Mine," by Oriole orchestra; contralto solos, selected, by Agnes Hayes; "Berceuse" (Chopin), by Evelyn Richards; tenor soles, selected, by Arthur C. Colby; "Sobbing Blues" and "Dream Daddy," by Oriole orchestra; contralto solos, selected, by Henrietta Blackwell; "Liebestraum" (Liszt) and "March Militaire" (Schubert-Tausig), by Evelyn Richards; contralto solos, selected, by Agnes Hayes; "Silvery Moon" and "Fascinating Blues," by Oriole orchestra.

WDAP—Chicago Board of Trade, located at Drake hotel; 390 meters.

Day—8:30 a. m., 10 a. m., 10:30 a. m., 11 a. m., 11:30 a. m., 12 noon, 12:30 p. m., 1 p. m., 1:30 p. m., quotations and market reports direct from the Chicago Board of Trade.

Evening—10 p. m., H. C. Frazier.

WPAD—Formerly on W. A. Wiebold & Co.'s, School street and Ashland avenue.

Notice—This station has closed and is being moved to Armour institute, where it will be operated by the radio department of that institution.

WSAH—Located at 4801 Woodlawn avenue; 248 meters.

WSAK—Located on Chicago Radio laboratory; 368 meters.

SUBURBAN STATIONS

(Central Time Is Shown.)

WCBD—Zion, Ill.; 345 meters: J. H. Depew, station manager.

Day—2:30 p. m. to 3:45 p. m., sacred solos and duets, and an address either by Wilbur Glenn Voliva, general overseer of the Christian Catholic Apostolic church in Zion, or one of his representatives.

WCAY—Milwaukee, Wis.; 261 meters; no silent nights.

Day—1 p. m. to 4:30 p. m., special concert; novelty and test programs as announced.

Evening—7:30 p. m., regular concert program.

WHAD—Marquette University, Milwaukee, Wis.; 280 meters.

Wednesdays—At 7:30 p. m. only.

WIAR—Rockford, Ill.; 252 meters; Wednesday and Friday evenings. Monday evening, 9 p. m., MacDonald's Melody orchestra, in latest hits. Friday evening, 8 p. m., vocal and instrumental selections. Sunday, 12:30

Continued on Page 15.

Society Takes Up Radioitus

Radio has become a society fad. Heretofore it was just something that interested the plebian. Now, however, blue-blooded aristocracy has set up and taken notice.

This is true particularly in New York, where gay Gotham society debs have found a new way to assist their pet charities by building complicated radio sets and selling them to their friends and giving the proceeds to a fund which they have created to help along the needy and deserving.

The idea is ta build with their own hands a radio receiving set. Usually a five-tube neutrodyne of the Hazeltine type is selected for the purpose. This is not such a complicated set to construct and can be built with the minimum of labor and detail.

Several fair members of Gotham's smart set have employed Maxwell Ringoll, a radio engineer, to guide and direct them. Instead of making dolls and sofa pillows these young ladies cut and bend bus bar wire, wield soldering irons and manipulate Yankee drills and screw drivers just like they were old timers.

The radio sets, when completed, are sold to willing buyers. The young women say they can make more money for charity this way in a few hours of engrossing labor than they can in a week of ordinary charity effort.

Some of the prominent society debs who are engaged in this sort of work include Margaret Hennesy, Margaret Stout and Edith McCoon.

Chicago society girls have not taken to this work yet. However, it is a fad that appeals to everyone and soon we may expecte to see the gold coast crowd hard at work with hook-ups and circuits.

Offers Radio Amateurs Prizes for Test Records

A test suggested some time ago by Thomas A. Edison is to be carried out by the Aerial League of America. Henry Woodhouse, president of the league, asks radio amateurs all over the world to co-operate during the present winter in keeping regular daily records of radio reception at their stations, including signal strength, drection of the wave, and, if possible, any accompanying magnetic conditions such as the aurora.

Prizes are offered for the best report. Information can be obtained from the Aerial League of America, 280 Madison avenue, New York city.

Cuban Announcer Has Name of Irish Flavor

Remberto O'Farrell is the announcer of UWX (Havana, Cuba) and, nothwistanding his name, is a native Cuban of Spanish descent. He speaks perfect English, however, and makes all his announcements in both English and Spanish.

PWX is owned by the Cuban Telephone company, an associate of the Internatonal Telephone and Telegraph corporation, New York city. It operates 400 meters and broadcasts regularly, Wednesdays and Saturdays at 7:30 and 10 o'clock, central time. Jose Izguierdo is chief operator and Urbano del Castillo program director.

Radio May Aid Plants

Experiments indicating that the growth of plants is hastened by high-frequency electric currents have been reported recently by several separate investigators. Currents were used, not waves. Whether actual radio waves will have similar effects remains to be investigated.

Sound Waves in Water

Sound waves of frequencies so high as to be inaudible have been produced in France and used in scientific experiments. Tho these waves are in air or water, not in the ether, they are well within the frequency range of radio waves.

Use Switch on Charger

A double-throw switch should be used between your storage battery and home charger. By throwing the switch one way the battery is disconnected from the set and put in circuit with the chager. The reverse cuts out the charger and connects battery with the set.

Some Notes on Regeneration for Radio Receiving Sets

WHEN an impulse transmitted from a distant radio station strikes the antenna of a receiver the current produced in the wires leading down to the receiving set is carried to the tuning unit.

After having been allowed to reach its maximum value there by the careful adjustment of the circuits, it passes on to the grid of the vacuum tube, assuming, of course, that the set uses this modern means of detection.

The signal which passed down from the antenna to the tube is altered greatly by the rectification properties of the tube. Instead of making its exit from the tube as a wave of extremely high frequency it is changed to impulses of relatively low frequencies. These frequencies can be translated into sounds by the human ear.

Experimenters discovered by accident that after the tube had completed its recitification of the incoming wave the circuit in which the low frequency wave traveled, namely, the circuit in which the phones were connected, also carried a high frequency current having nothing to do with the first current carrying the sounds.

Used to Intensify Signal.

It was found that this high frequency current could be handled in such a way that the energy it contained could be carried around again to the grid of the tube and there made to intensify the incoming wave.

To some it might seem that the difference in time between the moment of impulse on the grid and the secondary impulse of the energy carried back from the plate would introduce an element of distortion, but this is not the case, due to the tremendously high speed of electric waves.

This phenomenon, by which the action of a wave on a vacuum tube is used to bolster the same wave, is known as regeneration, and is now incorporated in the greater proportion of radio sets built and sold.

How Regeneration Is Had.

Regeneration can be accomplished in several ways, one of the most common being by means of the "tickler coil." This is shown in Fig. 1.

To produce a regenerative set of this type requires merely a variocoupler and variable condenser for tuning and regeneration. The variocoupler ball serves as the tickler coil. The aerial is connected first to the condenser and then to the variocoupler.

In the illustration the latter shows a fixed primary, altho the usual coupler is provided with two or more taps to give a wider range of wave lengths. From the lower end of the coupler the antenna circuit is completed by a lead to a water pipe.

The tube detector circuit takes in the wire leading from the variable condenser to the grid thru the grid condenser C and a second wire leading from the lower end of the coupler to the positive pole of the filament battery.

Circuit Is Completed.

To bring the high frequency impulses in the plate circuit back to the grid circuit the wire from the plate of the tube is carried back to the rotor ball of the coupler where the coupling—relative position of rotor and stationary coil—determines the amount of feed-back or regeneration. The low frequency current passes thru the rotor, on to the telephone receivers and on to the filament to make the circuit complete.

The question naturally arises as to the limitations of regeneration. This is limited by the characteristics of the tube. If the regeneration is carried beyond a certain point, with vocal or instrumental sounds at least, the tube commences to act as a generator and the sounds are distorted beyond recognition.

Tuned Plate Method.

Another favorite method for producing regeneration is shown in Fig. 2. This is called the "tuned plate method." The tuning in the plate circuit is accomplished by means of the variometer.

The function of this variometer is to tune the high frequency currents in the plate circuit to resonance with similar impulses in the grid circuit, thus allowing the former to strengthen the latter. Because of the better tuning facilities afforded by the circuit shown it is one that is recommended widely by engineers. In addition to the variable condenser and the taps on the variocoupler the tuning is also affected by the rotation of the grid variometer. The two variometers are similar in size, composition and make-up, but they perform two separate and practically independent functions

Howls Greet Overzealous.

Regenerative circuits of any type require extreme care in handling, otherwise the noises will make the sets inoperative. There is a tendency to increase the regeneration to a point where the loudest signals are being received, but this happens also to be the most critical operating point of the tube.

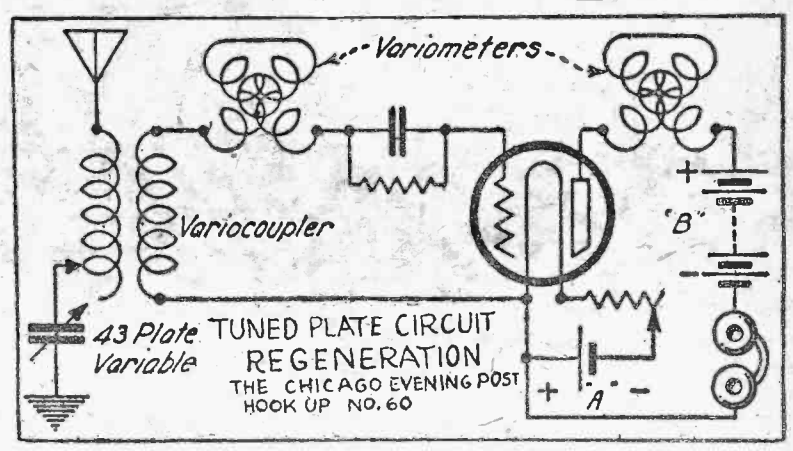
A slight change in the heat of the filament or in the voltage on the plate of the tube and the latter instantly becomes a generator of currents of many frequencies. There is no trouble in recognizing this condition when it occurs, for then the receivers are filled with a weird collection of howls and squeals and broadcast concerts will be unpleasantly distorted.

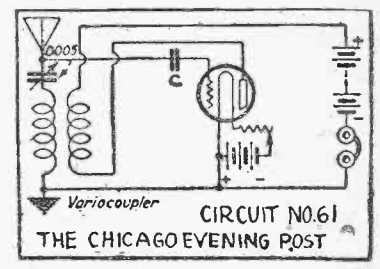
How to Get Maximum.

It is possible to carry regeneration to its maximum limit if certain precautions are taken. The most important of them requires the use of extremely fine controlling adjustments on the rheostat of the tube. This permits the operator to carry the heat of the filament to the desired point and hold it there.

Another advantage is to shield all parts in the set from the operator so that the movement of the body or the hands will not affect the delicate tuning of the plate variometer.

Sometimes this idea is carried even further and with success of shielding all parts in the set from each other. Copper gauze is excellent for this purpose. Small compartments are made for each part from the gauze and on completing them the compartments are connected together and connected to the ground.





Two popular hook-ups carrying out the Armstrong regenerative idea.

London Amateur Tells How He Received WDAR

A letter from Douglas H. Johnson of radio station 6 DW, located at 131 Clapton Common, London, E5, acknowledging receipt of station WDAR about 3.55 (Greenwich meridian time) on Tuesday, Nov. 27, 1923. Excerpts from the letter as follows: "Your station was received quite comfortably on one valve, but the terrible jamming from the arc station at Northolt, England, interrupted. However, the message was quite clear and the call letters and the word 'Philadelphia' were heard several times. If there had been no jamming from Northolt I could have gotten you clearly, signals being very clear and quite loud and strong on a one-valve receiver."

An interesting fact about the above is that it was received on a one-tube set.

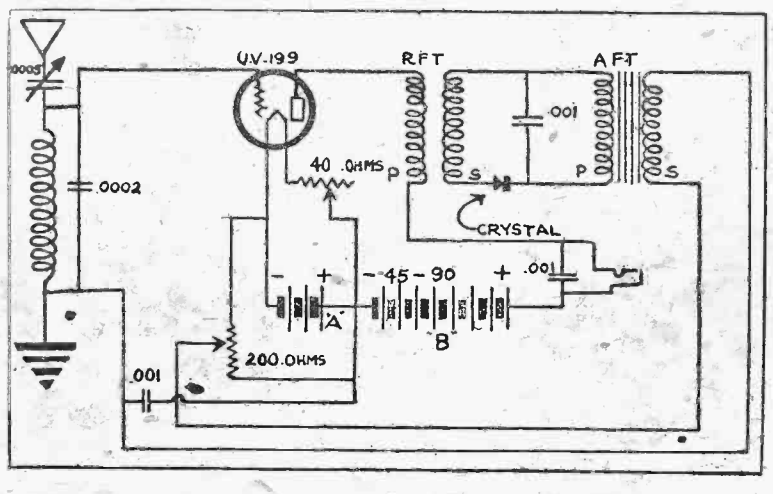
This station WDAR also received an acknowledgment thru Doubleday Page & Co's radio magazine, "Radio Broadcast," that in the official transoceanic tests recently they have had official acknowledgment of the receipt of this station from Charles E. Horner, 487 Fulham Palace road, Fulham, London, England.

The first acknowledgment of this station's WDAR's west coast transmission attempt, Dec. 12, between 12 and 3 a. m. (Dec. 13) E. S. T., came in a telegram from Kentfield, Cal. Conditions for broadcasting were fairly good, but not ideal, the weather still being too warm and damp.

Smoke and Fading

Complicated fading phenomena, which have been causing trouble with broadcast reception in the neighborhood of London, may be due, it is suggested, to the increased conductivity imparted by smoke particles to the air over the city.

HERE is a one-tube reflex set using a crystal detector that occupies so little space it may be carried in one's pocket. It was designed and constructed by Anatol Gollos Jr., 6337 Magnolia avenue. Young Gollos is the 15-year-old son of Capt. Anatol Gollos, the inventor of the "Sun" receiver pictured and described in last week's Post Radio Magazine. The diagram is shown herewith.



Counterpoise Aids D'x.

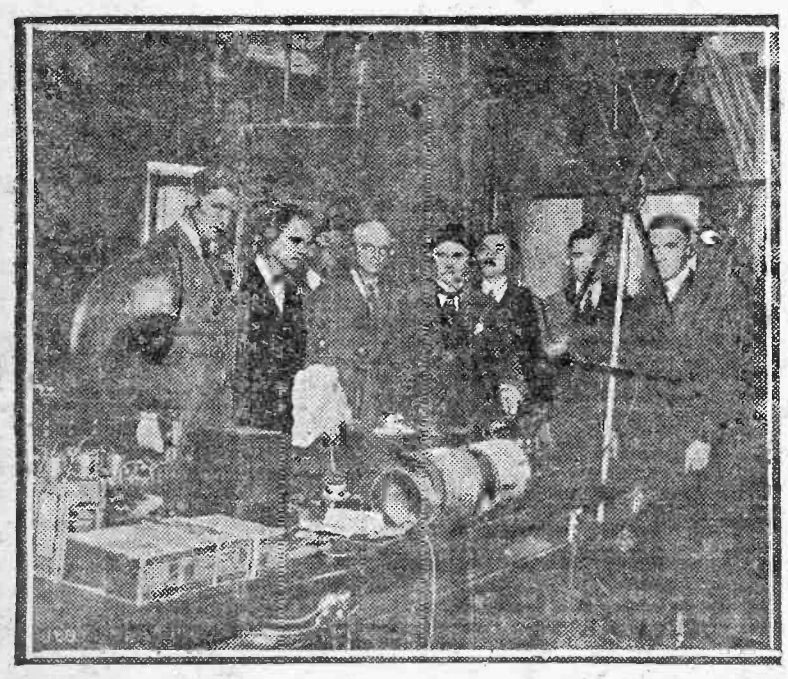
Employment of a counterpoise in lieu of a ground connection will aid in bringing in distant stations when location permits. It also improves clarity of signals. A true counterpoise is located just above the ground, not less than a foot at the most.

Inventors Seek Certain Selectivity in Receivers

Perfect and certain selectivity in the transmission and reception of messages, either code or voice, is a goal toward which several eminent engineers and inventors are working. Marconi permitted an announcement in the press some months ago that he was experimenting toward this end.

Alexanderson is known to have recently devoted his energies to the same problem and the patent office applications undoubtedly would disclose the names of others.

It is to be regretted that necessary secrecy is thrown around the records of the Signal corps of the United States army in the world war. They are believed to contain a great deal of valuable information on this important question, much of which was developed by amateur radio men serving in our overseas forces. When selective transmission becomes an actuality it is possible that it may be known as "point-casting" as distinguished from broadcasting.



Dr. J. Harris Rogers, discoverer of underground and undersea wireless, with radio experts and friends "listening in" for European stations on his new cage antenna loop in his famous laboratory at Hyattsville, Md. The words "transatlantic station" were heard clearly at the bedside of Dr. Rogers at his Hyattsville home. Left to right are, G. E. Oliver, Radio Corporation of America; W. L. Lesch, R. S. A.; Dr. T. E. Latimer, personal physician to Dr. Rogers; Dr. J. Harris Rogers; W. B. Flaherty, assistant; A. C. Doyle, R. C. A.; D. H. Beatty, safety expert. The Rogers underground loop is in a well twenty feet from the ground and is shielded by a copper rim.

How Radio Proved Its Value in an Emergency

On the evening of Oct. 27 thirteen broadcasting stations dotting the breadth of the United States transmitted the ceremonies incident to navy day and the dedication of Roosevelt house, the restored birthplace of Col. Theodore Roosevelt, in New York city, says an exchange.

It was the first time so ambitious and concerted an effort had been made by the broadcasters and was an instantaneously successful demonstration of what might be expected of organized radio in a time of national emergency. There is no way of computing the number of people who listened in, but it must have run into the millions, as there are believed to be somewhere near 2,000,000 receiving sets in operation in the country.

Civilization progresses in direct proportion to the development of means of transportation and communication. In view of this latest and most wonderful demonstration of the absolute effeciency of radio as a method of reaching practically all of our people instantly, the greatness and power of the United States is again forcefully emphasized.

STORAGE "B" BATTERIES.

Storage "B" batteries are expensive, but save in the long run.

Construction Details of Miner's Superdyne, Which Outsupes the Hetrodyne

IN the Nov. 15 issue of The Post Radio Magazine the first announcement in the middle west of Miner's new Superdyne circuit was made, this being concurrent with the completion of tests made that same day in Washington. Today The Post Radio Magazine presents to its readers the first complete description of the Superdyne, with diagrams, photos and construction details of the new circuit, published in Chicago or the middle west. The article was written especially and exclusively for The Post at the request of its radio editor by Mr. C. D. Tuska of the C. D. Tuska company, owners of the patents.—THE EDITOR.

By C. D. TUSKA.

THE Superdyne receiver is a name which has been applied to a new receiving circuit. Almost a year ago Robert S. Miner of the C. D. Tuska company started to work on a receiver which would give results which surpassed the regenerative receiver and the many radio-frequency outfits which we had tested.

In seeking for this new "super" circuit, we investigated all of the latest circuits and every modification of regenerative, radio-frequency and other circuits of which we had information. In order to acquaint you with some of the difficulties and problems, I am going to partially review the vacuum tube circuits:

First, we have the usual vacuum tube circuit of straight detection. This type of circuit is illustrated by Fig. 1 and is familiar to everyone. It detects at radio-frequency and gives us an audio-frequency impulse in the plate circuit.

The first improvement over this circuit was made by Armstrong, who about 1914 conceived the idea of making the plate circuit resonant to the frequency of reception in the grid circuit.

Altho there are many modifications of the Armstrong feedback circuit, it may be considered as an inductance in the plate circuit, which can be tuned to the required frequency. Sometimes this inductance in the plate circuit is coupled to the grid circuit conductively or inductively. At other times the plate circuit is not coupled by any other means than the capacity of the tube; that is, the capacity which exists between filament, grid and plate (Fig 2).

Drawbacks on Radio-frequency.

The next attempt to improve the sensitivity of the receiving circuit were in the efforts which have been made to develop a radio-frequency amplifier that has one or more stages of vacuum tubes which are coupled together before the detector. These one or more stages are supposed to amplify the radio-frequency so that the detector will receive the full benefit of its efficiency which increases approximately as the voltage squared.

This system of amplification is not a difficult matter on long wave lengths where the vacuum tubes can be connected easily by a resistance method.

In this method the efficiency per stage is very low and the resistance is very wasteful of "B" battery voltage. Also, in the case of the shorter wave lengths, we encounter many difficulties. The first and most important of these is tube capacity.

At the short wave lengths or extremely high frequencies, i. e., wave lengths under 600 meters, we find that the capacity of the tube is so great that the radio-frequency current tends to pass thru the capacity rather than take the path which is required to operate the vacuum tube. There have been numerous attempts made to overcome this capacity trouble, particularly in England where special tubes were built having small elements. Special care was taken to bring the grid and plate leads out of the tube so as to eliminate capacity in the wiring. These tubes have greatly reduced capacity and have improved the radio-frequency amplifying characteristics (Fig. 3).

However, in America we have had no such development work on tubes. One successful attempt at the solution was made by Armstrong, who employed the super-heterodyne method, i. e., the method of converting the high frequency into low frequency, which easily could be handled with our market tubes. Using this type of circuit, we find that it is generally necessary to use at least eight vacuum tubes, and there is more or less difficulty in the handling of such a system by a novice.

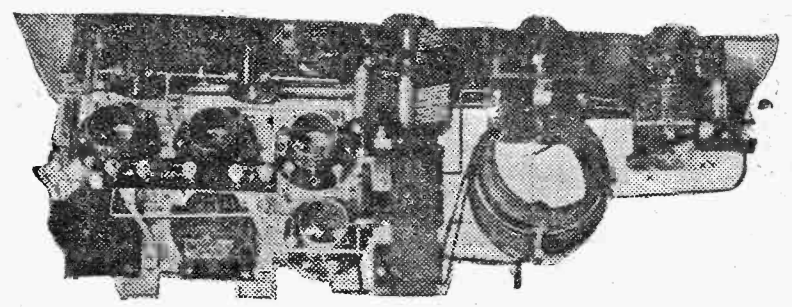
The amount of current required from the "A" battery is a serious drawback and the high cost of tubes does not make the outfit any more attractive.

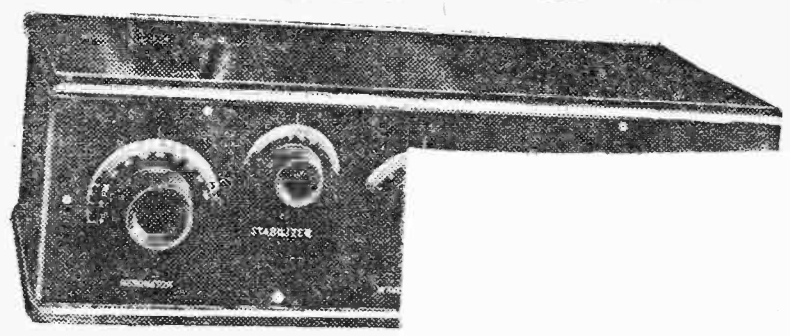
Facts at Long Distance.

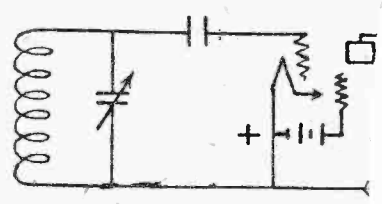
Armstrong's later work consisted in the development of what he terms the "super-regeneration method." While this method seemed to offer all of the necessary benefits, in practice we find it extremely difficult to get satisfactory results in distant reception. Near-by signals were very loud, but distant reception was lacking.

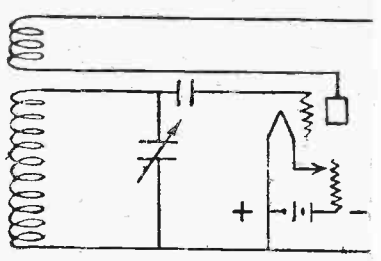
The latest of all these various efforts is the Hazeltine neutrodyne receiver. The circuit attempts to neutralize the feedback capacity in a radio-frequency amplifier. While the circuit does perform well, it generally oscillates at some wave lengths when exactly in resonance and offers difficulties in tuning weak signals (Fig. 4).

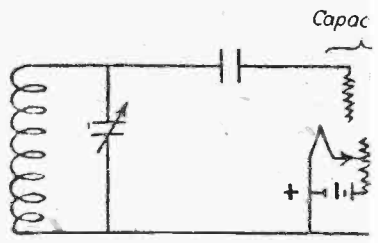
This is a brief and rather hazy review of some of the efforts which have been made to produce the supersensitive receiver.

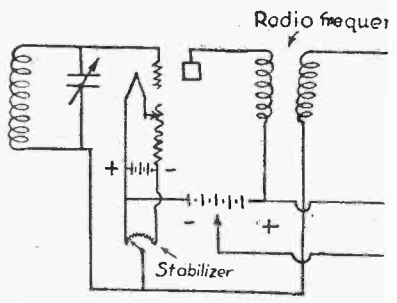












What Is Claimed for Miner's Superdyne

MINER'S new Superdyne receiver, described on this page, is being given a thoro test in The Chicago Evening Post's Radio Experimental laboratories, and a report on its actions, details of construction and notes on operation will appear in an early issue. In the meantime the Editor would like to receive reports on the work of other experimenters, and particularly of any improvements in the circuit that may have been developed in these experiments.

Mr. Miner, known to amateurs as IRU, believes that the only trouble with radio-frequency is that we do not get sufficient amplification per stage and he decided to overcome this difficulty. He set about doing it in this way: First, by locating the difficulties, then by overcoming them.

At the start we realized that there were two obvious troubles: First, the capacity feedback of the tube. Second, the difficulty of securing a resonant plate circuit.

The first attempt to produce a more sensitive receiver was somewhat along the lines of most of the radio-frequency amplifiers. All of the various transformers were tried out and attempts were made to design special transformers. This was given up, as it was found difficult to get a transformer which would cover the band of wave lengths and give sufficient amplification per stage.

We tried using tune plate methods, but we found two things were inclined to happen: First, we did not get as much amplification as we did with one less tube in a regenerative outfit, and, second, the ever-present tendency for the vacuum tube to oscillate as soon as the plate circuit approached resonance with the grid circuit spoiled the amplification.

We attempted to overcome this difficulty by means of the usual stabilizer, which "QST" has so aptly termed "a losser." Even using the stabilizer, we found that it was most important to have a resonant plate circuit.

One look at the voltage curve of a resonant circuit such as shown in Fig. 5 immediately will point out the advantages of curve "AB" over curve "CD". "AB" is the type of curve which we might expect with the resonant plate circuit, while "CD" is the sort of result which would probably be had with the transformer coupled amplifier.

Miner Discovers New Feedback.

It was evident that we must use resonant circuits and it was further improve it by changing the constants. We went thru all of the stage of increasing capacity and decreasing inductance as well as the reverse. We tried every sort of coupling and every conceivable manner of turns ratio. Hundreds of separate experiments indicated that the successful operation of the circuit depended to an extremely high degree in following these dimensions carefully.

Not only is it necessary to carefully follow the instructions about sizes of wire and dimensions, but in addition one must be very cautious not to parallel the grid and the plate wires of the radio-frequency stage. These wires must be kept at right angles and as far apart as possible. If the reverse feedback coil is coupled too closely to the grid coil the capacity between the grid and plate windings exceeds the negative magnetic feedback and the set will not work. It is extremely important to avoid this trouble, and here again we want to caution you to copy exactly the specifications we have outlined.

Must Stick to Specifications.

The dimensions and constants of the various coils and condensers are shown in the accompanying table. If anyone is anxious to experiment with this circuit I want to take this opportunity to warn him of the absolute necessity of sticking to the dimensions, wire sizes, etc.

We have not had very good success with reception on the detector, which probably partly is due to the capacity of the phones on the ungrounded circuit. If you intend operating with a small indoor antenna, ground the filaments and connect the antenna to the grid of the first tube, leaving out the antenna coupling turns. With this method, phones on the detector probably will be entirely satisfactory.

Now a word about results. First, the maximum results can be obtained after the operator has learned how to adjust carefully the circuits. It is not possible to get these results until one has had some experience in tuning faint signals.

The astonishing part about this outfit is that it operates without an antenna and gives signals of sufficient intensity to be heard thru the use of a loud speaker.

In Hartford, Conn., without the use of an antenna or loop or capacity of any sort, other than the usual ground connection, we have heard repeatedly on a loud speaker broadcasts from Chicago, Davenport, Kansas City and stations nearer to us.

In attempting to compare the outfit with some of the sensitive sets on the market, we went to Washington and ran a series of tests.

First, a constant artificial source of power was set up. This was tuned on a regenerative receiver and the audibility measured around 50. With the same power, the same tubes, batteries, etc., the Superdyne receiver showed an audibility of over 200.

The same two outfits were tried under similar conditions with a broadcasting station as the source of power. Here the regenerative receiver showed audibility of about 60, while under corresponding conditions the Superdyne receiver showed an audibility of 10,000, which was the end of the meter.

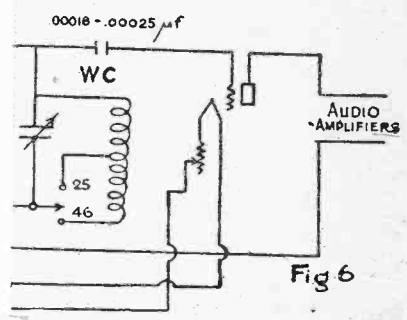


Fig 6

Outsupers Heterodyne in Test.

The next test was of a more practical nature. Here we compared the Superdyne receiver under actual receiving conditions with the naval six-tube universal radio-frequency amplifier. The signals with the four-tube Superdyne were louder probably three to four times than with the six tubes on the navy amplifier.

The last experiment was the most astonishing of all. In this test we compared the four-tube Superdyne with the eight tubes on a super-heterodyne receiver. Some of the signals on the super-heterodyne surpassed this new circuits, while in other cases the Superdyne exceeded the super-heterodyne.

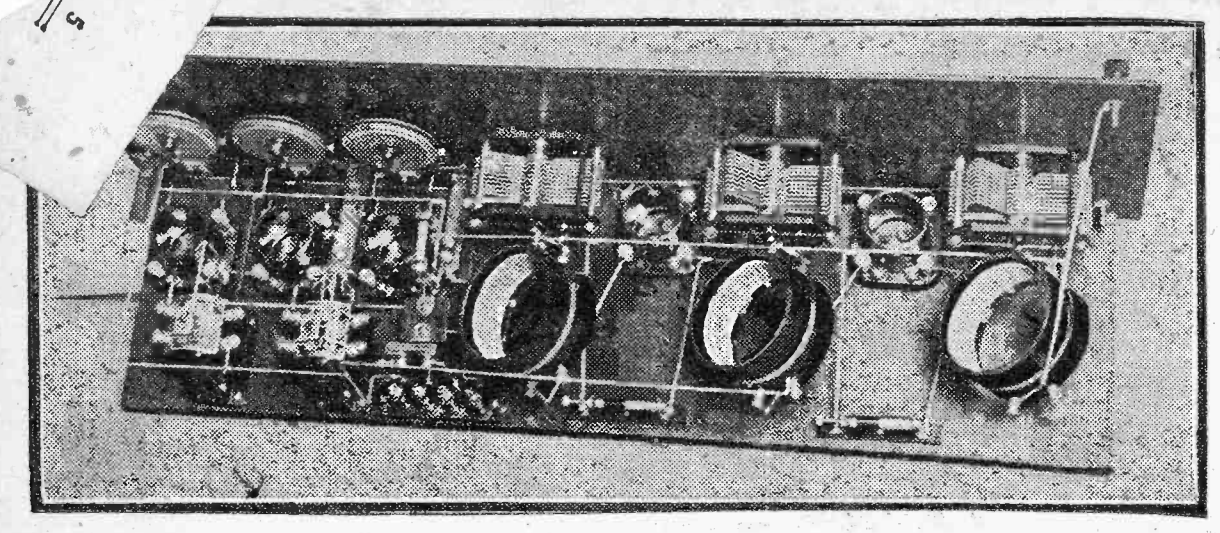
Taken all in all, and being very con-

Continued on Next Page.

SUPERDYNE COIL DATA.

	Coil Form O. D.	Winding	Turns	Wire	Taps	Micro heuries
Secondary	4 in.	1¼ in.	42	No. 22 D.S.C.	0.20.42	273
Antenna	Over Sec.	Turns Spaced ¼	4	No. 22 D.S.C.	0.4	
Tickler	3⅝ in.	Ball Rotor	18x2—36	No. 22 D.S.C.	0.36	
Plate Reactance	4 in.	1¼ in.	46	No. 22 D.S.C.	0.25.46	264
Condenser (Grid)		Tuska Type 271	23 plates	Maximum Capacity	.00482	
Condenser (Plate)		Tuska Type 271	23 plates	Maximum Capacity	.00482	

Wave Length Range (Approximate), 176-358; 310-660.



This is a five-tube neutrodyne receiver built for Robert Mandel of Mandel Bros. by Paul S. Baer of the Sheridan Radio shop, 4611 Kenmore avenue. One of the deviations from the usual hook-ups of this circuit is on the rheostat connections. Most designers connect the rheostats to the positive side. Mr. Baer has connected to the negative instead, and claims that this simple change takes a lot of the squeals and squawks to be heard in many of the neutrodynes. The first night Mr. Mandel had his set be brought in Fort Worth, Los Angeles, Kansas City, Cincinnati and Minneapolis in the first hour's tuning.

How to Build New Miner Superdyne

(Continued from Preceding Page.

servative, the best we could say for the super-heterodyne was that the signals may have been slightly louder using the eight tubes against our four.

A word about the operation: In operating this circuit we have found that it is highly desirable to adjust the plate circuit for the wave length to be received, then operate the reverse feedback coil which we have called "stabilizer", and the grid circuit in exactly the same manner as one operates a regenerative rceeiver. By careful adjusting the reverse feedback against the positive capacity feedback one can get astounding degrees of amplification. We figured out that the voltage amplification per stage probably ran in the nighborhood of 100 times. Of course, it is a well-known fact that one tube of radio-frequency regeneration of the old style rarely exceeded a voltage amplification of eight or nine times.

In order to simplify the operation we have omitted any tuned antenna circuit and simply used four turns of wire which are closely coupled to the grid circuit. This impulse excitation method of tuning seems to be sufficiently selective, which probably is due to the selectivity of the two resonant circuits.

We have made numerous attempts to simplify the adjustments of the receiver such as using fixed reverse feedback and gearing the two tuning condensers together, but this method decreases the sensitiveness of the receiver.

The closed circuits do not affect each other's wave lengths, but the feedback varies with the wave lengths received. We find that the reverse feedback has an appreciable effect on the grid circuit tuning. However, and fortunately, the plate circuit remains absolutely constant and may be calibrated in terms of wave length.

Voltmeter Should Be Used to Test Plate Voltage

Decreased signals quite often come from a drop in plate voltage.

Unless a voltmeter is used, there is no quick way of testing the condition of a "B" battery. Should there be any failure of the battery or the circuit this instrument indicates the trouble immediately.

A two-point switch or a jack can be connected in the detector and amplifier "B" battery circuits, so that the voltmeter can be switched into either battery at will. A voltmeter of 100 volts range should be used.

Dixie Station Finds Favor with Chicagoans

WMC (Memphis, Tenn.) is one of the most popular Dixie stations with the Chicago radiophans. It broadcasts daily at 8:30 p. m., central time, except Sundays and Wednesdays. At 11 p. m. Tuesdays and Fridays the Midnight Frolics are on the air. The wave length is 500 meters. It is operated by the Memphis Commrecial-Appeal and George D. Hay is announcer. P. G. Root is chief operator and J. E. Karakoff is assistant. The station has a 500-watt transmitter.

Faulty Tube Contacts Cause Operator Trouble

Quite often faulty reception may be traced to the vacuum tube socket or the tube prongs themselves. The spring contacts become loosened or else sprung out of place and one or more of the tube prongs do not make good contact. In this case bend the springs upwards. Sometimes the tube prongs become coated by corrosion. A piece of emery paper will restore a good contact.

Tree Makes Fair Ground

When good ground of the usual type is not available, a long spike or nail driven deeply into a live tree will make an excellent substitute. A live tree has sap in it, and this is composed of salts which make a good conductor to the moist earth near the roots of the tree.

Make Grid Lead Short

The length of the leads between the grid condenser and the detector tube and those between the secondary and the "B" battery should be as short as possible.

Cheap Condensers Make Nonselective Radio Sets

The value of precision variable condensers in a receiving set is not appreciated by the average home builder, or so many cheaply constructed condensers would not be sold. The dielectric losses of a condenser are equivalent to adding a series-resistance in the oscillating circuit. To add a series-resistance in the oscillating circuit means loss of energy, which, in turn, means broad tuning and diminished signal strength and few signals. Cheaply constructed condensers have high dielectric losses. Precision instruments may cost much more at the time of purchase, but they have the minimum of dielectric losses. If you want a sharp tuning, selective receiving set, buy precision condensers.

Explosion's Sound Waves Bump Into Fading Spots

Recent experiments in Holland indicate that the sound wave going out from a great explosion shows phenomena of "dead spots" and "fading" the same as are exhibited by radio waves. The theory for this behavior of sound is still a mystery, just as much so as is fading of radio signals.

Hogan Names Twelve Most Selective Receiver Types

The seventh of the series of radio talks, which have attracted such wide attention, is to be presented thru WEAF (New York city) by John V. L. Hogan, consulting engineer and past president of the Institute of Radio engineers and author of "The Outline of Radio," Dec. 28. He discusses "How to Avoid Interference."

In the course of his remarks, Mr. Hogan said it is possible to classify the six things that give the most trouble, as follows:

1. Near-by broadcasting stations using wave length frequencies close to that which it is desired to receive.
2. Radio telegraph transmitters of the spark type.
3. Oscillating receivers that produce whistling noises.
4. Distant broadcasting transmitters that radiate waves having frequencies within a few kilocycles of the frequency being received.
5. Atmospheric discharges, known as "strays" or "static."
6. Induction from lighting, trolley or power systems.

Which Bother Most.

"Of these six kinds of interference," continued Mr. Hogan, "the first, the second and the third are the most bothersome. Of these three worst sources of interference, the first one seems to trouble the greatest number of people.

"Perhaps this interference from near-by broadcasting stations is not so great a difficulty as is interference from spark transmitters, but where it does exist it is practically continuous, whereas spark interference at worst is only intermittent. I suppose that accounts for the fact that most of the letters I have received ask, in one way or another, for remedies that will prevent hearing speech or music from one broadcasting transmitter while listening to another.

"In any event, this kind of interference is wholly or partly spoiling the broadcast reception in many homes today, and it is doubtless the first that we should study in detail.

"There is one very good thing about this 'cross talk,' as we may call it, and that is that it can be very nearly, if not entirely, eliminated by rearrangement of your own receiving apparatus. Of course, you must be reasonable in what you expect from any radio receiver. It would hardly be fair for a man who lived only a few blocks from WCAE in Pittsburg to expect his receiver to pick up signals from KDZE in Seattle without interference.

What One May Expect.

"That is because WCAE sends out a wave of 650 kilocycles and would be heard very loudly, where KDZE sends at 660 kilocycles (only ten kilocycles higher) and would produce very weak signals at Pittsburg.

"On the other hand, this Pittsburg man might expect a good receiver to cut out WCAE at 650 kilocycles (even tho very near to him) while he listened to WOR in Newark at 740 kilocycles, to WEAF in New York at 610 kilocycles, or to other distant stations that have a moderate wave-frequency difference.

"In the same way, anyone living anywhere in or around New York may reasonably expect to be able to listen to any one of the four local stations—WEAF (610 kc), WJZ (660 kc) or WHN (833 kc), without any interference from any of the other three at any time.

"Many people living in the middle west side district of New York have apparatus with which they are unable to hear any stations other than WJY or WJZ when those transmitters are working; but this trouble is not hard to cure, for there is no insuperable difficulty in getting a receiver that will bring in long-distance stations such as KDKA in Pittsburg and WJAZ in Chicago even when installed within only a few blocks of WJY and WJZ.

Two Rules Guide Radiophan.

"The whole matter of eliminating interference from one broadcsting station while listening to another comes down to the choice of your receiver. There are two rules to guide this choice, as follows:

1. The nearer your receiver is to any broadcasting station the more highly selective it must be to prevent interference from that station.
2. The greater the distance you desire to receive, and consequently the more sensitive your receiving apparatus is, the higher its selectiveness must be to prevent interference.

"A receiving set which is perfectly satisfactory in one location; or for one service, may fail utterly when used in another place for another purpose. Radio receiving is a matter in which one man's meat may be another's poison.

"It may be helpful, tho, to consider a list of twelve types of useful radio receivers arranged in the approximate order of their selectiveness, and I will give you such a list here.

"If your receiver is at the bottom of the list, don't let that fact disturb you, for if it is sufficiently selective for your purposes, well and good. But even a receiving set that is rated halfway up the list might not be good enough for some locations, and in such cases the only two remedies are either to pass the set along to some one else who can use it and to get a new outfit of better selectiveness or else to improve the original receiver.

Twelve Most Selective Types.

"Here, then, are twelve types arranged in the order that I believe puts the most selective outfits at the top and the least selective at the bottom:

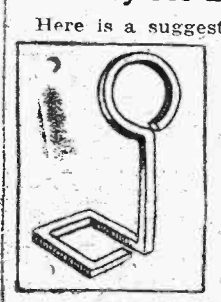
1. Super-heterodyne with closely turned intermediate amplifier.
2. Multiple-stage tuned radio-frequency amplifier with regeneration and with double-tuned in-put circuit.
3. Multiple-stage tuned radio-frequency amplifier with regeneration and single-tuned aerial-input circuit.
4. Multiple-stage tuned radio frequency amplifier without regeneration, but with double-tuned aerial-input circuit.
5. Simple regenerator with double-tuned aerial-input circuit.
6. Multiple-stage tuned radio-frequency amplifier without regeneration, with single-tuned aerial-input circuit.
7. Simple regenerator with single-tuned aerial-input circuit.
8. Multiple-stage untuned riadio-frequency amplifier with regeneration.
9. Nonregenerative audion detector with double-tuned aerial-input circuit.
10. Crystal detector with double-tuned aerial-input circuit.
11. Nonregenerative audion detector with single-tuned aerial-input circuit.
12. Crystal detector with single-tuned aerial-input circuit.

"Remember that this list is arranged in the order of selectiveness, as it appeals to me. A different list would be required to show the relative sensitiveness, and a still different list to indicate the relative ease of adjustment.

"Still further, bear in mind that to warrant its rating on this list any particular receiver must be well designed and well built. A poorly made super-heterodyne may be less selective than a good single-tuned simple regenerator."

Key for Bolt Nuts

Here is a suggestion for the home workshop. It is a key for tightening nuts on switch points; it is made of bus bar wire bent as shown in the sketch. It may be made to tighten larger nuts by enlarging the grip holes.—Ed Jochens, 4021 West 20th street.



Argentine Radio Plan Beats Our C. R., Anyway

The chamber of deputies of the Argentine republic (corresponding to our congress) has taken steps to make the public listen to their proceedings whether the public wants to do so or not.

The system certainly is an improvement on our own Congressional Record, which is printed daily and never reaches the people.

A broadcasting station has been installed in the chamber at Buenos Aires in which the deputies meet. Debates are broadcast and trucks equipped with receiving sets and loud-speakers are stationed from point to point around the city to pick up these debates and pour them into the ears of such of the citizens as chance to be on the streets.

Keep Secondary Leads Apart to Kill Capacity

Capacity between the secondary coil leads causes considerable trouble in receivers when the wiring is done improperly.

Keep the secondary leads as far away from each other as practicable and, if possible, at right angles, to each other. Secondary leads are those that run from the tuning unit to the grid condenser and the "B" battery.

How to Build "Old Reliable," the Editor's Own Personal Radio Receiver

THIS is the third of a series of articles on "Old Reliable," the editor's personal hook-up of the Armstrong three-circuit regenerative receiver. Next week a different design for the cabinet will be illustrated and wiring details given.

By IVERSON C. WELLS
(Radio Editor, The Chicago Post.)

LAST week I promised you I would give you full construction details on "Old Reliable." I am going to disappoint you. I am showing you, instead, another layout and panel arrangement.

I do this because in the first article on the Armstrong three-circuit regenerative receiver which was published Dec. 13, I showed the original "Old Reliable" that graces my own table. It was built along the lines of the set illustrated today. Many started to build that receiver, procured the parts and waited for further details. Next week I will take up the details of the panel and layout which was printed last week.

The receiver and two stages of audio-amplification which are illustrated on this page occupy a panel space of thirty inches in length by eight inches in depth. It is the popular form and appeals to many phans.

The accompanying pictures show pretty clearly the general arrangement of the parts. The two condensers and the variometer and variocoupler occupy the right hand end of the panel. The two stages of audio-amplification are built on a sub-panel at the left. By placing the transformers underneath the tubes a closer hook-up is possible, and, since short leads are one of the requisites of this hook-up this feature is not to be ignored by the home-builder.

The parts used in this set are the same published in previous articles. The two condensers are Kellogg's. The one in the aerial circuit is a plain forty-three plate. The one in the grid circuit is a vernier Kellogg, also forty-three plate. The variocoupler is a Michigan and the variometer is a Kellogg. The two transformers are All Americans—the first stage being five-to-one ratio and the second stage a three-to-one ratio.

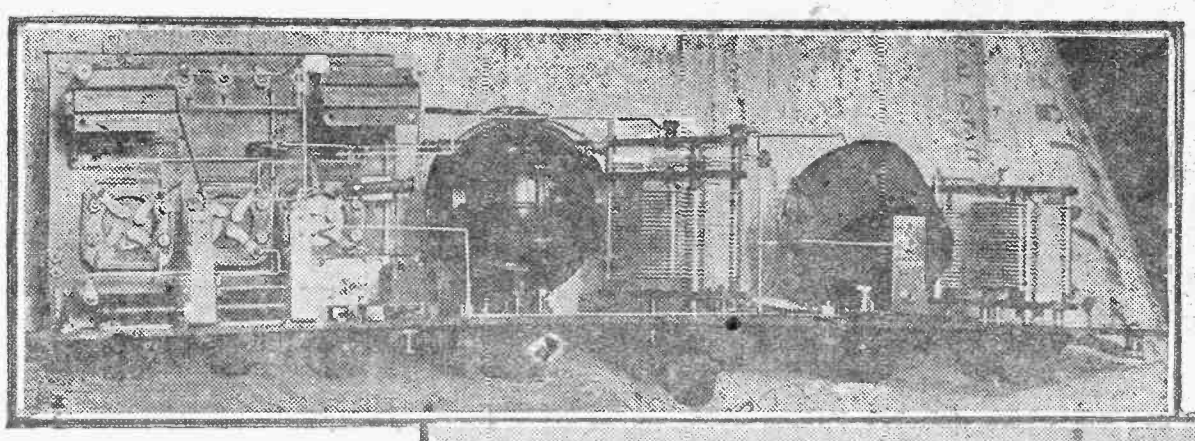
The detector is a C-300 and the two amplifying tubes are VT-2, but may be C-301-A or UV-201-A.

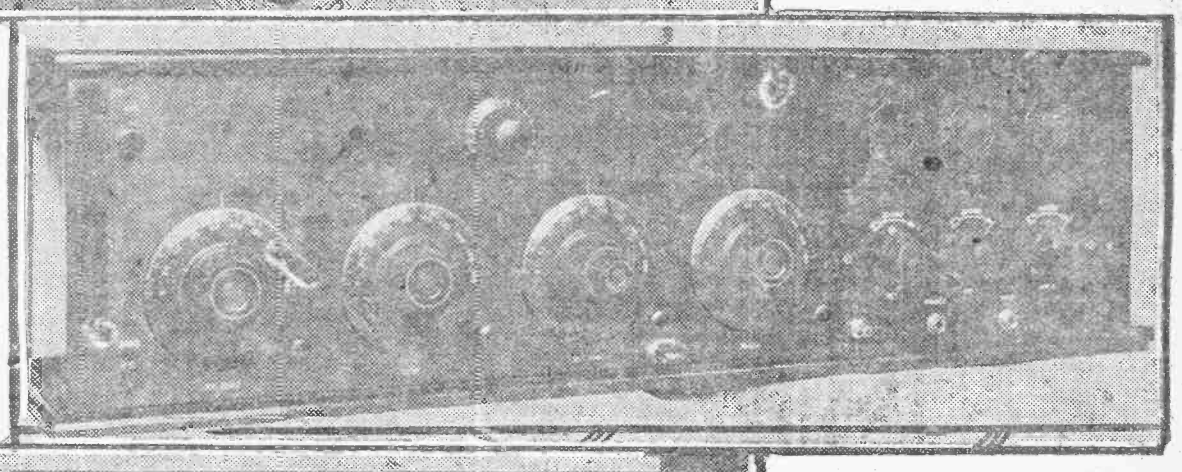
Proper spacing of the parts, especially in the radio-frequency end of the circuit, absolutely is necessary, if one is to have a noiseless, nonhowling receiver, with extreme selectivity. Note the spacing between each instrument at the right of the receiver.

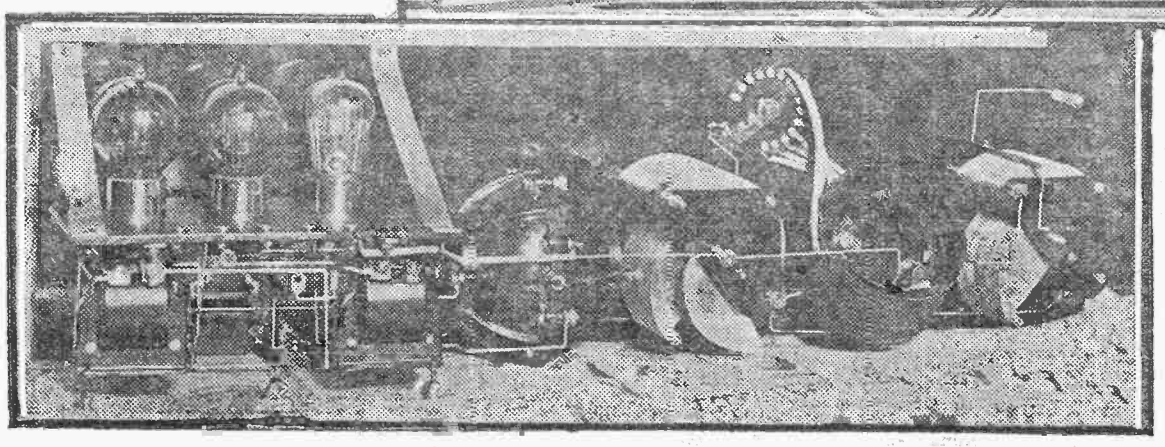
The audio-amplification end of the circuit is just to the reverse. Here short leads are demanded and all the parts are closely coupled. The transformers, however, while being placed close to the tubes and rheostats, are kept far enough apart to prevent trouble from magnetic interference. This danger is further guarded against by having the instruments mounted at right angles to each other.

The set illustrated this week was designed and constructed for Arthur Wilkus, 5853 Calumet avenue. Mr. Wilkus has been having the usual Chicago radiophan's trouble with local interference and had an "Old Reliable" built to solve his problems.

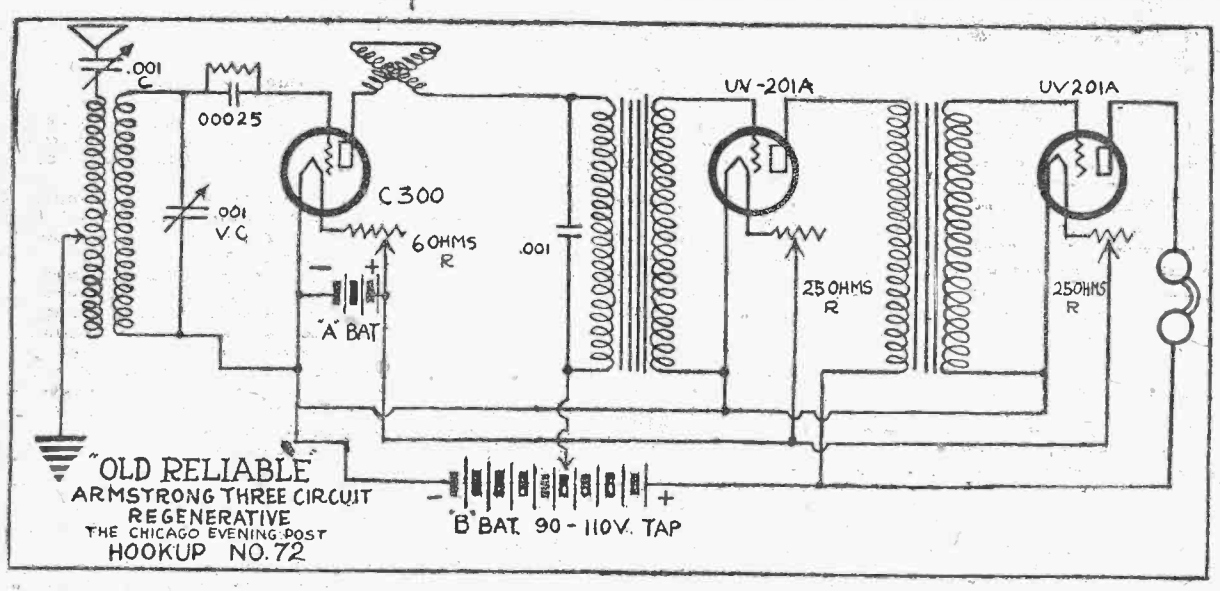
Next week's pictures of the set for which the panel layout was given last week will be published in these pages. It uses the same parts as were used in the Wilkus receiver. The set to be pictured was designed and built for C. L. Hays, 9957 Winchester avenue. I have some interesting facts to relate about both of these receivers and the work they are doing in their new homes.







This is an "Old Reliable" two-stage receiver designed and built for Arthur Wilkus, 5853 Calumet avenue. The top photo shows a bottom view of the receiver. A direct rear view is shown at the bottom.



How to Shield Set Against Body Capacity

Shielding a panel and grounding this shield eliminates "body capacity."

Cover the rear of the panel with a coating of shellac thinned down with wood or denatured alcohol. Procure a book of aluminum leaf such as is used by sign painters. Lay the leaf on the panel while it is still "sticky." Cover the entire surface. Smooth out the aluminum with a cloth, a photographers's roller or a small rubber window dryer.

Allow the leaf to set overnight. Remove all surplus leaf with a soft cloth rubbed over surface gently.

Now drill the holes in the panel as usual. Cut the aluminum leaf away from the holes so the instruments, when mounted, will not touch it. The coating is grounded to the earth post of the set.

Rockford Station Heard 1,000 Miles in 21 States

While WIAB (Rockford, Ill.) is only a 50-watt station and radiating 3.4 amperes, it has been heard in twenty-one states within the last five weeks. It is reaching out regularly distances up to 1,000 miles. The transmitter is a 50-watt oscillator and the modulator also is 50 watt, with a suitable amplifier. This station broadcasts Monday nights at 9 o'clock, Friday nights at 8 o'clock and Sundays at 12:30 p. m. The Joslyn Automobile company operates the station.

CORRODING BATTERIES.

Coat the terminals of storage battery with vaseline. This stops corrosion.

Builds More Radio Lighthouses

Experience with the revolving radio lighthouse at Inchkeith has been so successful that two new stations on the same system are to be erected by the British government.

Three-foot Radio Waves

Experimenters in England are working with transmission of signals over radio waves as short as one meter. These very short waves have been produced previously in laboratories, but have had only a scientific interest.

ROOF AERIALS GROUNDED.

An aerial built over a tin or metal roof is no farther above the ground than its distance from the roof.

Some Hints on Laying Out Parts for Receivers

In starting out to build a receiver, the parts should be procured first. Then design your panel accordingly. It is wise to draw on a stiff piece of cardboard the size of your panel. Put center holes in first and then when the right angles of your instruments are determined, draw in the mounting holes.

Place your instruments so as to make wiring as short as possible. Grid and plate leads should be short and far apart from each other. A little more time spent in the designing of a set will give a more pleasing appearance to the eye as well as better results in receiving.

Multiple Circuits Tune Hard

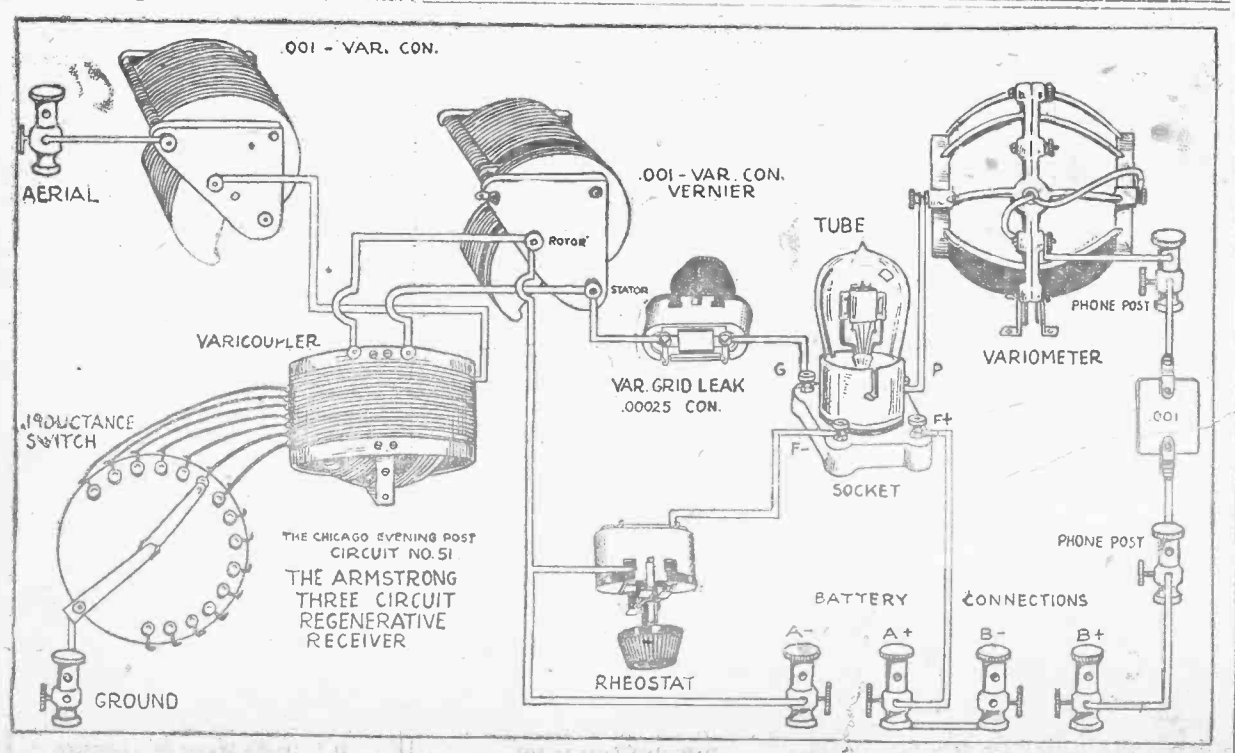
The reason a two or three-circuit tuning receiver is more difficult to tune is that each of the circuits must be in tune simultaneously before signals are heard.

Home Engraved Panels

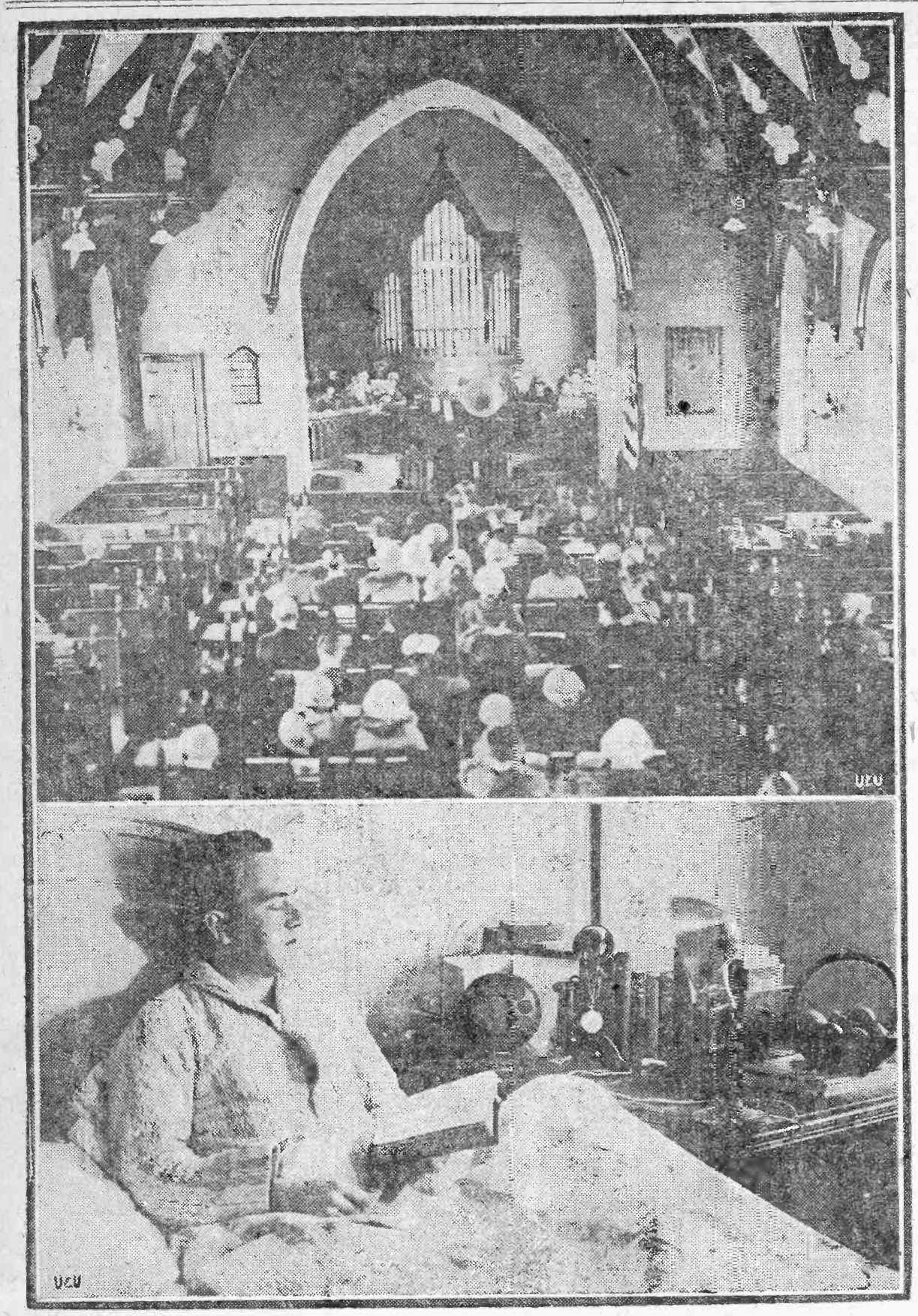
Panel engraving is a luxury only few can indulge in because of the scarcity of firms that have facilities to handle this work. But professional-looking dial markings and battery connections can be made by any inexperienced workman. Mark figures desired with pencil on panel. Then, using a sharp-pointed tool, follow the lines made, scratching fairly deep. After this is filled with Chinese white or artists' opaque a surprisingly fine-looking engraving results.

LOCATION MAKES DIFFERENCE.

Different localities make a difference in receiving sets. A receiver may work fine in one location, but prove a failure in another.



Pictorial diagram of the "Old Reliable" Armstrong three-circuit regenerative receiver.



Altho the Rev. J. L. Zengirth of the First Presbyterian church of Chestnut Hill, Philadelphia, was ordered to bed by his physicians, it did not prevent him from delivering his regular Sunday morning sermon to his congregation one Sunday recently. This photo shows the interior of the church, with radio-amplifiers on pulpit, thru which the minister's sermon was delivered from the pastorage.

Crystal Set Brings In DX Stations

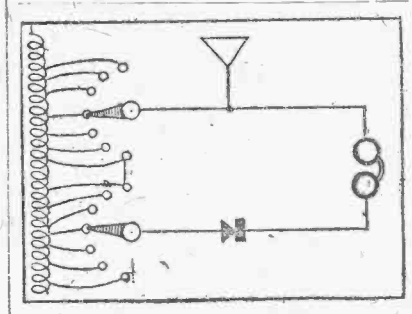
Howard F. Graebke, 448 North Ashland avenue, Chicago, brings in long distance stations many owners of tube sets would be proud to log. His circuit is shown in the accompanying diagram. Here is what he says about it:

RADIO EDITOR: Just to let you know what I have been getting on my crystal set. On a Monday evening I have heard the following: KDKA, Pittsburg; WTAS, Elgin; KSD, St. Louis; WCBD, Zion; WOS, Jefferson City, Mo., and also WOAW at Omaha. Not so bad, what?

My hook-up consists of fifty-six turns of No. 22 wound on oatmeal box, tapped at every single turn six times, and every tenth turn five times.

I don't like to brag about anything, but I honestly heard these stations on this set. You will note where the detector is placed; this makes quite a difference in putting it in the ground instead of aerial part of circuit.

The circuit submitted is simple and any small boy could hook it up at a cost of only a few cents. The Post has not tested the hook-up and is giving it for whatever value readers may attach to it.



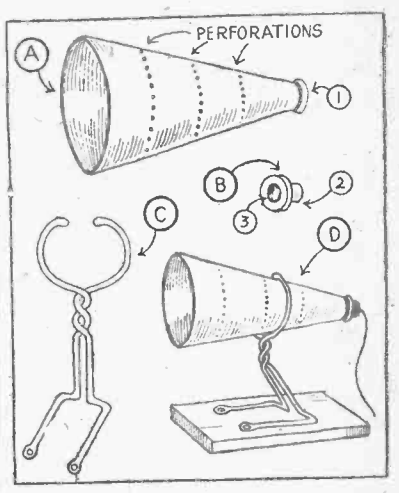
Long-distance crystal hook-up.

Homemade LoudSpeaker at Cost of $6

A most efficient loud speaker, possessing exceptional tone qualities and free from the tinny sound or blasts characteristic of many of the high-priced horns, can be made by anyone at a total cost of $6.

The material necessary for construction consists of a twelve or fourteen inch fiber megaphone, such as college boys use (40 cents); a rubber phone adapter (50 cents); a wire coat hanger 10 cents); a Baldwin unit ($5). Some old battery wax (scraps) and a block of wood (scraps).

First perforate the horn, as shown in illustration, with three rings of small holes. This prevents any pos-



sible vibrations (see figure A in illustration). If the horn is made from good fiber this will not be necessary. The horn should be shellacked if it does not come that way to you. This keeps out the moisture and preserves tone qualities.

The rubber phone adapter (fig. B), probably will be too small for the horn. Fit the end (3) into the small end of the horn (1) and fill the space with melted sealing wax or wax taken from an old "B" battery. This will also act as a binder for the adapter, holding it firmly into place.

Insert the Baldwin unit, or any other good loud-speaker unit, in the other end (3) of the phone adapter.

With a pair of pliers bend and shape the wire coat hanger into the design shown in figure C. One end forms the clamp for the horn and the other acts as claw feet to attach to the baseboard.

The baseboard should be at least an inch in thickness and twelve inches long by six inches wide. It may be smoothed, stained and polished if desired. Screw the claw feet of the spring wire support (C) on the board and insert the horn as shown in figure D.

The editor of The Post Radio Magazine made one of these speakers one evening more than a year ago to answer in an emergency and has never found a horn that excelled it in purity of tone, so he has kept it at work ever since.

Uses Portable Transmitting Set at WGY

A short-wave radio transmitting set which may be transported to the scene of church services, concerts, dramatic performances or lectures, as easily as a motion-picture cameraman is sent on news-weekly assignments, has been introduced as part of the broadcasting equipment of WGY, the Schenectady station of the General Electric company.

This set is not used to broadcast directly to the listener, but is a radio relay which conveys the program to the broadcasting station. This first radio transmission cannot be tuned in on the average radio receiving set.

The portable transmitting set is conveyed to the hall or church from which it is desired to broadcast an entertainment or sermon. Wire connection is established between microphone or pick-up within the hall or church and the transmitter of the portable set outside. The wavelength is too low to interfere with the usual receiving sets or broadcasting stations and it is also so low that there can be no interruption from spark transmitters by armatures.

How Waves are Caught.

By means of a sensitive receiving set located near WGY, the electrical vibrations into which speech or music has been converted are picked up, amplified and then conveyed to the main transmitting equipment of WGY, from which the program is put on the air on the licensed wavelength of the station, 380 meters.

Prior to the introduction of the radio relay it was customary for WGY to connect church and radio station by wires. Wire installations required considerable preparatory work and because of the time involved in making the necessary installations some programs that might have proved instructive and enjoyable had to be omitted.

Rebroadcasting does not affect the quality of music or speech. WGY has made frequent use of the radio relay methods and the listeners were at no time aware that a radio transmitting set working on a low wave length had supplanted the wire link in the system.

What Relay Means.

There is another and even more important use for the small transmitting set in radio relay and this use suggests a particularly interesting development for radio in the future.

In the relay now in common use at WGY, the small station is used to feed into the larger transmitting set thru the introduction of a receiving set between the radio links. It is possible that the future will see many of these small transmitting sets scattered about the country and used to re-radiate on lower wave lengths, concerts received on a sensitive receiver from any one of a half-dozen main stations, for the benefit of listeners with crystal sets or short-distance receivers.

For example, such a receiving set might pick up the best of the WGY program from Schnectady and then a special feature from WJZ or other station, and by the use of the transmitter re-radiate to the countryside within a limited distance of the station.

This would give the man with the small receiving set the advantage of listening to a selected program, the best of the main stations. In this manner he would be able to get programs and to get music that would not otherwise be available to him on his set.

How Broadcasting Stations Use Two Wavelengths in Transmitting

Experimental work designed to tie up radio broadcasting stations together for the purpose of sending out a single program simultaneously by means of radio intercommunication is being carried out in several parts of the country. This experimental work primarily is designed to eliminate the necessity of using costly land line connections.

So far the experiments have taken two distinct lines—first, by having the master broadcast radio station radiate on two different wavelengths, one for local broadcast reception and the other to control the distant broadcasting station which is to radiate the same program at a different wave length, and, second, the employment of mobile broadcasting stations as pick-ups for special programs that are being given at points some distance away from the studio of the main broadcasting station.

Wilson's Speech Picked Up.

In this connection a very interesting incident occurred at the time that former President Wilson was giving his Armistice day message from his home in Washington. In this particular case the Washington station, WCAP, and the New York station, WEAF, were both directly connected to Mr. Wilson's home by means of ordinary telephone wire connections. His speech was radiated by these two stations.

While this was being done the operators of station WGY, in Schenectady, picked up, by means of a very sensitive radio receiver, the speech that Mr. Wilson was giving, passed it thru special input amplifiers, and reradiated it on the 380-meter wave of WGY.

The result was that many owners of crystal sets within the range of Schenectady were able to hear this speech and are probably yet under the impression that they were receiving direct from WEAF—more than 150 miles away!

It is now an open secret that mobile broadcasting apparatus has been developed at the Schenectady plant and is being used for the purpose of extra studio work. That is, the mobile plant will proceed to a distant point where the program is being given, place its microphones at the most convenient points and radiate direct on very short wave lengths. This broadcast will be picked up in the operating station of WGY and impressed on the regular transmitter there and radiated for the benefit of the fans within receiving distance of WGY.

Still Experimenting.

This system, of course, is still in an experimental stage, altho it is giving very practical results. It does away with the necessity of making a special wire connection between the main station and the point where the program is being given. Since such telephone connection must necessarily be very clear and, in fact practically perfect, a great saving is assured without the possibility of any interference with regular broadcast work.

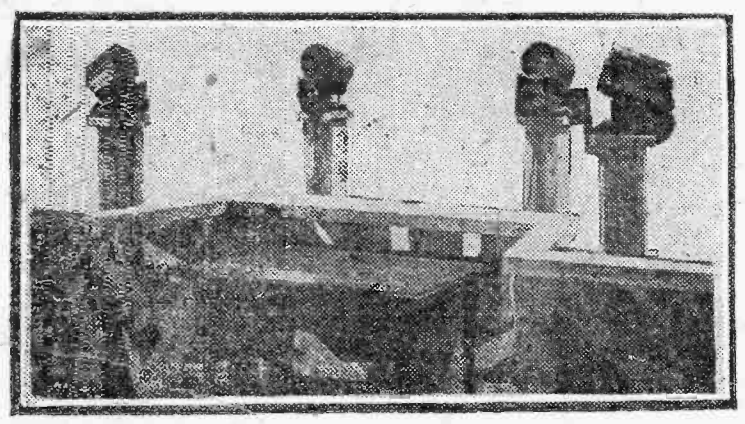
The other form of radio tie-up between broadcast stations is being developed by the Westinghouse company thru station KDKA, at Pittsburg. This station is being used as the master station in a network system that is being gradually developed.

Two additional units have already been established—one in Cleveland and the other in Hastings, Neb. The dual radiation from KDKA is by means of the regular wave and a secondary wave of 100 meters, which is picked up by the Cleveland and Hastings stations and used to control their transmitting apparatus.

As this system develops, the plan is to have the subsidiary stations also radiate two waves—one for normal broadcasting to the fans within hearing distance, and the other on an extremely short wave length, which in turn will control some other distant broadcasting station.

If this plan materializes according to expectations it will be quite possible, in the near future, for one single broadcasting station to control another system located at strategic points thruout the country, so that a single program can be heard by practically everybody with a receiving set in the United States.

There is no reason why the two different systems cannot be used in conjunction with each other—one as a pick-up for the program, and the other to control all of the broadcasting stations which will radiate it.



NEVER ...re, in Canadian history, did such a bevy of parliamentary satellites ever gather before a microphone as on the evening of Dec. 6. The illustration shows four microphones (below which are seen the smaller loud-speaker microphone) installed in the military drill shed on Craig street Montreal, before which spoke the Rt. Hon. W. L. Mackenzie-King, prime minister for Canada; Sir Lomer Gouin, minister of justice; Hon. George P. Graham, minister of railways; Hon. L. A. Taschereau, premier of Quebec, and others. The speeches were delivered before an audience of 10,000 persons within the hall and 7,000 outside—listening-in thru the loud-speaker devices—and over 500,000 thru station CKAC, La Presse, Montreal.

The installation was made by the Marconi company of Montreal, under the direction of J. S. Thompson, chief engineer of the company, and J. M. Cartier, director-announcer of station CKAC.

Here Is a Two-Stage Amplifier for Hagerman's Long-Distance Crystal

ON NOV. 28 Mr. Hagerman published in these columns a hook-up for a long-distance crystal set. It has given such wonderful results that there has been a clamour for an amplifier. Today Mr. Hagerman gives a design for an amplifier that is particularly well adapted for the crystal hook-up.

By LEWIS B. HAGERMAN.
(Radio Technical Editor, The Post.)

THAT long distance crystal hook-up I gave you a few weeks ago in these columns seems to have made good. I knew it would. I knew it because I had given the circuit a tsvgut of several months and I was positive as to its achievements.

However, now that everyone is pulling in coast to coast stuff—almost, mind you, almost—the real crystal phans are wanting to know if it can be AMPLIFIED.

Why not? Anything that can be detected can be amplified. That's a proven fact.

However, amplifying crystal detectors is a luxury. It is only the real crystal phans that would want to do that. Look at it this way: If you have got to invest in two vacuum tubes and two transformers and batteries for an amplifier why not also go just a step farther and put in a tube and socket for a detector as a substitute for the crystal?

I can see you crystal phans smiling. Say, when a crystal phan is a crystal phan, he is such because he is riding a hobby—not an economy.

Well, let us go to the amplifier:

I have been working for some time on a special amplifier for this crystal set. It had to be just a little different than the usual hook-up because we had to exploit the surprising sensitiveness and clarity of the long-scorned crystal.

LEWIS B. HAGERMAN.

At first glance you will take a snap judgment and say this amplifier is not different from the usual hook-up. True—in most respects. But, give it the closeup look and you will note that there are some peculiarities about the parts employed and that also I have worked in some other little wrinkles.

Understand, first of all, that crystals naturally are not long-distance getters. They are rather timid when it comes to station signals that go beyond the sound of your voice. Therefore, one must proceed gingerly. You have to coax and plead with a crystal. Perhaps, that is what you and I like about the dainty little bit of mineral.

Anyone can bring in DX with half a dozen tubes, a search warrant and a dynamo. However, it takes a real crystal phan to forget that DeForest and Fleming ever lived and work back among the days when Cleopatra was singing siren songs to Marc Antony.

This amplifier surpasses the majority of three-tube sets in clarity. A peculiar fact that many people have noticed is that the set even when it is not as loud as a tube detector set can be heard and enjoyed two to three times as far from the loud speaker. I attribute this to the fact that every syllable of speech and every note of music is round, mellow, clear, and distinct, being absolutely void of tube noises, howls, hisses and crackling sounds.

With the original set and this amplifier stations more than 700 miles away have been heard on a loud speaker. The parts constituting its construction are inexpensive but efficient. The transformers are of low ratio. This insures no distortion. They also have extremely short grid leads.

The layout is so designed that it can be used on any set whether crystal or otherwise. A 7x9 panel was used to match the long distance crystal hook-up I gave you recently.

For the phones only one jack was provided. This was done so that it could be tuned in on one stage of amplification and then thrown in on the loud speaker from the third. This arrangement permits simple wiring as you can see by the accompanying pictorial diagram.

The panel layout depends on the style instruments you use.

On the panel are mounted two rheostats, four binding posts and one bezel, or peephole. The arrangement used is optional but should be planned with the view of making the wiring as simple as possible.

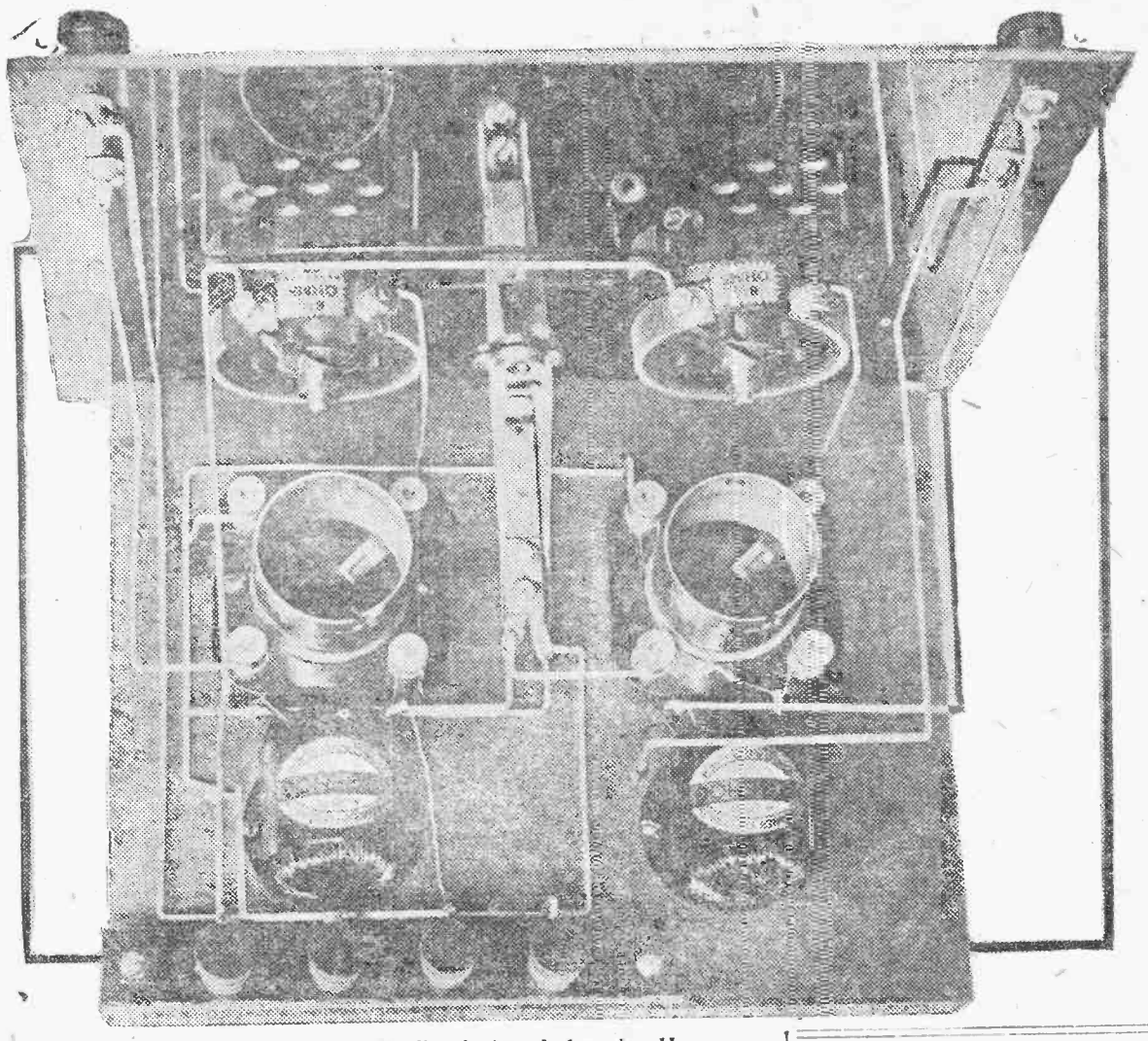
After drilling panel and mounting apparatus start wiring by connecting filament leads to rheostats, sockets and from rheostats to socket. Next comes the transformers. Some care should be taken here to keep the leads separated and to prevent shorts. Great care should be taken on the jack. Be sure to run both leads from the primary or "P" of the second transformer to the two center prongs. The "B" battery leads, are comparatively easy and clearly shown.

Tune-in with phones in jack and both tubes on because, if the second tube is lighted after the set is tuned, it will spoil the adjustment. Be careful on local stations because the volume is apt to hurt your ears.

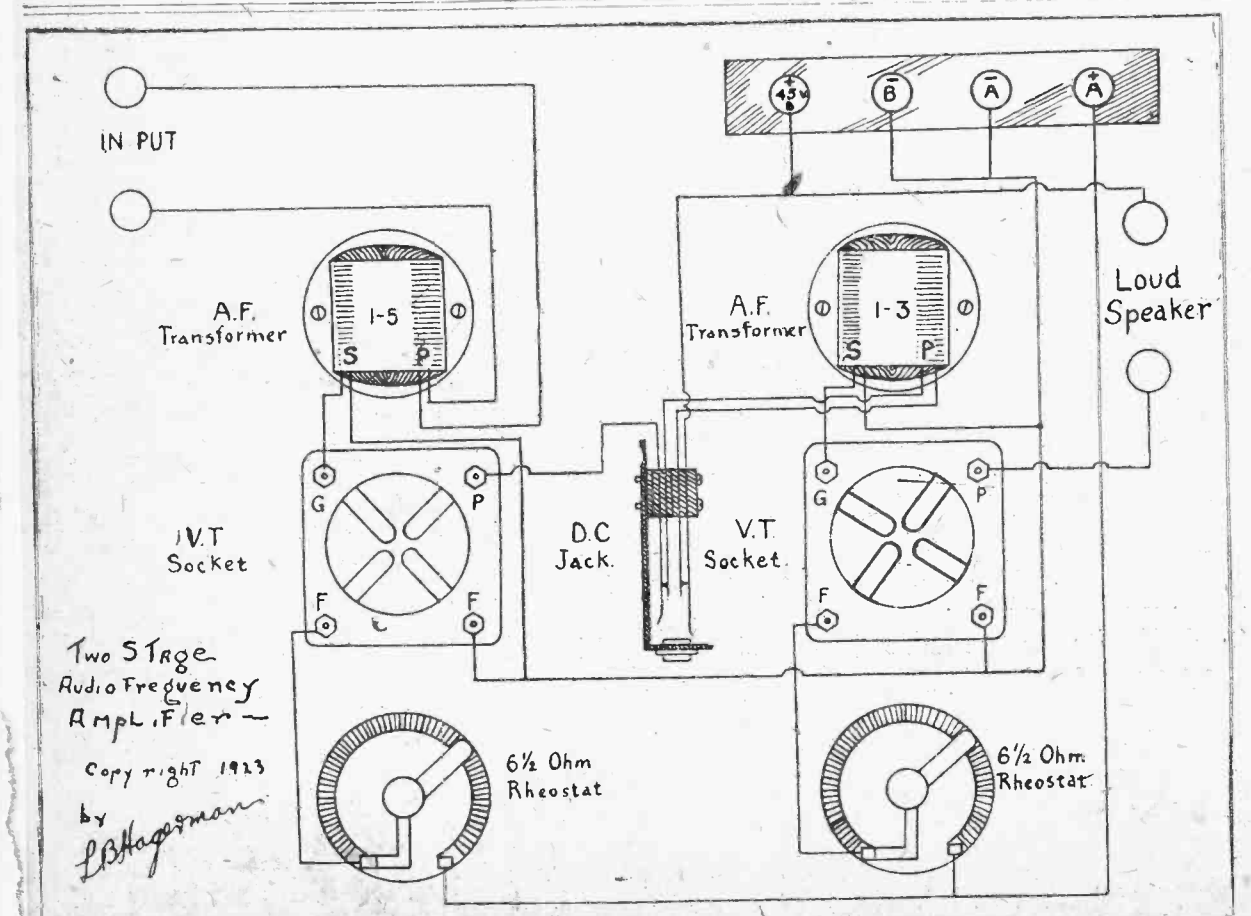
The results I have obtained with this long distance crystal have been no less than amazing. During the last week I have had the following stations come in loud and clear on my Baldwin speaker:

WOC (Davenport, Iowa), KDKA Pittsburg, Pa.), WGY (Schenectady), WOS (Jefferson City, Mo.), WCBD (Zion, Ill.), WTAS (Elgin, Ill.), WSAI (Cincinnati), WWJ (Detroit), WHB (Kansas City), WHAS (Louisville), and all local stations.

Of course with the phones many stations within a thousand miles come in clear and distinct.



Two-stage audio-amplifier specially designed for the Hagerman long-distance crystal set. Note the compactness of the hook-up. Hedgehog transformers are used because of their low ratio and their adaptability to short grid leads.



Pictorial diagram of the Hagerman two-stage amplifier for the long-distance crystal set.

Batteries in Use Must Not Be Placed on Charge

Many people use storage battery chargers on their sets, but do not like to charge the batteries during the evenings. Tubes have been blown because the owner of the set has been negligent in charging his battery and finds in the evening when he wants to use his set that the storage battery is so low that it is impossible to operate it. Consequently, he has placed the battery on charge and at the same time tried to operate the receiver, with the result that the tubes "went west." If your battery needs charging, charge it, and do not try to operate the set while it is on charge—unless from a spare battery kept for that purpose.

Reception Underground

Several ambitious young experimenters recently conducted a series of interesting tests with a reflex set in a moving subway train. At forty feet below the street level, using a three-tube set and a loop aerial, four local stations were brought in on the loud speaker. This proves the theory that radio waves permeate the earth as well as the air.

How to Hook Up 18 Circuits in Test for New Combinations

By R. H. LANGLEY.
(Radio Engineering Department of General Electric Company.)

ONE of the most fascinating things about radio is that it provides such a fruitful field for experiment. The art is young, and there are many questions yet to be answered. The apparatus for the study of these problems already is planted in millions of American homes, and this paper is addressed to those who find pleasure in trying new circuit combinations.

With a small selection of the standard apparatus, it is possible to arrange many interesting new combinations that are not given in the instructions. I shall give a list of the apparatus needed for the combinations to be described later, and it might be well to make mental note of the items which you do not have:

Two single-circuit regenerative tuners.

One vacuum tube detector and two-stage amplifier.

One three-stage radio amplifier.

One variable air condenser.

One 6-volt storage battery, or

Six No. 6 dry cells.

Four blocks of plate battery, 22½ volts each.

One three-cell flashlight battery for bias, 4½ V.

One homemade loop antenna.

Six radiotrons, UV 201, UV 201-A or UV-199. Outdoor antenna and ground connection.

The loop will consist of eight to ten turns of almost any kind of copper wire, wound at ⅜ or ½ inch spacing on a wood frame 3 or 4 feet square, and arranged so that it may be rotated on a vertical axis.

In all the circuits to be described, a UV-200 soft detector tube may be used, if suitable arrangements are made for obtaining the correct plate voltage.

Many Combinations Possible.

With the apparatus just enumerated, there are at least eighteen different receiver circuits possible. Some will be very sensitive, some highly selective and some both selective and sensitive. Some will be suitable for use in congested districts, some will be preferable in rural districts, some will function best for near-by stations and some for distant stations. It is not possible, of course, to give diagrams of these circuits, but we can classify and describe them so that the possibilities of the various combinations may be seen.

Let us divide the eighteen circuits into five classes:

First, on the outdoor antenna without radio amplification.

Second, on the outdoor antenna with radio amplification.

Third, on the loop antenna.

Fourth, using both the outdoor antenna and the loop, and

Fifth, some special arrangements.

In the first class, that is, on the outdoor antenna without radio amplification, we can list seven different combinations. Two of these are regenerative; the other five circuits are not regenerative. This, of course, means a great deal in signal strength, particularly on the more distant stations, but for the sake of making the list clear and easy to remember we will take them all together.

The seven-circuit arrangements possible on the outdoor antenna without radio amplification are as follows:

1. Single-circuit tuner, using crystal detector.
2. Single-circuit tuner, with vacuum-tube detector amplifier.
3. Single-circuit tuner, with detector amplifier and the regenerative connection.
4. Using the outside condenser to make a two-circuit tuner.
5. Using two tuners to make a two-circuit tuner.
6. Using two tuners to make a three-circuit tuner.
7. Using two tuners and the external condenser to make a three-circuit tuner, with all three circuits tuned.

Connecting the Tickler Coil.

There are two ways of using the external air condenser to make a two-circuit tuner. We may connect the variable condenser across the tickler coil to make a secondary circuit, or we may connect the condenser in series with the tickler coil to make a primary circuit.

In using two tuners to make a two-circuit tuner, the tickler coil of the first tuner is used as a coupling coil and connected to the input terminals of the second tuner.

In using two tuners to make a three-circuit tuner, the two tickler coils are connected together to form the third or link circuit. If we connect the variable air condenser in series with the two tickler coils, we can then tune this intermediate circuit.

The second class of circuits were those on the outdoor antenna with radio amplification. For these we use our three-stage radio amplifier and insert it between the tuning system and the detector amplifier. This may be done on any of the seven combinations which we have just noted, except possibly with the crystal detector.

In the third class we use the loop antenna. There are several combinations here; let us notice only two. The first is the straight loop circuit where the variable air condenser is connected across the loop and then connected to the three-stage radio-frequency amplifier and from this to the detector audio-amplifier. The second combination, which by the way is a very interesting one, provides a method for using the loop in a regenerative circuit. This uses the loop and one of the single circuit tuners, then the radio-frequency amplifier and the detector amplifier.

Many Possibilities Here.

The fourth class uses the antenna and the loop in combination. There are also several possibilities here. The best one, perhaps, consists in connecting the antenna and ground to one of the single circuit tuners. The loop and variable air condenser are connected to the three-stage radio-amplifier and the detector amplifier in the usual way. These are two independent circuits, the only connection between them being that the tickler coil in the tuner is connected to the tickler terminal on the detector amplifier. This combination is quite remarkable in performance. The antenna circuit is brought into resonance with the signal by means of the tuner and the loop circuit picks up energy from this tuned antenna circuit. The reactions obtained by the tickler coil connection make it possible to successfully eliminate very loud nearby stations.

In the fifth class, let us notice two stunts. The first one consists in amplifying the signal obtained from the crystal detector, by connecting in such a way that the output of the crystal detector goes thru the primary of the first audio frequency transformer. No batteries are needed in the crystal detector circuit. This is a very fine way of obtaining excellent loud speaker singals from nearby stations. The second stunt is the use of a grid bias and a higher plate voltage on the amplifier tubes. Open the grid circuit and insert a small flashlight battery of say 4½ volts between the grid and the filament bus. The negative end of biasing battery should be connected to the grid and the positive end to the filament bus.

Higher Plate Voltage.

It is then possible to use very much higher plate voltage on the amplifier tubes, with the result that considerably greater amplification is obtained with the same or even better quality of reproduction. With the UV-201, UV-201-A or UV-199 radiotrons, the plate voltage may be increased to 90 or 110 volts.

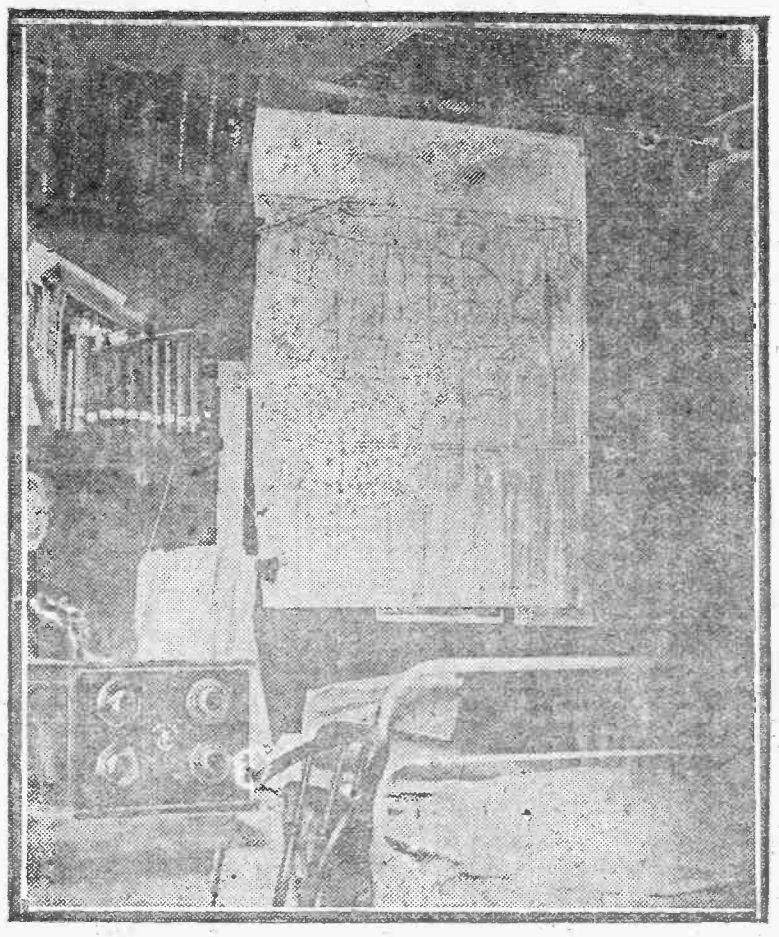
There are many people who imagine that the loop antenna is a substitute for the big out-door aerial and that the same results can be obtained from either. This, of course, is very far from the truth. There is a very fundamental difference. The aerial is a condenser. It is a very large condenser to be sure, so far as its physical dimensions are concerned, but it does not have a very large capacity. The loop, on the other hand, is an inductance. This means that the method of tuning the aerial is quite different from the method for the loop.

The same receiving sets will not work interchangeably on either. The single circuit tuners are suitable for tuning the antenna, but when we used the loop, we used a separate variable air condenser to tune it.

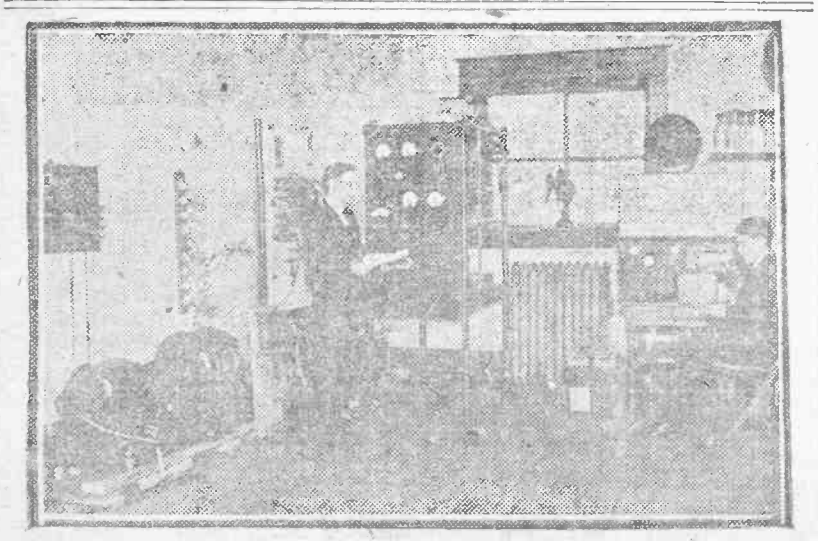
As to Choice of Tubes.

In these experimental combination receivers, it makes very little difference which tube we use. The main difference between the various tubes is in energy consumption in the filament, rather than in performance as detectors or amplifiers. Some are slightly better than others in this respect, but the main purpose of the newer types is to simplify the A battery problem.

The UV-200 and the UV-201 require one ampere filament current necessitating a storage battery. This is expensive and troublesome and requires frequent charging. The UV-201-A takes only one-fourth of an ampere and can be operated four times as long as one charge of the battery. It may also be operated from dry batteries. The UV-199 tube takes only six-one-hundredths of an ampere and can be operated from dry batteries with great success.



This is the little cell in the state prison at Concord, N. H., where Convict No. 472 keeps closely in touch with the outside world thru his radio. The copper screen above the map is the prisoner's antenna, and he grounds his set to the cot. He has received from more than fifty stations, including Montreal and Havana. It is the only thing that keeps him in touch with the outside world.



Here is the broadcasting station at the University of Illinois. Our photo shows the broadcasting studio, transmitter and power-room all in one. All college sport events and activities are broadcast and have been picked up all over the country.

Dr. Pratt Calls Chicago Huge Fixed Condenser

A theory has been suggested by Dr. H. Preston Pratt, the tube inventor, that the whole city of Chicago is a huge fixed condenser. The electric light wires, power wires, and steel structures form the positive plate and the earth make the negative plate. Air is the dielectric.

Dr. Pratt further states that this is the cause of local interference and long-distance crystal reception. This theory has not been proved, but is from an interesting viewpoint and worthy of consideration.

"Othello" to Be on Radio

For the second time this season KYW will broadcast the opera "Othello" Wednesday night, Jan. 2. The cast will remain virtually the same. One change is being made. Schwarz will take the place of Rimmi, who sang the barytone roll two weeks ago.

Norway Opens Station

A new short-wave broadcasting station has been opened at Christiania, Norway. It transmits on a wavelength of 390 meters, the shortest wave in use so far on the continent of Europe.

Places Where Slip-Ups Occur in Home-Built Sets

Every once in a while a howl of disgust goes up from some phan who has made a receiver or has had a friend, who has had such wonderful success with one of the same type, make one for him, says a writer in Radio World. The blame thing doesn't "perk."

The same circuit has been used, and maybe the original wiring on the successful receiver has been copied, but—nothing doing, or else what is doing is so weak that you look in derision on all radio experimenters. Of course, you or your friend followed the plans exactly. You may have followed them to the letter, but it is not the circuit that is at fault, nor the workmanship, but the apparatus used.

Every fan likes to keep the cost down. Every production cost is subject to a final revision, when it comes time to buy the parts and you are persuaded that "Oh, sure! The others charge more, but this is just as good. I just finished a set using them and they work."

When Trouble Comes.

Probably one of the most common slip-ups is in the purchasing of condensers, both fixed and variable. Your friend in constructing his own set probably used a well-made mica dielectric type of condenser that was finished in a moulded case, or a pressed metallic case. Did he use a cheap-looking paper condenser on yours? If so, change it! Are you using good variable condensers? There is a type that uses well-moulded, shiny-looking composition. It looks pretty, but examine the plates, their spacing, their bushings, their method of fastening. Is the shiny composition moulded bakelite, or just a tar composition which is made to look pretty, but which has a low dielectric value, and consequent high losses?

Is your grid leak the best that you could get? Is it the proper value for the tube you are using, or is it just one picked at random from any number of values?

Are your connections all well soldered? Is it a neat job? Or has the soldering paste run rambling down all over the wires, forming shorts and leaks?

Are you using a good socket? Do the prongs make positive contact with the lugs of the tube?

Making Sets Uniform.

These are just a few questions to ask yourself when trouble arises in your new set. A manufacturer always turns out a uniform product because he always uses the same make of apparatus. He tested out numerous makes first, found the best and then bought quantities of them so that all his product would be the same.

Test your condensers. If you can squeeze them there is a liability that they are poor. If the plates of your variable condensers are of thin, paper-like aluminum or brass, there is a great chance that the entire condenser is poor. Variable condensers should have sturdy-looking plates, well made or pressed spacers, machined bearings and uniform spacings. A condenser is made for hard use, probably harder and more constant wearing use than any other component part of the machine, so get one that is sturdy.

Be Careful of Shielding.

Maybe, in the zeal of construction, the panel has been shielded. Every back inch of the panel surface is carefully covered with a nice, smooth layer of tin foil or sheet metal. When mounting your apparatus on this nicely shielded panel have you taken care to see that none of the screws or parts touch it?

There is also the chance of poor inductances. Have homemade coils been used? They look nice, in their shiny coat of shellac, which is probably the worst thing that could happen to a coil designed to work in a radio circuit. Maybe larger coils than necessary have been used or neat bank-wound tapped coils and couplers have been incorporated in the set. Do the specifications call for such windings? An extra hundred turns or so of wire on a coil may look dangerous, but the "dead-end" loss, or current lost by the extra wire in the circuit eating up the energy, will make itself known by signal strength loss or broad tuning.

Polly Lux, who adorns the "Vanities of 1923," and has reached such a stage of incurable radiomania that she has placed the receiver next to her bath, so her press agent avers. Can you beat it?

10 Golden Rules of Radio for Use of Listeners-In

There are ten good rules for broadcast listeners:

1. Don't try to hear Australia in mid-summer. Be satisfied to enjoy the nearer stations most of the time.

2. Don't be disappointed if an occasional storm interferes with your summer radio evening. There are many fine concerts coming. You can't expect to find a pearl in every oyster nor to receive a record-breaking concert every night.

3. If you want louder signals use a longer aerial, more tubes, higher plate voltage, more sensitive loud speakers and more careful tickler and receiver adjustment.

4. A pleasant signal filling a moderate-sized room should be enough to give satisfaction. It is not worth while producing signals which deafen the neighbors. It is wasteful to insist on tremendous signals which are generally less pleasant than moderate signals.

5. If your local station comes in too loudly and drowns others out, a smaller aerial will help in tuning him out, with a smaller condenser connected between aerial and ground. And if all measures to get rid of the local station fail, why not enjoy his concerts? He is working hard for you and it is nobody's fault that you are so close to him that you are bound to hear him. Broadcast stations have to be closer to some people than to others.

6. For the new longer waves about 450 meters, use a condenser connected between the aerial and ground terminals of your set.

7. A little patience in learning to handle your receiver yields rich returns in satisfaction from fine signals. Remember that "Rome wasn't built in a day" and keep on getting more and more familiar with your set and how it works.

8. It is a good idea to read the radio column of a newspaper, or a good radio magazine or two. It helps you to know how your set works and keeps you up-to-date in radio. Information of this sort is an aid in getting the concerts loud and clear.

9. Ask your radio dealer for advice; he can probably tell you what you want to know and will be glad to do so. The manufacturer of your set is also willing to help you get the desired results from its use.

10. Do not throw away the direction sheets or booklet that came with your set and with the tubes. Read all such material carefully now and then. If you have lost the direction sheets, write to the dealer or manufacturer for others. The direction sheets must answer most of the questions which have been puzzling you and preventing you from getting the best out of your set.

Questions You Ask and Answers We Give

WRONG HOOK-UP.

511—CHICAGO: I am using the inclosed hook-up and would like to inquire from you what all is wrong with it, and how it can most readily be improved. It was originally an ultra-audion, but I made certain changes and removed certain parts. The grid leak, for instance, seemed to have no effect whatever on the reception, so I removed it entirely, after trying it at various places and at all capacities from 0 to 5. The lead from the minus B to the ground had no effect either, so I removed it.

I have two stages of amplification, and am able to get the Chicago stations very distinctly (with head phones), and without interference one with another, but am unable to get outside of Chicago. The variometer is lattice wound, in a wooden frame, and has about 75 turns on the rotor, and apparently about the same number on the stator. The detector tube is a U. V. 200, and the two amplifiers are U. V. 201-a. I have a 6-volt storage battery and 90 volts of "B" battery. The detector rheostat is a 6-ohm Howard vernier, but the vernier is of no use, because I have to keep the rheostat turned on full to get the signals loud enough to be heard properly. The amplifier rheostats are 25-ohms and work best when turned on one-third to one-half full.

I am using 100 feet of 16-strand insulated wire for an aerial, strung thru the house, and sometimes permit twenty feet or so of it to hang out the window. Am living on the second floor of a two-family flat in Austin. The set works practically the same without any aerial whatever, as with the one I am using.

Will you please tell me (1) what to do to the set to get a fair degree of distance, (2) why the detector rheostat must be turned on full to get any volume, while the amplifier rheostats seem to work best when not turned on full, (3) whether radio amplification can be added, and, if so, how, and (4) give me the hook-up for a good nonregenerative set, preferably a reflex circuit.

The answers to your questions are as follows: (1) Rewire it as per the diagram mailed, (2) the hoop-up used was incorrect (3) radio-frequency amplification on a circuit of this kind is not advised, (4) a hook-up for a reflex circuit was given in answer to question 1, and use an outside aerial if possible.

NO GRID LEAK.

508—CHICAGO: I have been reading your radio magazine without a miss and find same very interesting and I hereby wish to take the liberty to ask a few questions. I am attaching hereto my crude drawing of the hook-up I am using, showing parts used. I find this set good for local stations, but I am unable to pick up any outside stations. Would be pleased if possible if you will advise any changes that will improve the set so as to increase the selectivity and volume.

I inclose herewith self-addressed stamped envelope if it meets with your convenience to favor me with a reply. With a cheer for your radio magazine.

To procure more distance, selectivity and volume from your set, would advise using a 43-plate vernier condenser in the ground circuit, 45 volts instead of 22½ on the plate of your detector tube, a 40 instead of a 30 ohm rheostat and a variable grid leak of from 1 to 5 megohms.

ANTENNA CONSTRUCTION.

506—CHICAGO: Please tell me what is the best attenna I could erect on a roof sixty feet long and about eighteen or twenty feet wide? I would like to know if Hagerman's crystal set could be improved. If so, how?

On a roof sixty feet long an aerial of two or three wires, spaced three feet apart and six or ten feet above all obstacles, would suffice. There is no method by which you can improve the Hagerman crystal set.

A. F. AMPLIFICATION.

505—EVANSTON: I wish to congratulate you on the wonderful radio section you put out every Thursday evening. It sure is the "berries." I have now struck a hard job in my set. I wish to add two steps of audi-amplification to my ultra-audion set. As I wish to use Carter pack and plugs, I would like you to show me how it is all hooked up in one cabinet. It is easy for me to make the two step in a cabinet and connect it onto the detector, but that's not what I want. I certainly would appreciate your making this hook-up for me, as I am thru with another Chicago paper. It's about three weeks ago I wrote them and have not heard one word. Somebody suggested your magazine to me, and now I write to you for some information. On the next page you will find the circuit. I have worked both coasts with this set. It sure is the wonder set, but I think later on I shall try the set which the radio editor of The Post has. I am going to use two circuit jacks on the first and on the detector and on the second step the single jack on the second stage. These are all Carter jacks.

A hook-up of an ultra-audion with two stages of A. F. amplification was mailed.

CRYSTAL HOOK-UP.

504—CHICAGO: Please send a general hook-up, or a diagram, of the Hagerman crystal receiving set. Do you think you could send me also a list of the parts needed and the approximate or average cost of a set like this, if I wanted to build it myself? I also am congratulating you and The Post Radio Magazine, and I hope it gets bigger and better than any other radio magazine on the market.

The hook-up of the Hagerman crystal set and list of parts necessary for its construction were mailed. Refer to question and answer No. 491.

"OLD RELIABLE."

503—CHICAGO: The "Old Reliable" is just what I have been looking for, after having been led astray on other circuits. (1) Is there panel space to use a Kellogg vario-coupler with diamond wound coil attached? (2) Also do you approve of a fixed induction coil, like the "Sleeper," which is claimed to tune from 150 meters to 1,000 meters?

Below are the answers to your questions: (1) Yes, but we prefer using 160-degree vario-coupler with pig-tail connection. (2) We do not approve of a fixed inductance for a coupler in the "Old Reliable."

NON-REGENERATIVE.

503—SOUTH OMAHA: I received your sample paper today and certainly did enjoy it, and I take the liberty to ask you for a good circuit for a radio set using a variocoupler, twenty-three plate condenser, grid leak and condenser, eleven-plate condensers, and a tickler coil, or one which will enable me to receive for about 100 miles, using the above parts and a few others. The radio magazine is great. None of our Omaha newspapers have it. It's as good as the Radio Digest.

A set wired as per your diagram would never receive distance because of the fact that it is non-regenerative. We are enclosing a hook-up whereby you can receive up to 1,000 miles.

FREE SERVICE

QUESTIONS asked on any subject pertaining to radio will be answered in this department in either the daily edition or The Radio Magazine section published each Thursday. No charges are made for this service. If personal reply is desired by return mail, enclose self-addressed and stamped envelope. Write on only one side of the sheet, and where a check is desired on a faulty circuit be sure to send legible diagram as used in the hook-up.

TUBE MOUNTING.

513—HAMMOND, IND.—Being a new phan, I would appreciate a reply to a few questions. I have an Aeriola Sr. receiving set, using the one tube (without any additional equipment). Will you please explain this circuit to me, and if any diagrams are available would appreciate one. Is this a good set for clearness in, say, 1,000 miles radius? Some of my distance calls are noisy. Heard Schenectady, N. Y., plain in Judge Landis' talk the other night, but the music was not clear. Do you think this is due to poor tuning? Please comment on the construction of my aerial. What will I need to add one more tube to set, and what will I gain by so doing? Can tubes be set in horizontal position without injury? On this set I have heard Hastings, Neb., Pittsburg, Memphis and Schenectady, and, of course, the close-in stations. I do not seem able to tune out Chicago stations when they are on strong. Is there anything I can do to help me tune them out when I so desire? Please accept congratulations on your Radio Magazine.

This is a simple regenerative set with a range of approximately 1,000 miles. Your trouble with tuning in long-distance was probably due to antenna construction. Antenna as shown will not give maximum results. Change it to coincide with diagram mailed. To add another tube to your set the following material is necessary: One tube, one rheostat, one 5 to 1 A. F. transformer, one socket, binding posts, wire, panel, etc. By adding this much more volume will be obtained. Never mount tubes in horizontal position, as this causes sagging of the filament, which greatly decreases the efficiency and life of your tube. By adding The Post wave trap, as described in the Dec. 13 issue of the Radio Magazine, you will be able to tune out local stations at will, will.

AUDIO-FREQUENCY.

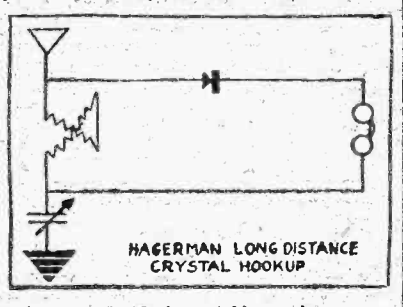
512—BELVIDERE, ILL: I have a Radiola Sr. receiving set, after which comes two states of amplification, which I believe is called audio-frequency. Is that the right name? How may I add additional amplification, and would this be practical to receive father stations?

Audio-frequency is the right name for the type of amplification you refer to. An additional stage can be added, as per the mailed diagram, altho distortion might result.

HAGERMAN CRYSTAL.

491, CHICAGO: Will you please send me your hook-up of the long-distance crystal set and the material required?

We are printing diagram of the Hagerman long-distance crystal set, as per your request. Parts required are as follows: One



variometer, 1 43-pl. variable condenser, one crystal detector (not fixed), one 7 by 9 panel, four binding posts, baseboard, wire, screws, etc.

HAGERMAN CRYSTAL.

482—CHICAGO: I wish to congratulate the Chicago Evening Post for the fine Radio Magazine, and to ask a few questions about the long distance crystal set. (1) What make of variometer did Mr. Hagerman use? (2) Can I use the Univernier condenser, an illustration of which I inclose, in this set? (3) Would a varicoupler tune the set more sharply?

Below are answers to your questions: (1) The variometer used in the Hagerman crystal set was a Dayton. (2) The Univernier is merely a geared dial. This cannot be used in place of a variable condenser. (3). A vario-coupler would not be as efficient because of inductive losses.

WAVE TRAPS.

478—CHICAGO: Please send me the hook-up on the wave trap that was printed in your Radio Magazine on Nov. 15.

The hook-up you request was mailed. It also appeared in the Dec. 20 issue of the Radio Magazine.

MULTIPLE GROUND.

492—CHICAGO: Has the multiple ground idea ever been applied to tube sets? If so, what effects have been noted? Has volume or range been increased?

Would also like to know why I can dig up New York city, Newark, Dallas, Fort Worth and Los Angeles on a one-tube ultra-audion without amplification practically at will, and cannot get Medford, Hillside, Boston, Washington, D. C., New Orleans, or any Canadian station. Have also got PWX on it. Your Radio Section is a whiz. After the holidays am going to send you Monday night DX loggings that will make some of you boys step. Got another question: What phenomenon causes a perfectly honest crystal set that has behaved for a year suddenly whoop it up on a silent night and record a range of about 500 miles in any direction? No multiple ground used. There are no high-powered regenerative sets near that would set reradiate. How come?

A multiple ground is of advantage to any set. They have been used by many amateurs for years. If your set has an imperfect ground at the present time—and the chances are 3 to 1 it has—a multiple ground would increase the volume and range considerably. You do not state in which direction your aerial is running. If you wish to get northeastern stations, your aerial should run northeast and southwest. Your results with the crystal set are not phenomenal. In these days of high-power broadcasting stations, a fine crystal set should have a range of at least 500 miles.

LONG-RANGE CRYSTAL.

502—CHICAGO: Can you give me a sketch of a long-range crystal set which will operate loud speaker? I understand a crystal set can be made to operate nearly a distance of 400 to 500 miles. Is this so?

A crystal set, when properly constructed and installed, will receive even further than 400 or 500 miles. See question 491 for diagram.

NEUTRODYNE COILS.

490—CHICAGO: Being only a novice in the radio game, I am therefore seeking information in this field concerning the much-talked-of "Neutrodyne set" of which you make mention in today's Post. I am desirous of building a three-tube Neutrodyne with a separate rheostat for each tube and would appreciate your forwarding the writer a diagram or other available information you may have relative to its construction. Also, would you recommend making my own coils and neutrodons or buy them? Of the latter, whose make would you recommend? In order to make this set compact, what size panel should I use?

Diagram mailed of three-tube neutrodyne set as per your request. The coils for the neutrodyne set can be constructed by yourself from diagrams which appeared in the Dec. 20 issue of The Post Radio Magazine, or they may be bought from any reliable dealer. We recommend only coils that are licensed under the Hazeltine patents. A 7 by 18 panel is the smallest possible size to use and retain maximum frequency, as your coils should be spaced at least six inches apart.

LONG-DISTANCE CRYSTAL.

489—CHICAGO: Note the article in your Radio Magazine of Thursday, Dec. 20, written by L. V. Phillips, La Grange, Ill., regarding long-distance receiving on his crystal set from a hook-up that you mailed him. Will you kindly mail me this same hook-up and oblige?

We are mailing Nov. 28 copy of the Post Radio Magazine, which has on page 9 a diagram and construction details of a crystal set such as you request. See also diagram published today for question 491.

GOOD RESULTS ON INSIDE AERIAL.

487—CHICAGO: I am a brand new Post reader, chiefly because of its splendid Radio department, and wish to take advantage of your kind assistance in criticizing receivers. Mine is the four-circuit tuner designed by Mr. Cockaday (with two stages). The set is "cooked up" to receive up to 2,400 miles and up to 3,200 miles (code). I must say it is very selective, but something is wrong somewhere. I am sure of that because on the average I can't get anything over 800 miles. And I do not get many "in-between" stations. Here are some stations, for instance, that fall within the nearest range of the set and which I do not get: WGK St. Louis (I get KSD), WOO Philadelphia, WRAC Washington, D. C., WFAH Waupaca, WJAD Waco, CFCN Calgary, KDZE Seattle (I am putting Seattle down because I already heard on Nov. 5 KFI and KHJ Los Angeles, also CKCK Regina, Saskatchewan). Neither do I get Hastings, Neb., or KOP Detroit. I might add scores of others that I should get and do not. I get Dallas, Memphis, Louisville, Omaha, Kansas City, Minneapolis, WWJ and WCK Detroit (but not KOP), Cincinnati, Cleveland, Atlanta, Birmingham, New York, Schenectady, Pittsburg. Do you suppose that I ought to be satisfied, or is that all I can expect of this set? There is only one thing I have changed, and that was to place 23-plate variable condensers in E and F instead of 17 plates as called for in original specifications. But I have only a 35-foot aerial, four-strand, in the attic, about thirty-five feet from the ground, as I increased my capacity to balance the inductance. But then again I have noticed in later editions of that magazine, somebody asked for that hook-up and 23-plate condensers were specified, so how is a fellow to know what to follow? Which would you recommend? My ground wire is attached to the wash basin drain in my bathroom. Would it be better if I attached it to the regular water pipe? We have a gas water heater in the bathroom and I suppose the water system is connected up with the gas system—electrically, of course, I mean in the piping—would that make any difference? Should I use a multiple ground? Would the fact that my aerial is indoors make any difference? Would a ribbon aerial make the set more selective? Should I use any particular type only of rheostat for my WV 201 AS? Can you personally recommend any other three-tube set which would give me distance, volume, selectivity to a greater extent than the four-circuit tuner?

Considering the type aerial you have, the results you are obtaining are very good. To get proper results out of any set, a good outside aerial of 100 feet, one wire, must be used.

In the Cockaday circuit 23-plate condensers will suffice, but will make your tuning much more critical than 17-plate. Verniers are advisable. Your ground is O. K. 201 A tubes should be used with 25-ohm rheostat. There are few sets today that are any better than the four-circuit tuner.

AUTOPLEX TROUBLE.

498—CHICAGO: Having built the Autoplex, and not having had good luck with same, would appreciate any information you could give me to help clear the trouble. I am able to get stations, but under no circumstances am I able to clear up the reception. It has a whistle and scratch which seems to be impossible to get rid of. Have checked the wiring two or three times and have used loading coils and have varied the B voltage from forty-five to ninety volts in an attempt to clear the rushing noise and the whistle, but to no avail. Instruments used as follows:

Two BPM moulded variometers (inside wound on stator, very close coupler. One 1,500 turn Estrn honeycomb coil. One Carter rheostat. One UV 201 A tube. B battery up to ninety volts. In regard to another set I have, can a forty-two plate (.005) v. condenser be used to vary the wave length on a vario-coupler instead of using taps on the primary?

In order to get clear reception on the Autoplex set, at least 112½ volts of B battery should be used. Are you using a thirty ohm rheostat? In your fourth paragraph you make a forty-three plate condenser, 005 mfd. capacity. We wish to advise you that a condenser of that size has a capacity of only .001 mfd. It can be used, as you suggest, instead of taps on a vario-coupler.

NEEDS BETTER PARTS.

463—Chicago: I enclose a rough sketch of my three honeycomb coil set, with which I have been securing, by using two steps of amplification, practically every class B station in the country with the exception of Los Angeles and San Francisco, and have also had all the local stations, together with Elgin, Zion, Omaha and at times KDKA on my phonograph. However, in buying the parts with which to construct the set I very foolishly purchased some cheap parts, which are now giving me more or less trouble, and I have decided to rebuild the set with the best parts obtainable. I think, tho, that there are some parts in my present circuit that might be eliminated with no loss of efficiency whatever, and I would like to have your advice on it. I have my primary coil and 43-plate variable hooked up with a series parallel switch, so that the condenser can be shunted across the coil, used in the ground lead or cut out altogether. Do you consider this switch necessary and would the set not be just as efficient if it were eliminated? I have a 13-plate condenser shunted across my variable grid leak and .00025 fixed condenser in the grid circuit. Could this variable condenser be eliminated without loss of efficiency? Is the 23-plate condenser I have shunted across the secondary coil of the proper value? I have no less than five diagrams for the construction of a honeycomb coil set, and every one of them is different, so I would appreciate it very much if you will be kind enough to advise me specifically regarding the set I now have and wish to rebuild. As information, I have experimented with every coil from a 25 turn to 150 turn (all DeForest coils), and have found that a 50 in both the primary and secondary, with a 75 turn in the tickler, will give the best results. So far as my set is concerned, the 35-50-75 recommended by most radio writers does not give nearly as much volume nor cover as large a band of wave lengths as the 50-50-75 I am using.

The diagram you submitted is O. K. with the exception of the 43-plate condenser, which should always be used in the ground lead, and the 13-plate condenser, which is not necessary.

There is no other method to improve the set except by buying better parts. The results you have obtained with it are very good, and I think if you stay up late enough you will get Los Angeles and San Francisco.

COUNTERPOISE AERIAL.

461—Chicago: Has the plan of running two aerials at right angles to one another been tried to increase volume and selectivity? By that I mean using one for an aerial and the other as a ground and reversing to keep the aerial toward the general direction of the sending station? If so, are the results good? Do you suppose that the magnetic north pole has any influence on the transmission of messages to the far north? I have an ultra-audion, homemade affair, with two WD-11's. Silent night my range was from Washington, D. C., to Dallas, to San Francisco and Calgary. I caught our president's speech from WMAQ and WOO. My best test as to selectivity, I think, is to get WGR, KDKA or WDAP when they are all broadcasting.

A counterpoise aerial, such as you describe, would undoubtedly be much better than a ground. The reason this is not used oftener is because very few people have the conveniences necessary to erect such a combination. The north pole undoubtedly has an effect on radio messages broadcast to the far north; just what will have to be learned by experimentation.

LOWER WAVE LENGTHS.

441—Chicago: I am the owner of a standard neutrodyne receiving set. Inasmuch as I have learned to operate it and have been doing so for the last three and a half months, I find that I am able to receive only those stations which are within the range of from 280 to 800 meters. I would greatly appreciate receipt of your suggestions, telling me what I may install on the neutrodyne set without rewiring being necessary, so that I may receive stations whose wave lengths are below 280.

To lower the wave length of your neutrodyne set, insert a .001 or a .002 fixed condenser in your antenna lead. You might also try shortening your aerial.

TWO WAVE TRAPS.

449—CHICAGO: I have a homemade crystal set and on Sunday just about the time I got in the midst of the service given by the Evening club, the Zenith Edgewater Beach station would cut in. The simple wave trap described in your first issue solved the problem as the trap cuts out either as desired. However, on other nights when the four big stations are sending, complications result. Shall appreciate diagram and explanation of hook-up of traps in series. I made that simple little wave trap for the nominal sum of $10.35; e. i.—one variable condenser, $1; item, two spools of wire, 50 cents; item, two Fahnstock clips, 10 cents; item, one new bed spread, $8.75 (I laid the soldering iron on the old bed spread). No hard feelings. I like your magazine, in fact, haven't enjoyed anything like it quite so much since the days when I used to revel in Dan Beard's American Boys' Handbook.

We can appreciate your feelings as to the soldering iron incident. Would not advise hooking wave traps in series, but you might try one in the aerial circuit and one in the ground circuit.

TOO MUCH SHIELDING.

464—CHICAGO: My set is one that I purchased a short time ago from a Chicago concern and is of the single circuit regenerative type. Now since I have set this instrument up, I have been able to receive Chicago and Elgin with very good clearness and fairly loud, but it seems as tho as soon as I get an outside station there is all sorts of whistling and crackling when I take my hands away from the dials. Sometimes I can hold my hand on the ground wire and can hear the station faintly but clearly. I have inspected for loose wires, etc., but everything seems to be O. K.

I am a new beginner at radio but I find there is one thing about my set which does not seem right. The outfit is shielded with a metal shield and to this shield is soldered the aerial post, the ground post, the negative "B" battery post and the positive "A" battery post, also the switch. My diagram will help to show you more clearly.

Your trouble obviously lies in the shielded panel you speak of. I cannot understand how with the aerial and ground soldered to the shield, you got any results whatsoever. Altho the other connections are O. K., using a shield as a conductor in this way is not advisable because of the danger of shorting battery wires and burning out tube.

FIVE TUBE NEUTRODYNE.

476—CHICAGO: Will you tell me when I may obtain detailed information in regard to the construction of a four or five bulb "Hazeltine Neutrodyne Radio Set?"

A five-tube neutrodyne hook-up, with full details of construction, was given in the Dec. 20 issue of The Post Radio Magazine.

WAVE TRAP TROUBLE.

475—CHICAGO: After reading your article in Nov. 28 radio section of The Chicago Evening Post, I purchased an assembly for a wave trap but it proved an utter failure. It consists of a coil with thirty turns on the outside and ten turns on the inside. The inside coil is connected to the condenser. I inserted this trap between the aerial and the set, but I did not get satisfactory results. I also inserted it in a ground position, with a like failure. I then took your suggestion and inserted it across aerial and ground, but likewise, more failure. When amateur code came in I could turn the condenser thru 360 degrees and the signals would not vary at all. When local stations were broadcasting I could tune them very low by use of the trap, but as soon as I returned to the set and tried to tune in other stations I returned in the local stations. I am using a three-tube Reinartz, and without the trap I could tune out one local station and bring in another. I have not been successful in tuning out Chicago altogether and bringing in distant stations. On Monday nights when Chicago is silent, I can get any number of distant stations, including Los Angeles. My only trouble on silent night is amateur code, which I cannot eliminate. Any suggestion as to making my set more selective or on improving the wave trap would be greatly appreciated.

In your letter you state you have ten turns of wire on the inside coil of your wave trap. Our directions call for thirty. The hook-up you use also is incorrect. Refer to article on wavetrap in Dec. 13 issue. We would advise you to wire it accordingly, and believe this will correct your trouble. You are getting very good results with your set, and there is nothing you could add, except the wavetrap, to improve it.

NOT ENOUGH GRID LEAK.

468—CHICAGO: Will you tell me what is wrong with my receiving set? When I place my hand over the grid leak and condenser, the signal comes in louder.

You are not using enough resistance in your grid leak. Would advise using a variable of from 1 to 6 megohms.

REINARTZ AND COCKADAY.

471—STEWARD, Ill.: Would appreciate very much to have the following questions answered: (1) Will a Reinartz receiver have disturbing effect upon neighboring receivers within one-eighth of a mile distant? (2) What would you say is the weakest feature of the Reinartz receiver? (3) I am also somewhat interested in the Cockaday receiver? Can a two-stage amplifier and loud speaker be successfully used with the Cockaday receiver?

Below you will find answers to your questions: (1) When the Reinartz receiver is oscillating, it acts as a low power transmitter, This oscillation can be heard as far as a mile and is anything but pleasant. (2) The weakest feature of the Reinartz receiver is that it is very susceptible to code interference. (3) The Cockaday circuit with a two-stage amplifier would operate a loud speaker and give very good results.

DIFFERENT CIRCUITS.

470—LEMONT, Ill.: I surely appreciate your Thursday Radio supplement and would like to take advantage of your department by asking a few questions. (1) What is the difference in selectivity and volume between the inclosed two circuits, if any? (2) Are these circuits the best circuits as to selectivity without loss of volume from loading coil common to circuits such as the two variometer and Cockaday circuits?

(1) The circuit using a variometer is the best. (2) The circuits you describe are variations of the ultra-audion and are no better than the two variometer or Cockaday circuits.

THREE STAGES OF A. F.

469—CHICAGO: Will you please furnish me with a diagram of the circuit used in the Aeriola Senior Westinghouse receiving set with three stages of audio-frequency amplification. The following are the characteristics of the set I intend to build: UV-199 tubes, 1 rheostat for detector (what size), 1 rheostat for three amplifier tubes (what size), "C" battery (what size), no detector tap for phones but figure on using only one circuit, namely, after the third audio-frequency tube. I am figuring on Hedgehog transformers chiefly on account of their small size. If you know anything about their efficiency, I would be very glad to get your opinion. You will note that I am using 199 tubes and understand that a rheostat should be used for the detector and a separate rheostat for the amplifier tubes. I also want to use a "C" battery.

The transformers you refer to are O. K. We are sending a diagram for three stages of audio-frequency, but are afraid distortion will occur on the third. Use a ratio of 3-1 on the transformers for all three stages.

ANTENNA DESIGN.

465—CHICAGO: I am using a Bremer-Tully tuning unit with their hook-up No. 2, which is stated to be a modification of the Reinhartz. On one tube have heard San Antonio, Denver and New York, also other eastern stations. I have added now one stage of audio-amplification, 5 to 1 transformer, but do not seem to get much amplification on the distant stations. Last Thursday added fifty feet single wire to my aerial, making a total of 175 feet single wire serial and fifty feet lead in. This increased the signals appreciably and did not result in increased interference. On the roof of the building there are at least five aerials on the north of mine, altho my aerial is several feet higher. I have never been able to tune in Minneapolis or any other station due north (might add that my aerial runs east and west), and since adding the additional fifty feet to the aerial I find that I cannot tune in the Drake (360 meters) very clearly, not to the point of oscillation. (1) Would running part of the present aerial north and south aid in getting the stations in those directions? (2) Do the aerials on north side of building cut off signals to my set? (3) Would increased condenser capacity in the ground circuit allow me to pick up lower wave lengths? (4) What is the proper hook-up for one stage of audio?

(1) Running part of your present aerial north and south would aid in getting northern stations. A much better idea would be to build another aerial north and south, then use the one you have and the new one alternately for counterpoise and aerial according to the stations which you receive. When using counterpoise disconnect ground. (2) Other aerials on your roof should have no effect on reception unless sets used are regenerative, when they might cause howls and squeals, but wouldn't affect your set otherwise. (3) Larger condenser capacity would enable you to tune to lower wavelengths. (4) Hook-up requested was mailed.

WIRE FOR WAVE TRAP.

464—CHICAGO: Last Wednesday in your radio section you described a wave trap which is connected in the ground lead, consisting of two coils of thirty turns each, one inside the other, with a forty-three plate condenser. The description called for No. 22 and No. 32 D. C. C. wire. Is this right, as I tried Saturday afternoon to get No. 32 D. C. C. wire and was unable to do so? If correct, please tell me where to get it and also send a diagram for the trap.

No. 32 D. C. C. wire is the correct size for The Post radio wave trap. This can be obtained at any of the radio stores in the loop. Diagram mailed.

HUM IN RECEIVERS.

463—CHICAGO: I have a one-tube Reinartz receiving set that gives me fair service over the Chicago broadcast district, but I get a constant hum in the ear phones the moment I plug in on rheostat—the hum does not increase very much as lamp is turned on. My aerial is 100 feet of stranded wire strung in my attic in three lengths; there are also electric light wires and gas pipes in attic. The aerial runs east and west—320 feet south of my house the Aurora, Elgin and Chicago railroad runs east and west. They carry a high voltage for their third rail. It has been suggested to me that I am getting an A. C. hum from electric road. Do you think this is the probable cause—other sets in neighborhood using same hook-up but with outside aerial are not troubled.

A hum, such as you describe, might be caused by an open circuit in your set, an imperfect ground or power wires near your aerial. To locate your trouble, would suggest that you start operating your set, then one at a time remove your aerial and ground. If the hum stops after removing the aerial, we would advise building another aerial, preferably outside. If it stops after

(Continued on Page 12.)

QUESTIONS AND ANSWERS

Continued from Page 11.

removing ground, try grounding set on something else, such as a radiator pipe, running water pipe or 6-foot pipe driven in ground outside. If hum continues after removing ground, there is an open circuit in your set, probably in your Reinartz coil. This may be tested by using your phones and a dry cell. Connect one tip of your phones to one side of the dry cell, put an extension on the other side. Then touch extension to one side of primary and other phone tip to other side of primary; a click should be heard. Do this on all three circuits—primary, secondary and tickler. If tick is not heard, find broken connection and solder it.

TOO HIGH A WAVE LENGTH.

461—Chicago: My set tunes from 300 to 550 meters. What simple means can be used to receive as low as 275 meters?

Your trouble would be corrected by putting a 43-plate condenser in the ground circuit or in place of the 11-plate condenser which is across aerial and ground.

CRYSTAL HOOK-UP.

460—Chicago: Will you please furnish me with complete hook-up for crystal set composed of one 23-plate condenser, one variocoupler with eight taps, one fixed condenser, one crystal detector and one jack? The variocoupler has four connections on the rotor.

The hook-up you requested was mailed. Use the two connections that come off the ends of the rotor.

PHONE CONDENSER; MULTIGROUND.

470—Chicago: In the crystal set of The Post Radio Magazine Nov. 28 you mention nothing about a phone condenser in parts needed. Isn't it necessary? The cut resembles the "R. W. crystal." The reason I ask is that I am partial to this particular one, and, as I am hooking up your set, I like to get it as near yours as possible. I'm afraid I'm up against it on the aerial, tho. My aerial is one straight seven-strand, about 100 feet long—and graduates from thirty to ten feet above roof of three-apartment building. I have the multi-ground as you suggest on another set and it's a wonder.

A phone condenser is not necessary in the Hagerman crystal set. The crystal detector used was an R. W.

WAVE-TRAP TROUBLE.

336—CHICAGO: I built your wave trap as described in magazine. I used No. 30 wire on coil A and 22 on coil B. My formica tubes measure 2⅞ inches and 3½ inches, respectively, as I could not get the size specified. I have a 44-plate vernier condenser. As I understand the connections, I hooked one end of coil A to ground and one end to a separate ground, also I tried every way I could to switch the connections. Will you please send me directions to hook-up and explain my trouble? I have a Westinghouse R. C. receiver. Your magazine is the best in Chicago.

From your explanation it seems that you have your wave trap wired wrong. You speak of two grounds. If you will refer to the article from which you built your trap, I am sure there is nothing said relating to an extra ground. I mailed schematic diagram. If you will follow this, you will find your mistake.

NEUTRODYNE PARTS.

334—CHICAGO: I would like to build a Neutrodyne radio receiver. There are several makes, but know mostly about the Freed-Eisemann and Fada. I believe that complete parts outfits can be bought, but I would like to have you tell me of what you consider the best make and the best make of necessary fittings to use. I have heard a Freed-Eisemann outfit and it is the best I have ever heard, but possibly the Fada is just as good. I live in the country and a 6,600-volt transmission line runs in front of my home. About 400 feet on one side of my home another 6,600-volt line turns off this line at right angles. Please tell me best length of aerial, height and at what angle to run same. Is it best to slant the aerial and take the low end to run to receivers? Would you advise me building a three, four or five-tube outfit? In buying these parts, can the panel be gotten with the holes drilled? Can you get good results from dry batteries on this size machine? Is there any way that current may be used off the alternating 110 volts, instead of using a tungar and battery? Please tell me what you think of the Radiola, Sr.? What make loud speaker do you think the best?

There are many makes of neutrodyne parts on the market today. We advise using only those that are licensed under Hazeltine's patents. In your position, we would advise single wire aerial 100 feet long, well elevated, at right angles to power line. The slant of your aerial has no effect on the reception. We would advise building a five-tube set, using six-volt tubes. Dry cell tubes in the neutrodyne five-tube set are about 75 per cent efficient. A storage battery or dry cell is the only practical method of supplying voltage to the filament of vacuum tube. The Radiola, Sr., is a simple and efficient set. For a loud speaker any of the standard makes are good. A victrola attachment is also very satisfactory. Buy your parts from a good, reliable dealer who guarantees his products.

NO VOLUME ON THREE TUBES.

330—CHICAGO: I have a similar hook-up as the one referred to as "The Old Reliable." I am using two variometers and one variocoupler instead of the 25-plate condensers. I am unable to acquire any great amount of volume from my set. Am using two 4½-volt "C" or Bias batteries, 4½ volts on first audio and 9 volts on second audio. Do you consider this too much voltage on the audios? Also I can only use 45 volts on my "B" battery. If I try 67½ or 90 I cannot get a sound from my hook-up. Have the "C" batteries any effect on the "B" battery voltage or the amount given? I can hear very plain over the headphones, but cannot get enough volume to use loud speaker. Could you suggest anything to give me more volume?

With a set such as you describe the volume should be so great on local and long-distance reception that it would be impossible to hold the phones on the ears. It is obvious that your wiring diagram is wrong. If you will send us a hook-up of set as you are using it now, we will gladly check it for you.

MUSIC NOT CLEAR.

339—CHICAGO: I enjoy your Radio section very much. Your magazine is great; higher than the moon for quality.

I have a ultra-audion set using three WD-11 tubes for detector and two steps of amplification. I have nothing but praise for this set on local broadcasting, every word and music loud and distinct all over a 12x12 room on the detector and first step with a pair of Frost phones. I have picked up on the last two Monday nights about 33 out of town stations reaching as far west as Los Angeles, but I am unable to distinguish anything but a human voice. The announcer's voive generally comes in clear and distinct, but music and singing is a continual howl and screeching. I have varied the "B" battery voltage but if seems to work best with 22½ volts on the detector and 42 volts on the amplifier. I am using a 10 to 1 transformer on the first step and a 3 to 1 on the second. I am also unable to hear anything out of town on the detector alone; not even the customary whistle. I am using three 6-ohm rheostats and a variable grid leak and a 23-plate vernier variable condenser. My aerial is outside clear of all obstructions, and consists of four wires thirty feet each, with a lead-in of twenty feet.

We would advise trying 5 to 1 transformer in your first stage of amplification. If your aerial were longer, your reception would be greatly improved. If this does not correct your trouble, insert from 3 to 6 volts of "C" battery in filament leads of your transformers.

NO VOLUME ON DISTANCE.

324—CHICAGO: I am using the hook-up as per inclosed diagram. I am not getting satisfactory results in reference to long distance stations. The local station comes in very loud with my speaker but cannot get volume on distant stations. I get most all stations but not loud enough for the headset. Possibly you can suggest rearrangement of my set so I can get desired volume.

We would advise using more "B" battery on the plate of your amplifier tube, at least 90. You might also try bringing your detector tap off at 45 instead of 22. If this does not correct your trouble lengthen your aerial.

DISTANCE BUT NOT SELECTIVE.

326—CHICAGO: Have built a Lewis B. Hagerman crystal long distance receiver and find it difficult to tune out stations, altho I do get distant stations. Would it be advisable to attach wave trap?

We are very glad you are getting distance on the Hagerman crystal set. A wave trap would make the set very fine tuning.

How to Correct Mistakes When Drilling Panels

The average radiophan invariably makes one or more mistakes when drilling a panel for a set which uses a great number of parts of various sizes and makes. More than one home builder has discarded a perfectly good panel because he wished to change his hookup or drilled the coupler holes where the condenser should be.

A very convenient and efficient method of plugging unwanted holes has been discovered. This permanently will repair any hole up to one-half inch in diameter.

Place panel on smooth piece of paper. Pour enough melted solder or lead in hole to come flush with face of panel. Then, before metal hardens, level with edge of smooth metal object, wiping off surplus. This makes a nice looking job and after metal hardens is permanent.

Copies Message from MacMillan in Arctics

Leonard H. Weeks, operating amateur station 9 DKB, Minot, N. D., copied the following message from the Bowdoin, now ice-bound in the Arctics: "Arthur White, Swift & Co., Chicago, Ill.: All food supplies from Swift & Co. on Bowdoin in excellent condition and giving satisfaction.

"(Signed.) MacMILLAN."

Long-Distance Records of Phans

HAS NINETY-ONE STATIONS BAGGED.

RADIO EDITOR: I see that you also publish all the stations heard on receiving sets. Here is my list of ninety-one stations. None of them are old stations because I have had my set only this fall.

KDKA, East Pittsburg, Pa.; KFDY, Brookings, S. D.; KFEX, Minneapolis, Minn.; KFJB, Marshalltown, Iowa; KFKB, Melvern, Kan.; KHJ, Los Angeles; KSD, St. Louis, Mo.; KYW, Chicago; WAAC, New Orleans; WAAF, Chicago; WAAK, Milwaukee; WABA, Lake Forest, Ill.; WABL, Storrs, Conn.; WBAH, Minneapolis; WBAP, Fort Worth, Texas; WBU, Chicago; WCAE, Pittsburg; WCAG, New Orleans. (This station broadcasts from Rose Electrical supplies, located on Camp street.) WCAH, Columbus, Ohio; WCAP, Washington; WCAU, Philadelphia; WCBD, Zion, Ill.; WCK, St. Louis, Mo.; WCX, Detroit, Mich.; WDAF, Kansas City, Mo.; WDAP, Chicago; WDAR, Philadelphia; WEAF, New York; WEAH, Wichita, Kan.; WEAO, Columbus, Ohio; WEAS, Washington; WFAA, Dallas, Texas; WFI, Philadelphia; WGI, Medford Hillside, Mass.; WGR, Buffalo, N. Y.; WGY, Schenectady, N. Y.; WHAD, Milwaukee; WHAS, Louisville, Ky.; WHAZ, Troy, N. Y.; WHA, Madison, Wis.; WHB, Kansas City, Mo.; WIAO, Milwaukee, WJAX, Cleveland, Ohio; WJAZ, Chicago; WJZ, New York; WLAG, Minneapolis, Minn.; WLAW, New York; WLW, Cincinnati, Ohio; WMAJ, Kansas City, Mo.; WMAQ, Chicago; WMAY, St. Louis, Mo.; WMC, Memphis, Tenn.; WOAI, San Antonia, Texas; WOAW, Omaha, Neb.; WOI, Ames Iowa; WOQ, Kansas City, Mo.; WOR, Newark, N. J.; WOS, Jefferson City, Mo.; WPAD, Chicago; WPAH, Waupaca, Wis.; WRAD, Marion, Kan.; WSAI, Cincinnati, Ohio; WSB, Atlanta, Ga.; WSY, Birmingham, Ala.; WTAS, Elgin, Ill.; WTAM, Cleveland, Ohio; WWJ, Detroit, Mich.; WQAS, Lowell, Mass.; unknown, Denver, Col.; PWX, Havana, Cuba; WGM, Atlanta, Ga.; WDAO, Dallas, Texas; WSAH, Chicago; WHAM, Rochester, N. Y.; WPAM, Topeka, Kan.; KOP, Detroit, Mich.; KFKX, Hastings, Neb.; WEAN, Providence, R. I.; WNAC, Boston, Mass.; WJAD, Waco, Texas; WOO, Philadelphia; WRC, Washington; WJAG, Norfolk, Neb.; WCAL, Northfield, Minn.; WRM, Urbana, Ill.; CFCA, Toronto, Canada; WAAW, Omaha, Neb.; CKCK, Regina, Canada; WNAD, Norman, Okla.; KFAF, Denver, Col.; KFEL, Denver, Col. I have heard all the stations in alphabetical order more than once, and some of the ones that are not in order I have also heard more than once. I have heard all of these station signals clear before I put them down. I think this a good record for a two-tube set. Any disbelievers may have proof.—JOHN SHELDON, 241 South Avenue, Glencoe, Ill.

RADIO EDITOR: My cousin has forwarded several copies of the Radio Magazine. It is the best yet. Mostly all real dope. I thought maybe you would like to know that there are many long-distance phans outside the city. I took an account of the stations I heard on Dec. 19. They are: KDKA, WBZ, WCAE, WLAG, WDAF, KYW, WDAP, WOC, WRC, WJZ, WMAQ, WTAM, KSD, WORJ, PWX, WCM, WABO, WLW, WTAS, WLAX, WOS, CHYC, WBAP, WNAD, WPAH, WJAZ, WLAL, KHJ, WJAR, KFKB and WSB, making a total of thirty-one. I have a two-variometer set and one set of audio-frequency.—C. RAY WAGNER, R. F. D. No. 6, Arcanum, Ohio.

GETS CUBA NEAR WOR.

RADIO EDITOR: Your radio department has put me on your regular buying list as it sure is the best there is. Yes, I got PWX Saturday evening, Dec. 15, along about 10 p. m. Tuned right in between WTAM and WOR. It came in fine at intervals of least interference. I heard a talk in Spanish, also the announcement a couple of times and his mention of being swamped with messages from the United States and so couldn't answer them all. Your Thursday edition is a wonder, but why not get WWAE, Joliet, Ill., there too? I have had it on the air for three weeks at least, now. I see Radio Digest beat you to it today. Also why put in the set program for KYW or WMAQ when even your own paper says they will broadcast opera that evening?—W. H. FOSTER, 9238 Pleasant Ave., Chicago.

HAGERMAN'S CRYSTAL SET.

RADIO EDITOR: Will you please send me a copy of Nov. 28th's issue of the Radio Magazine. I am interested most in the Hagerman long-distance crystal receiver. I read your magazine every Thursday and I receive many helpful hints from it. I want to congratulate you on being the first paper to have such a magazine. Couldn't we get Mr. Wells to tell us his secret about the set with no aerial? I am inclosing 10 cents in stamps to cover charges for the magazine. Luck to you and your Radio Magazine.—CHARLES LUMPP, 316 South Marshfield avenue, Chicago.

TABLE AS LOUD SPEAKER.

RADIO EDITOR: Please send me a copy of the issue of the Radio Magazine of Dec. 13. Your magazine is most instructive and is worth many times the price. Please keep up the good work. I am inclosing 10 cents in stamps for the favor.

Here is a suggestion which is very handy. If one possesses a set powerful enough to reproduce the voice in the phones to enable a person in the same room to hear it, place the phones flatly on a table and notice the marked improvement in volume.

This is due to the fact that the table acts as a sounding board.—GEORGE H. SCHIFF, 7027 Clyde Avenue, Chicago.

MAKES RADIO EASY.

RADIO EDITOR: I would like to have the Radio Magazine of Nov. 28, for I have mislaid mine and can't do without it. I want the crystal hook-up of Hagerman long-distance receiver. I know your Radio Magazine is the best because it explains everything real plain so anyone can understand it. Hope you will keep up this great work.—JOHN BIELINSKI, 3244 North Hamlin avenue, Chicago.

BREAKS HIS OWN RECORD.

RADIO EDITOR: If we DX dial twisters are to list the programs we hear correctly, The Post Magazine will have to start a course in classical music. Last night (Dec. 17) it seemed everybody was broadcasting classical numbers, and a fellow would need a degree in a musical college to ascertain and spell the names correctly.

Some of the numbers sounded like this: "This is station ARY. Miss Ann Tenna will now sing a selection from the opera, 'Polly-Wants-a-Cracker,' or Mr. Fil A. Ment will now sing the 'Transfer Song' from 'Carmen,' Mick Rogarad conductor."

Of course, when it came to the popular numbers, I had no trouble, as my record last night will show. Can some one tell me where I can get a classical music dictionary?

I have read all the good things Ye Editor said about the three-circuit Armstrong set, and right here just want to say "Amen" to everything he wrote. I would also like to say that I have the twin brother to his set, because its just like what he wrote and a little bit more. Why, boy, it's so sensitive, that if they ever start sending money by radio it will pick it up, and I'll be a millionaire overnight.

Now, to get down to my DX report Monday night, Dec. 17. I believe the old Armstrong has set a record that will be hard to beat. There is a notary public a few steps away form me, but I do not believe an affidavit is necessary, as even they can be false. However, I dare any one to question me on the authenticness of this report. I have been careful, and only listed those stations I was absolutely sure of. I heard signals from stations whose identity I am sure of, but no announcement was made at the time I heard them, so I did not list them. I refer to WBAK, Pennsylvania state police broadcasting code on 400 meters, between 11 and 12 o'clock, and to WAAW, Omaha, whose generator hum is a familiar sound to my ears.

Last night (Dec. 17) I tuned in forty-three long-distant stations and two locals, which makes forty-five. This is the best record I have ever made, but I hope to better it as soon as we have more favorable weather.

I have been receiving letters and calls from local and out-of-town radio bugs for my hook-up. I am using the three-circuit tuner, with vario-coupler, two variometers with twenty-three plate condenser across secondary. I have placed the two variometers in inductive relationship to each other.

This arrangement, while contrary to advice of radio experts, has increased my volume so that I get Denver, Fort Worth and many others on the loud speakers. My set is a two-step, using WD12 tubes, detector controlled by Bradley stat.

Following is a list of stations, programs, and time received of stations tuned in alst night at Listening Inn station ICJ:

At 6:25, WCX, Detroit, contralto solo, classical number; at 6:35, WCAP, Washington, request number, "When You Were Young," etc.; at 6:37, WOC, Davenport, sandman story; at 6:45, KDKA, East Pittsburg, bedtime story; at 6:50, WGY, Schenectady, WGY orchestra, "Moderato"; at 7, KSD, St. Louis, organ, "In the Forest"; at 7:02, WCAE, Pittsburg, news of the day; at 7:10, WOO, Philadelphia, orchestra, "An Egyptian Ballad"; at 7:15, WHB, Kansas City, B. of K. questions, Miss Anthony; at 7:20, WCK, St. Louis, orchestra, popular selections; at 7:25, WBZ, Springfield, WBZ trio, "At Dawning"; at 7:30, CHYC, Montreal, announcing broadcasting of special program; at 7:40, WLAG, Minneapolis, P. H. Wells' literary talk; at 7:45, WEAF, New York, orchestra, Concerto Movement in G; at 7:50, WWJ, Detroit, tenor solo; at 7:55, WTAS, Elgin, "Wop Blues"; at 8:02, WOS, Jefferson City, prison instrumental trio; at 8:04, WCBD, Zion, "Lead, Kindly Light"; at 8:22, WHAZ, Troy, address; at 8:30, WJZ, New York, details of Ferris-Mandell bout; at 8:35, WFAA, Dallas, "On the Road to Mandalay"; at 8:37, WMC, Memphis, orchestra, "That Old Gang of Mine"; at 8:45, WDAF, Kansas City, violin solo, classical number; at 8:47, CKCK, Regina, orchestra; at 8:50, WPAH, Waupaca, song, "Boyhood"; at 9, WJAD, Waco, orchestra, "I Loved Her," etc.; at 9:15, WDAR, Philadelphia, orchestra, "Where Mama Goes, Papa Goes"; at 9:22, WOR, Newark, piano solo; at 9:25, WBAH, Minneapolis, soprano solo, classical number; at 9:30, WOAW, Omaha, band, selections from "Bohemian Girl"; at 9:43, WBAP, Fort Worth, sacred song, "My Mother's Prayer"; at 9:59, WLW, Cincinnati, "Calm Was the Night"; at 10:15, WBAV, Columbus, singing off; at 10:25, KFDL, Denver, barytone solo; at 10:42, KFKX, Hastings, announcing receipt of telegrams; at 10:52, WGR, Buffalo, orchestra, "Pickaninny Lullaby"; at 11:13, WSB, Atlanta, Harmony Boys orchestra (did not announce number); at 11:55, KFI, Los Angeles, piano solo; at 12:04, KPO, San Francisco, orchestra, "Ozark" (?) Blues"; at 12:12, CFCN, Calgary, barytone solo, "Rose of Picardy"; at 12:22, WCAL, Northfield, testing; at 12:34, KGW, Portland, signing off; at 1:12, KFKB, Milford, piano and song.—IRVING C. JOHNSON, 4551 North Clark street, Chicago.

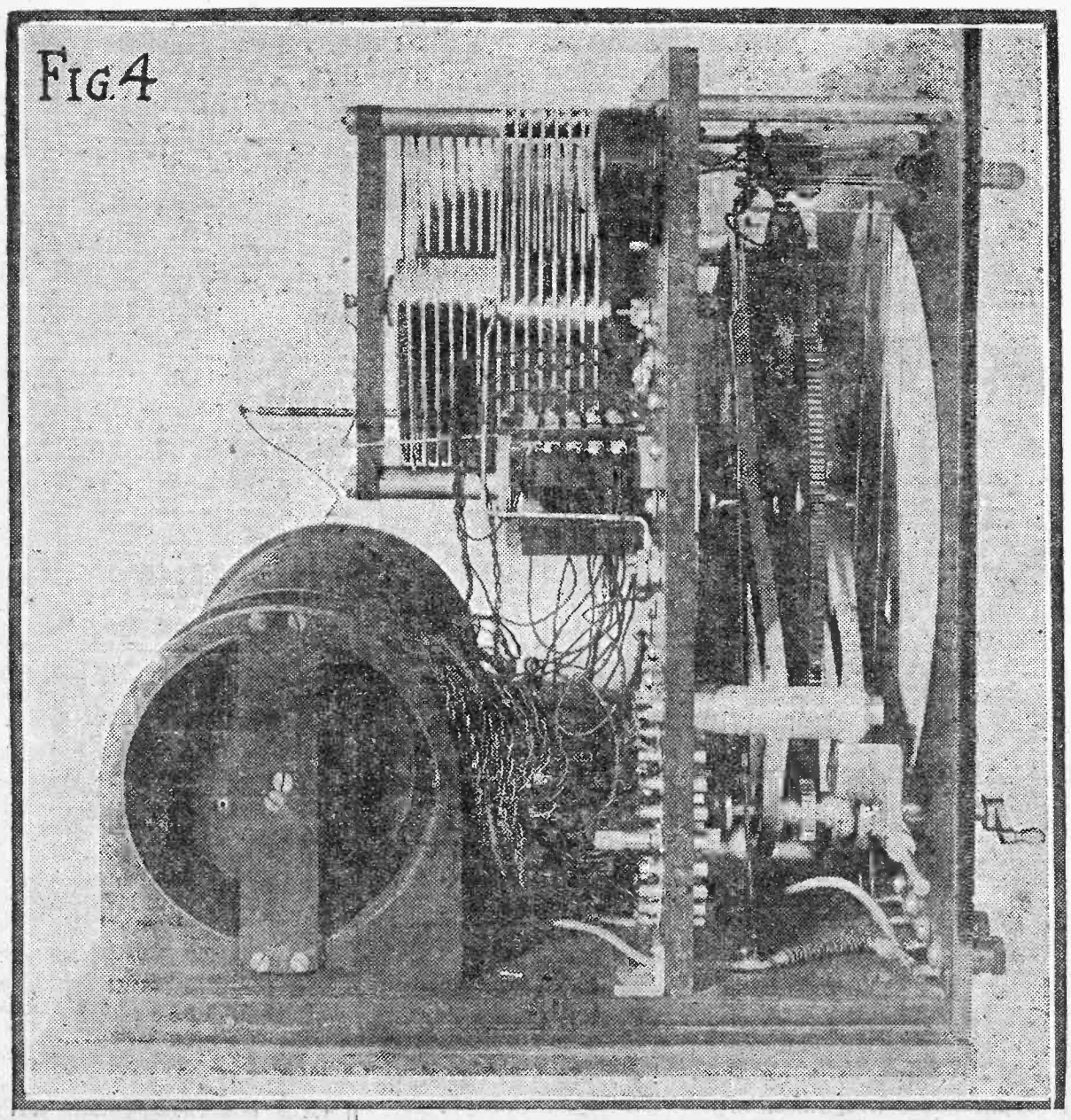
HERE'S A GOOD RECORD.

RADIO ERITOR: Here is my record for Dec. 17, 1923, on my one-tube (WD-11) set, employing the ultra-audion circuit: At 5:54, WOR, orchestra, "Linger Awhile"; at 5:59, WCAE, piano solo; at 6:07, KDKA, "Silent Night," sung by double male quartet; at 6:13, WCX, solo by George H. Lancy; at 6:34, WLAG, "Old Time Songs"; at 6:43, WCAP, tenor solo; at 6:47, WGY, WGY orchestra; at 7:16, WOC, announcements; sign off 7:17; at 7:20, KSD, orchestra selection, "Arabian Nights"; at 7:23, WEAF, announcements; program given by Philharmonic society; at 7:37, WHB, announcements of tomorrow's program; sign off 7:38; at 7:50, WBAP, violin solo; at 8:08, WSB, United States Postoffice orchestra of Atlanta, playing "Dance of the Clown"; at 8:26, WWJ, "Poppy Land"; at 8:29, WCAV, "Tenn, Tenn, Tennessee"; at 8:38, WCBD, "Sweet and Low"; at 8:41, WMC, "Drifting Back to Dreamland," by a hotel orchestra; at 8:45, WOS, Three Aces playing "Oh! Sister! Ain't That Hot!"; at 8:50, WPAH, orchestra music; at 8:54, WHAZ, requesting reports from listeners-in; at 9:15, WDAF, "Medley of Popular Airs"; at 9:27, WOO, organ recital; at 9:30, WBAH, soprano solo; at 9:47, WDAR, solo, "I Still Believe in You"; at 9:49, WTAS, "Back in the Old Neighborhood"; at 9:58, KFKX, announced a talk will be given on King Tut in January; at 10:05, WLW, signing off; at 10:25, KFAF, "Songs My Mother Knew"; at 10:45, WOAW, weather report; at 10:56, WGR, orchestra selections.

Besides these thirty stations, I have heard the following stations: WHAS, WFAA, WJZ, WSAI, WJAX, WTAM, WEB, WMAJ, WFI, WMAK, WCAO, KFIX, WBAX, WRM, WTAY, WWAE, 9EBI.

I use a 75-turn spider-web coil, twenty-three-plate condenser and WD-11, tube, using no vernier parts.

I believe this to be as good a record as any for a set of this kind. Wish your section of the paper much success.—GEORGE W. ALM, 3217 West Polk Street, Chicago.



SINGLE CONTROL RECEIVER—This is one of the most unusual commercial designs ever attempted. The tuning is done by a rotor, which is stopped when the desired signal is heard.

How to Drill Glass Panel for Radio Receiver Sets

Glass makes a beautiful panel, but is not generally used because of the mystery that attends its drilling. Altho the job is tedious and requires a certain amount of precision and practice, it can be done by any average person who owns a hand drill and some steel bits.

The first and most difficult step is to get an absolutely perfect template of the arrangement of the parts as they are to be used. This is pasted or clamped on the glass which is cut to size. Be sure to have panel laying on a perfectly flat surface.

To proceed pour a small amount of camphor on spot where hole is to be drilled. Start hole in glass with centerpunch and then slowly bore with drill. Keep hole filled with camphor and be careful. When panel is finished mount parts moderately loose so as not to chip glass. Any good cement can be used where firmness is desired.

Why Radio Receivers Are Built in Cabinets

In the early days of commercial radio when a set consisted of merely a cardboard tube, a crystal and a piece of wire, dealers built their sets in cabinets to make it seem as tho you were getting something for your money. In many cases that is exactly what they are doing today. There is no electrical reason for cabinets and a prominent manufacturer is building all his apparatus for base mounting and bringing out terminals of same so all wiring can be done under the mounting board. In this manner very short wiring results and therefore added efficiency can be obtained. Sets using as many as six tubes can be made of this apparatus and the finished product is very neat appearing.

Letter Box

SOME NEUTRODYNE FACTS.

RADIO EDITOR: I want to take exception to Mr. Donaldson's article on the neutrodyne receiver which was published in your wonderful magazine.

Mr. Donaldson starts out fine in the first paragraph. He leads the reader to believe that he will tell him how to correct his receiver trouble. The more he says, the more he leads the reader to understand that as a constructor of neutrodynes he is a failure.

When receivers of this kind are purchased (I have in mind Fada and Fried-Eismann), critical adjustment of filament is unknown. Why? Because of proper construction.

Now listen to this: The makers of radiotron tubes tell us that the filament current of the 201-A tubes are not critical. Have you tried them in various types of receivers and actually found them critical? I don't think you have.

My suggestion is this: Use, as Donaldson says, 25-ohm rheostats, but use a make like Howard's. Put them in the minus leg of the filament battery because the manufacturer says that is where they belong. Keep your wires short, but don't jam your instruments together like sardines. Built your set like commercial types (with reference to the spacing of parts) and you won't have a "balky neutrodyne."

Here is something worth while: Absolute neutralization is almost impossible, but absolute stabalization, due to neutralization, is possible. When stabilization has been obtained, the filaments of the radio tubes are not critical in the least. No capacity effects are present. No squeaks or squalls of the regenerative order are present. Out-of town stations will come in with the ease of the local stations.

If a neutrodyne receiver is balky it is not constructed and adjusted to neutrodyne principle.

Now, once more with reference to placing of parts: I have a power amplifier of the Western Electric type (home made). I placed this on top of my neutrodyne receiver after having tuned in a distant station. The placing of this cabinet on top of the receiver had the effect of cutting down signal strength. Answer that if you can.

I have in my home a seven-tube neutrodyne which you, Mr. Editor, are welcome to come and hear. I want to prove to you that the filaments of the radio tubes of a neutrodyne are not critical.

This letter is not written maliciously. If it conveys that idea it is because I am not an editor, just a radio bug.—WILLIAM A. MICK, 7234 Morton Street, Chicago.

HERE IS A BOOSTER.

RADIO EDITOR: Your 16-page Radio Magazine published every Thursday is certainly a winner. Every radiophan I know who has seen it wants to buy the Thursday issue, and in this way becomes a regular purchaser of the Chicago Evening Post, because of the fact that you give such good detailed description of the program of the various radio broadcasting stations in which most of the phans are interested.

I have also purchased another evening newspaper until you started your splendid radio page, since which time, as I am the owner of a five-tube Fada neutrodyne set, I have taken your paper regularly every evening because the arrangement of the programs of the various broadcasting stations in your page devoted to radio is so convenient and complete that it adds greatly to my enjoyment of my neutrodyne set, by which I am enabled to cut thru the Chicago stations and get a large number of the outside stations, even while Chicago is operating.

I hope that enough others will do as I have done and take your paper instead of the others we have been taking to make it profitable for you to continue to give us right along so good a radio section in your paper.—CHARLES F. SHIPMAN, 310 Exchange Building, Union Stockyards, Chicago.

FINDS SMALL WIRE SCARCE.

RADIO EDITOR: In regard to your wave trap as presented in the magazine section, I proceeded to secure the parts. I tried all the stores in the loop and could not secure the "Formica" tube, 2¼ inches. Then I sought the wire as suggested, 32 DDC and 22 DCC. It was easy enough to get 22 DCC, but 32 DDC does not seem to be upon the market. I tried at least a dozen radio stores, and none seem to get the idea.—ALFRED FITZPATRICK, 3421 Parnell Avenue.

(NOTE—There was such an unusual demand the last two weeks for material for the wave trap local stores could not keep merchandise in stock.)

AS TO LOCAL PROGRAMS.

RADIO EDITOR: The Radio Magazine is a very welcome addition to The Post, and is very much appreciated. Your list of broadcasting stations, however, would seem to be rather out of date, and the distances in miles from Chicago, shown opposite the stations in the tabloid schedule, are somewhat unreliable. For instance, you show Schnectady as 698 miles, and Troy as 748 miles. These towns are only eleven miles apart by rail, and Troy could not be fifty miles farther than Schenectady via air line. I realize that this is a new undertaking on the part of The Post, and that it will require time to perfect the magazine, and this is written in a spirit of constructive criticism.

The writer has, for the past ten months, been operating a "Monroe type D-7" detector unit, employing the Armstrong regenerative circuit, one tube, and no amplification of any sort. During that period of time some 139 out-of-town stations have been logged, representing an aggregate mileage of 73,849, or an average of approximately 531 miles per distant station; these stations include about everything from Oak Park to "KFI" and "KHJ" in Los Angeles, Rhode Island, Georgia, Texas, Cuba and California are regularly picked up under favorable weather conditions, and Montana once or twice. On Dec. 17, 1923, between 7 o'clock in the evening and midnight, forty distant stations were logged, representing a total distance of 22,083 miles, or an average of about 552 miles to the station. A few code stations were included in the log for that evening.

I am heartily in accord with the sentiment expressed in the letter appearing on page 10 of the magazine under date of Dec. 13, 1923, signed by Charles A. Kuncitz. I certainly agree with him where he states that he would throw his set in the alley were he compelled to listen to local stations. As a matter of fact, I seldom set mine up excepting on Monday evenings, and on Saturday, when I usually stay up to get the coast. We have heard G minors and A flats and "O Sole Mio" and the other five or six regulation pieces until it would seem unnecessary to print the daily programs, as they never are varied except in the order in which they appear on the program.

We, too, resent the implication that we are "getting something free, and, therefore, shouldn't complain of the quality." Who operates the broadcasting stations? Let's see: There is one here operated by a company associated with the radio trust. Then there is one that manufactures receivers; another is operated by a Chicago institution that took the station over comparatively recently, at a time when the institution was under fire in Springfield and Washington, and adverse legislation was feared. Doubtless the operation of this station has done much to mold more favorable public opinion toward the particular institution. Another is operated by a local newspaper, and is certainly worth a million dollars a year in advertising.

Who would purchase receivers were there no programs being broadcast by the corporations having large financial interests in the development of radio? And lastly, why are we charged $175 for receivers and equipment obviously worth but one-fourth that amount, by these same public-spirited and kind (?) corporations who broadcast, for our benefit, the nocturnes in A, B, C and D flats, sharps and minors, not for profit, of course, but because they love the "dear people?

If broadcasting does not net them enormous returns either in advertising or in direct sales of the equipment they manufacture, why are these stations such persistent air hogs? Why are twenty-four-hour services established, for which there is little, if any, demand?

We have nothing in particular against the local stations, excepting that their programs consist of about six numbers, repeated almost every evening and very tiresome, and the fact that they are on the air all the time. We like to listen out-of-town occasionally, and this we cannot do with any great degree of success, excepting on Monday evenings. We would feel much less antagonistic toward them if they had some slight consideration for the fans who liked to listen outside of Chicago, as well as to the same stations and the same numbers every evening.

I am confident that if, as Mr. Kuncitz suggests, the matter is fully aired by the phans, and they are given an opportunity of fairly and publicly expressing their views, results will be interesting and enlightening to the operators of the local stations.—WADE CAMERON WORRELL, 4911 Lake Park Avenue.

A FRIENDLY ACT.

RADIO EDITOR: Inclosed find check for which please send me The Post binder and also your Radio Magazine for Nov. 15, 22 and Dec. 6.

My friend, C. P. Barrett, general passenger agent of the Lackawanna railroad, sent me the Nov. 28 and Dec. 13 numbers. It was thru his kindness that I became acquainted with this department of your paper. I shall endeavor to keep right up to the minute every copy of your valuable Radio Magazine.—J. P. KANOKY, 833 Rialto Building, Kansas City, Mo.

WAVE TRAP WORKS FINE.

RADIO EDITOR: I have constructed the wave trap described in your first issue of the Radio Magazine of Nov. 15, with the 23-plate condenser mounted inside the coil, in accordance with suggestion of F. A. Zetsche, and have had excellent results on my crystal set in eliminating interference by WJAZ, particularly during the broadcasting of opera and the Sunday Evening club services by KYW.—H. R. HOTCHKISS, 1217 Monroe Street, Evanston, Ill.

BEST OF ALL.

RADIO EDITOR: Of all the publications of this nature printed in the large cities today, I think your "supplement" is the most complete and reliable, and I receive several. You are to be congratulated on its general good form. It is to be hoped that you will be able to continue to give your readers the same quality of interesting material with consistency that you have in the few copies which have come to my notice.—OWEN K. PARMITER, McKeesport, Pa.

JUST A FEW KICKS.

RADIO EDITOR: I have just finished reading your magazine and I want to say it is the livest thing in town. I can't say I always agree with E. G. Tulley and others. Our local stations are losing prestige with Elgin (WTAS) on every night with a wonderful program. Our local stations have not nearly so many people listening in as they imagine with the same junk every night. Why should anyone who can step away listen in? They should broadcast the latest popular music you hear at theaters and amusement place.

The World Crier needs adjustment, too. For instance, one evening last week there was a championship fight on in the east and a big fire and double murder in Chicago, all within one hour. The World Crier, after taking three minutes to advertise itself, said: "The world is quiet." Ha! Ha!

I'm also for a nation-wide move to stop spark stations.—JOHN C. FENMORE, 3146 Broadway.

GETS A REAL THRILL.

RADIO EDITOR: Last night thru the columns of The Post's Radio Magazine I got the very biggest thrill I've had since I ceased to belive in Santa Claus.

As this is not for publication and I am a grandmother, perhaps you will permit me to be garrulous. Last year my 12-year-old son made a very simple crystal radio, and I sat up till scandalous hours enjoying everything "from soup to nuts" that the Chicago stations broadcast. The severe storms of this summer put our set out of commission, and with good hearts my oldest son and his daddy undertook to rewind a coil and fix up a radio which would be a thing of beauty. It was—but no matter how we hooked it up we could not get anything distinctly. Junior and I then took things in our own hands, did not make such a polished job, but got better results, tho far from satisfactory, until one night I severed the aerial and ground wires, attaching them to what experts say are the wrong binding posts, and the things I hear are marvelous, tho apparently I'm receiving over the ground wire, which is attached to the hot water radiator.

I was feeling around the atmosphere a week ago last night and got the Spanish-American program very clearly also, but did not get the broadcasting station, and I searched all the local papers to see what one had such a program, and even called my son up to see if he knew, but no one could apparently answer where it was. Last night in reading your magazine he saw the letter written by Rose Cuneo Paneri and promptly phoned me that I too had heard Davenport, Iowa. Please don't pinch me and wake me up, for you don't know how much joy it is to crow over these experts who have laughed at my crude efforts and my devotion to our dinky little crystal set. And as my birthplace is in Iowa, I feel as tho I'm in fairyland.

A thousand thanks for my Christmas thrill. In me you've got an ardent admirer (don't tell your wife) from now on.—PEARL LEISNER, 2421 Wilson Avenue, Chicago.

USES A WAVE SELECTOR.

RADIO EDITOR: Until a fellow called me up this evening I had not noticed that you had published my note in regard to the three-circuit Armstrong regenerative hook-up. In our talk it was brought out that I had a Moore wave selector connected between antenna and ground. Thru oversight I did not mention this in my recent communication to you.

In justice to parties trying this hook-up, who may be disappointed at not being able to obtain equal selectivity, without a trap, this fact should be mentioned. Also my "A" battery was very low that first night, around 1.150. Since putting a full charge into "A" battery (a Gould 6 volt 80-100 amp. hr.) tone quality is not so good, operation much more critical, long distance results not so good and harder to get, tho since Sunday night my brother, R. R. Confer, who did the operating that first night, has tuned in CFCN thru WDAP and WFAA thru WJAZ.

The action of this hook-up with a very low and a full A battery has suggested to me that a variable resistance connected in parallel with the filaments might be a useful aid in some cases. What do you think of this idea?—F. M. CONFER, 1425 Carmen avenue, Chicago.

CRYSTAL WORKS FINE.

RADIO EDITOR: I wish at this time to extend to you a word of appreciation of your Radio Magazine as published in The Chicago Evening Post. I do enjoy reading them.

I have just finished a set of your long-distance crystal receiver as published in your magazine of Nov. 28, and tried it out last night for the first time. I hooked it up to my present aerial, which is only about 115 feet. I was simply amazed with the results, and am satisfied now that when I add another 100 feet of aerial I will have the set I have been looking for.

The reception from all the local stations, including Elgin, was great — came in clear and very distinct. I was able to tune in or out any station at will, without or interference of the other, with the exception of WJAZ, and then only when the Marine band was playing, and I was listening in on KYW at the time. Now I am coming to the part I want to tell you about. I waited until after 12 p. m. to hear Mr. Welch give the organ recital at McVicker's. I had listened to this organ on other tube sets, and good ones, but never with the degree of satisfaction I listened to it last night over this crystal set. Every note was as clear and distinct as it could possibly be. In the construction I used the very best parts I could buy, with a Detect Tone Crystal, with the above results. So I feel free to say thatanyone looking for a good crystal set to build will make no mistake. A word from you would be appreciated. It may be of interest for you to know I am at least twelve miles from the nearest station, which is KYW. WJAZ is eighteen miles away.—A. R. SHORT, 1818 West 108th Place, Chicago.

NOISY, BUT IT WORKS.

RADIO EDITOR: The Autoplex is an awfully noisy set, but just the same here is what I pulled in last Monday night, or silent night:

WCBD, WTAS, WLW, WGY, WRAO, WDAF, KDKA, WOC, WLAG, KZN, WJZ, WAAW, WBAP, KFDU, KSD, WOS, WOAW. I sure wish there was some way of getting the howl out of the set. I experimented with a 23-plate condenser without results. I am using a two-wire 75 feet antenna and cold water for a ground. I have two Paragon variometers, one Paragon tube socket and a 216-A tube with 150-162½ volts B battery and 1,250 turn honeycomb coil.—GEORGE SCHLAITZER JR., 1427 Rosemont avenue, Chicago.

REAL DX RECORD.

RADIO EDITOR: Here is my record for Monday night on a one-tube set made of Kellogg parts. The stations are KEW, Balabac, Philippine islands; KDZB, Bakersfield, Cal., KDJ, Fall River Mills, Cal.; WEAS, Washington, D. C.; KOP, Detroit, Mich.; WLW, Cincinnati, Ohio; WTAS, Elgin, Ill.; WCBD, Zion, Ill.; WOR, Newark, N. J.; KDKA, Pittsburg, Pa.; WHAD, Milwaukee, Wis.; KFAF, Denver, Colo.; KSD, St. Louis, Mo.; WOAI, San Antonio, Texas, and WGR, Buffalo, N. Y.—GEORGE KENOSZT, 537 North Albany Avenue, Chicago.

ZENITH BRINGS 'EM IN.

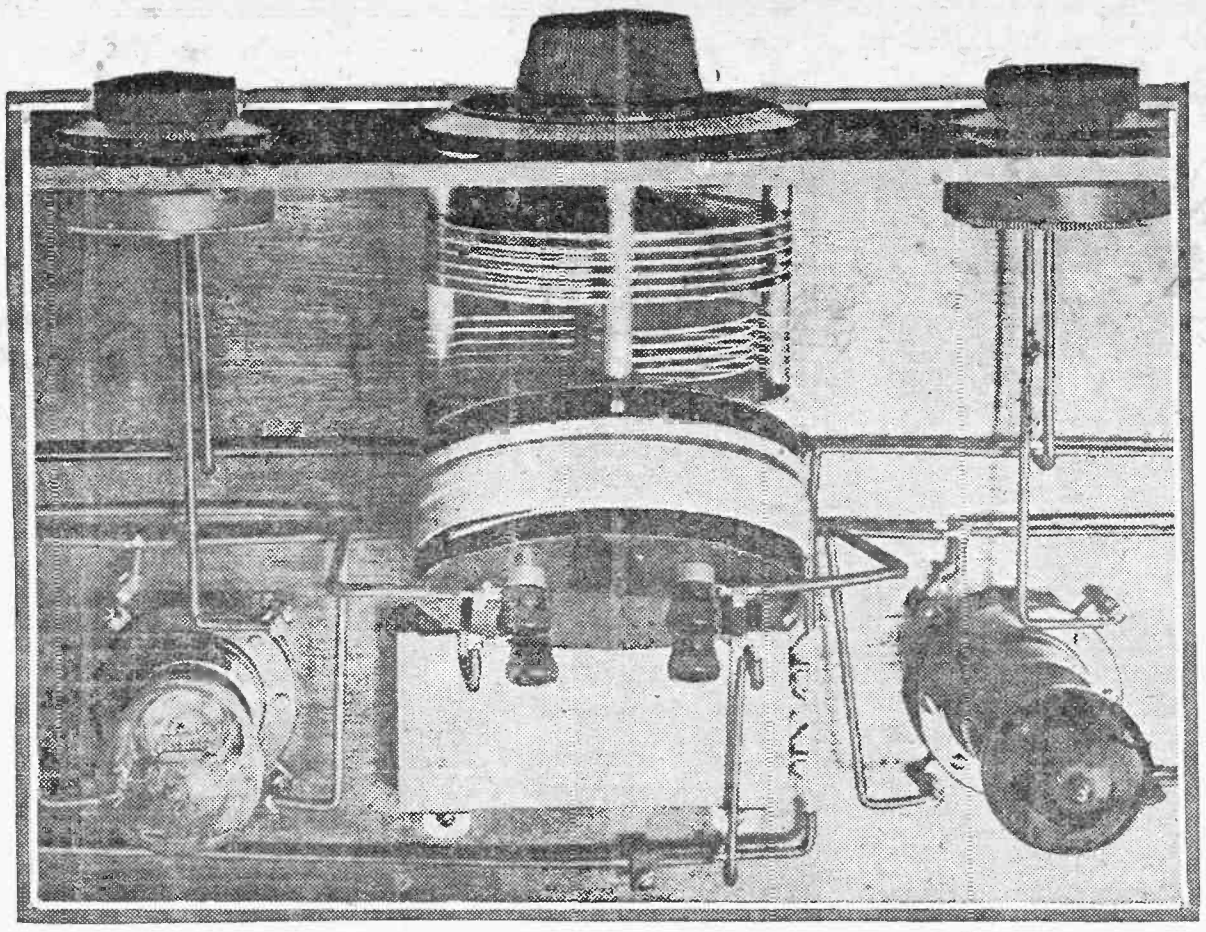
RADIO EDITOR: On silent night, Dec. 17, I brought in the following list of stations with a three-tube Zenith set. All stations came in on a loud speaker—Magnavox—some to be heard only two feet away, others over 300 feet, forty-three stations in all:

4:45, WMAQ, Chicago; 4:50, WHAS, Louisville; 5:01, KYW, Chicago; 5:10, WBZ, Springfield, Mass.; 5:15, KDKA, East Pittsburg; 5:20, WCX, Detroit; 5:21, WOS, Jefferson City, Mo.; 5:22, WSB, Atlanta, Ga.; 5:25, WIAO, Milwaukee; 5:56, WCAE, Pittsburg; 5:58, WOC, Davenport, Iowa; 6, WDAP, Chicago; 6:02, KOP, Detroit; 6:11, WGR, Buffalo; 6:26, WLAG, Minneapolis; 6:32, WOR, Newark, N. J.; 6:33, WDAF, Kansas City; 6:56, WCY, Schenectady, N. Y.; 6:57, WDAR, Philadelphia; 6:59, WEAH, Wichita, Kan.; 7:12, WOAW, Omaha; 7:14, WOO, Philadelphia; 7:15, KSD, St. Louis; 7:48, WEAF, New York; 7:56, WTAS, Elgin, Ill.; 8:04, WPAH, Waupaca, Wis.; 8:06, WRAO, St. Louis; 8:28, WJAD, Waco, Texas; 8:30, WCBD, Zion, Ill.; 8:54, CKCK, Regina, Canada; 9:06, WCAP, Washington; 9:09, WBAP, Fort Worth, Texas; 9:11, WFAA, Dallas, Texas; 9:19, WMC, Memphis; 9:24, WBAH, Minneapolis; 9:45, WLW, Cincinnati; 9:49, KFAF, Denver; 10:12, WJZ, New York; 10:17, WBAV, Columbus, Ohio; 10:19, KFDL, Denver; 10:29, WMAH, Lincoln, Neb.; 10:33, KPO, San Francisco; 10:45, WHN, New York.

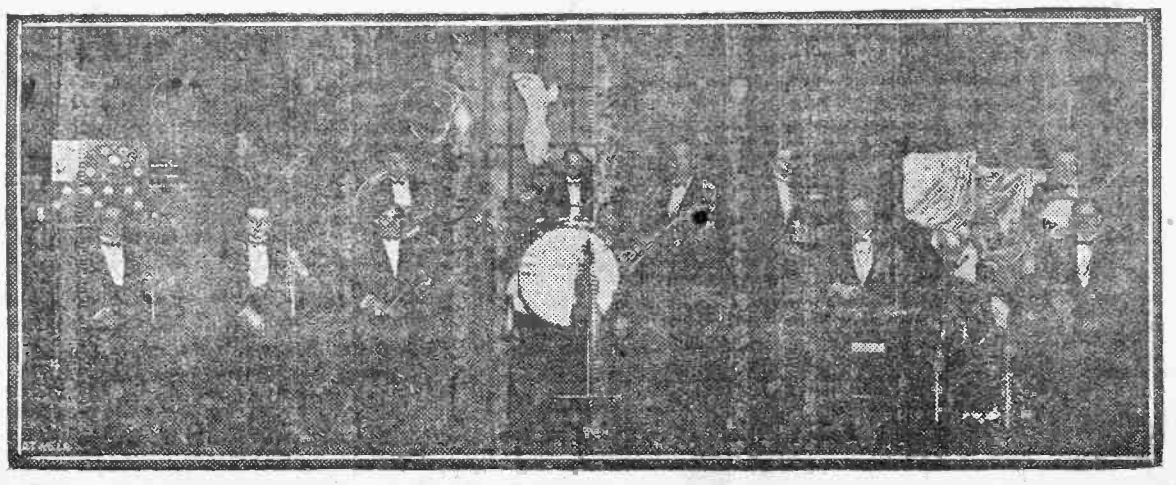
I built a very simple crystal set, using a variometer 43-plate condenser, .002 phone condenser, and a WR crystal. On Sunday night I heard, after the Drake hotel signed off, WBAP, Forth Worth, Texas. Silent night: WTAS, Elgin; WCBD, Zion, Ill.; WOS, Jefferson City, Mo. WOAW, Omaha, Neb.; KSD, St. Louis; WGO, Philadelphia; WLAG, Minneapolis, WGY, Schenectady. The last named station was heard while Drake hotel and Edgewater Beach hotel were broadcasting Tuesday evening.—AMBROSE ONDRAK, LISLE, Ill.

CRYSTAL REACHES OUT.

RADIO EDITOR: I brought in the following stations the first night I hooked up the Hagerman long-distance Crystal set: 9AFH, Rockport, Mo.; 9US, Chicago; 9ZQ, Chicago; 9HL, Columbus Junction, Iowa, 9BUU, Chicago; 9AQ, Champaign, Ill.—T. ROBERTS, 4250 West Adams Street, Chicago.



CONDENSER TESTER—The oscillator circuit is coupled to a wavemeter circuit and the condenser, giving the maximum current at given frequency and showing the lowest losses.



How KYW recently showed a complete broadcasting station on McVickers stage, transmitting Paul Beise's orchestra at the same time he entertained an audience.

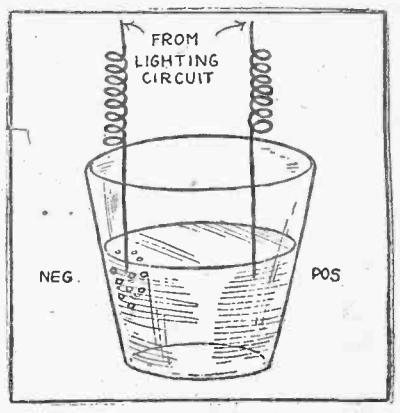
Making Simple Home Charger for "A" Battery

Where direct current, instead of alternating current is used in a house-lighting system, a simple home charger may be made for "A" batteries, using a lamp bank.

Procure a board twenty-four inches long by eight inches wide. Mount on it at either end two binding posts. These are for the input and output of the charger. Near one end and just below the two top binding posts, mount a double throw switch. Two ordinary house current fuses should be mounted in series with this.

Mount eight lamp sockets on board. Connect these in parallel. Insert eight 32-candle power carbon lamps or if these are not procurable use 100-watt mazdas.

Connect up the negative wire on the



board at the left and run thru one side of switch and fuses to the negative binding post below. Connect up the positive wire on the right side of the board, running it thru the switch and fuse and the lamps.

As a matter of safety mark the positive and negative posts top and bottom so they may be identified at all times.

Make sure which of the two wires of the lead from the house current socket is negative and which is positive. This may be done with a glass of water and tablespoonful of salt. Stick the two wires into the salt water. Bubbles will form around the negative wire. Keep the wires apart while making the test, or you will make a "short" and blow out the house circuit.

It is best to keep a special cord and plug for the house current socket attached permanently to the charger after polarity is determined. This prevents testing for polarity every time the charger is used.

Clips should be attached to the wires leading from the bottom posts to the battery to make connections easily.

This home charger, of course, can be used only where direct current is had. In Chicago direct current is in the loop district and as far north as North avenue and as far south as 12th street. It extends also west to Halsted street.

This charger will deliver current at the rate of eight amperes per hour. Use all eight lamps for two or three hours, or until the battery begins to "gas" or bubble. Then remove four of the lamps from their sockets and charge at the rate of four amperes per hour.

The last few hours' charging should be done wtih only two lamps, which will be at the rate of two amperes per hour. If the battery is charged in this manner, the plates will not buckle and the battery will have longer life.

Banks Install Radio to Get WJAX Reports

Several hundred banks and business houses in the vicinity of Cleveland, Ohio, have installed receiving sets to intercept the financial reports and news broadcast daily by station WJAX at Cleveland. Requests have been received to broadcast about 500 different stock issues and their quotations. Letters received at WJAX tell of unusual enthusiasm among the farmers and their appreciation for accurate knowledge of prices. Banks scattered thruout a wide area equipped with receiving sets supply data to their rural trade on request or thru bulletin boards.

Canadian Government Plans Radio Beacon

The Canadian government is about to install a powerful direction-finding wireless station at Pachena, on the west coast of Vancouver island, British Columbia, to protect ships of all nations entering the Straits of Juan de Fuca en route to American and Canadian ports. Numerous shipwrecks have occurred in this district, and it is expected that the new radio beacon will enable vessels to determine their exact positions in foggy weather, avoiding many dangerous reefs thereabouts.

Short Aerials Fail

The most common fault with aerials is that they are too short and not far enough from the ground. You cannot pick up much with ten or fifteen feet of wire strung near to the earth like a clothes line.

Alphabetical List of U. S. Radio Stations

ABERDEEN, Wash.—KNT.
ABILENE, Texas—WQAQ.
AGRICULTURAL COLLEGE, N. D.—WPAK.
AKRON, Ohio—WOE.
ALBANY, N. Y.—WNJ.
ALEXANDRIA, La.—KFFY.
ALLENTOWN, Pa.—WCBA.
ALLENTOWN, Pa.—WSAN.
ALTADENA, Cal.—KGO.
AMARILLO, Texas—WDG.
AMARILLO, Texas—WQAC.
AMARILLO, Texas—WRAU.
AMES, Iowa—WOI.
AMSTERDAM, N. Y.—WPAS.
ANDERSON, Ind.—WABC.
ANN ARBOR, Mich.—WQAJ.
ANTHONY, Kas.—WBL.
ARDMORE, Okla.—WOAA.
ARLINGTON, Ore.—KFGL.
ASHEVILLE, N. C.—WFAJ.
ATLANTA, Ga.—WGM.
ATLANTA, Ga.—WSB.
ATLANTIC CITY, N. J.—WHAR.
ATWOOD, Kas.—WEAD.
AUBURN, Ala.—WMAV.
AUSTIN, Texas—WCM.
AUSTIN, Texas—WNAS.

BAKER, Ore.—KFDA.
BAKERSFIELD, Cal.—KDZB.
BALTIMORE, Md.—WCAO.
BALTIMORE, Md.—WEAR.
BALTIMORE, Md.—WKC.
BALTIMORE, Md.—WNAY.
BANGOR, Me.—WABI.
BANGOR, Me.—WPAY.
BATON ROUGE, La.—KFGC.
BAUDETTE, Minn.—KFGY.
BAY CITY, Mich.—WTP.
BEAUMONT, Texas—WMAM.
BELLINGHAM, Wash.—KDZR.
BELLOWS FALLS, Vt.—WLAK.
BELOIT, Kas.—WPAR.
BELOIT, Wis.—WKAW.
BELVIDERE, Ill.—WOAG.
BERKELEY, Cal.—KQI.
BERKELEY, Cal.—KRE.
BERRIEN SPRINGS, Mich.—KFGZ.
BILLINGS, Mont.—KFCH.
BINGHAMTON, N. Y.—WIAV.
BIRMINGHAM, Ala.—WSY.
BOISE, Idaho—KFAU.
BOISE, Idaho—KFDD.
BOISE, Idaho—WFFB.
BOONE, Iowa—KFGQ.
BOSTON, Mass.—WNAC.
BOULDER, Colo.—KFAJ.
BOWLING GREEN, Ky.—WNAB.
BOZEMAN, Mont.—KFDO.
BRIDGEPORT, Conn.—WKAX.
BROOKINGS, S. D.—KFDY.
BROOKVILLE, Ind.—WSAL.
BUFFALO, N. Y.—WGR.
BURLINGTON, Iowa— WIAS.
BURLINGTON, Iowa—WLAT.
BURLINGTON, Vt.—WCAX.
BUTLER, Mo.—WNAR.
BUTTE, Mont.—KFAP.

CAMDEN, N. J.—WRP.
CAMERON, Mo.—WFAQ.
CANTON, N. Y.—WCAD.
CANTON, Ohio—WWB.
CAPE GIRARDEAU, Mo.—WSAB.
CARTHAGE, Ill.—WCAZ.
CASPER, Wyo.—KFDF.
CAZENOVIA, N. Y.—WMAC.
CEDAR RAPIDS, Iowa—WJAM.
CEDAR RAPIDS, Iowa—WKAA.
CENTERVILLE, Iowa—WDAX.
CHARLESTON, S. C.—WNAQ.
CHARLESTON, S. C.—WOAH.
CHARLESTON, W. Va.—WPAZ.
CHARLOTTE, N. C.—WBT.
CHENEY, Kas.—KFGP.
CHICAGO, Ill.—KYW.
CHICAGO, Ill.—WAAF.
CHICAGO, Ill.—WBU.
CHICAGO, Ill.—WDAP.
CHICAGO, Ill.—WJAZ.
CHICAGO, Ill.—WLAG.
CHICAGO, Ill.—WMAQ.
CHICAGO, Ill.—WPAD.
CHICAGO, Ill.—WSAH.
CHICKASHA, Okla.—KFGD.
CINCINNATI, Ohio—WAAD.
CINCINNATI, Ohio—WHAG.
CINCINNATI, Ohio—WIZ.
CINCINNATI, Ohio—WLW.
CINCINNATI, Ohio—WMH.
CINCINNATI, Ohio—WSAI.
CLARKSBURG, W. Va.—WHAK
CLEARFIELD, Pa.—WPI.
CLEMSON COLLEGE, S. C.—WSAC.
CLEVELAND, Ohio—KDPM.
CLEVELAND, Ohio—WHK.
CLEVELAND, Ohio—WJAX.
COLLEGE PARK, Ga.—WDAJ.
COLLEGE STATION, Texas—WTAW.
COLORADO SPRINGS, Colo.—KFCK.
COLORADO SPRINGS, Colo.—KFFQ.
COLUMBIA, Mo.—WAAN.
COLUMBUS, Ohio—WBAV.
COLUMBUS, Ohio—WCAH.
COLUMBUS, Ohio—WEAO.
COLUMBUS, Ohio—WMAN.
COLUMBUS, Ohio—WPAL.
CORVALLIS, Ore.—KFDJ.
COUNCIL BLUFFS, Iowa—WPAF.
CRANSTON, R. I.—WKAP.

DALLAS, Texas (portable)—KFFZ.
DALLAS, Texas—WDAO.
DALLAS, Texas—WFAA.
DALLAS, Texas—WRR.
DARTMOUTH, Mass.—WMAF.
DARTMOUTH, Mass.—WSAQ.
DAVENPORT, Iowa—WHAI.
DAVENPORT, Iowa—WOC.
DAVID CITY, Neb.—WRAR.
DAYTON, Ohio—WABD.
DAYTON, Ohio—WJAJ.
DEARBORN, Mich.—WWI.
DECATUR, Ill.—WBAO.
DECATUR, Ill.—WHAP.
DENVER, Colo.—KDZQ.
DENVER, Colo.—KFAF.
DENVER, Colo.—KFDL.
DENVER, Colo.—KFEL.
DENVER, Colo.—KFEP.
DENVER, Colo.—KFIC.
DENVER, Colo.—KFLE.
DENVER, Colo.—KLZ.
DES MOINES, Iowa—KFDP.
DES MOINES, Iowa—WGF.
DETROIT, Mich.—WCX.
DETROIT, Mich.—WWJ.
DETROIT, Mich.—KOP.
DOUGLAS, Wyo.—KFEV.
DUBUQUE, Iowa.—WQAK.
DULUTH, Minn.—WJAP.
DULUTH, Minn.—WMAT.

EAST LANSING, Mich.—WKAR.
EASTON, Pa.—WMAP.
EAST PITTSBURG, Pa.—KDKA.
EAST PROVIDENCE, R. I.—WKAD.
EDGEWOOD, R. I.—WEAG.
ELGIN, Ill. (Near)—WTAS.
EL MONTE, Cal.—KUY.
EL PASO, Texas—WDAH.
EL PASO, Texas—WPAF.
EMPORIA, Kan.—WAAZ.
ERIE, Pa.—WOAV.
EUGENE, Ore.—KFAT.
EVANSVILLE, Ind.—WNAM.
EVERETT, Wash.—KFBL

FAIRBANKS, Alaska—WIAY.
FALL RIVER, Mass.—WSAR.
FALL RIVER, Mass.—WTAB.
FARGO, N. D.—WDAY.
FAYETTEVILLE, Ark.—KFDV.
FLINT, Mich.—WEAA.
FORT DODGE, Iowa—KFER.
FORT DODGE, Iowa—WEAB.
FORT MONROE, Va.—WNAW.
FORT SMITH, Ark.—WGAR.
FORT WORTH, Texas—WFAP.
FRANKFORT, Ky.—WOAK.
FREMONT, Neb.—WOAE
FRESNO, Cal.—KMJ.
FROSTBURG, Md.—WPAQ.

GAINESVILLE, Ga.—WKAY.
GALVESTON, Texas—WHAB.
GALVESTON, Texas—WIAC.
GLADBROOK, Iowa—KFIK.
GLOUCESTER CITY, N. J.—WRAX.
GRAND FORKS, N. D.—WOAB.
GRAND ISLAND, Neb.—KFJA.
GRANVILLE, Ohio—WJD.
GREAT FALLS, Mont.—KDYS.
GREELEY, Colo.—KFJD.
GREELEY, Colo.—KFKA.
GREENCASTLE, Ind.—WLAX.
GREENSBORO, N. C.—WQAZ.
GREENVILLE, Ohio—WCBB.
GREENVILLE, S. C.—WQAV.
GRIDLEY, Cal.—KFU.
GROVE CIY, Pa.—WSAJ.
GUNNISON, Colo.—KFHA.

HAMILTON, Ohio—WBAU.
HAMILTON, Ohio—WRK.
HARRISBURG, Pa.—WABB.
HARTFORD, Conn.—WDAK.
HASTINGS, Neb.—WQAY.
HAVRE, Mont.—KFBB.
HILLSBORO, Ore.—KFFO.
HOLLYWOOD, Cal.—KFAR.
HONOLULU, Hawaii—KDYX.
HONOLULU, Hawaii—KGU.
HONOLULU, Hawaii—KYQ.
HOOD RIVER, Ore.—KFHB.
HOOD RIVER, Ore.—KQP.
HOULTON, Maine—WLAN.
HOUSTON, Texas—KFCV.
HOUSTON, Texas—WCAK.
HOUSTON, Texas—WEAY.
HOUSTON, Texas—WEV.
HOUSTON, Texas—WRAA.
HUNTINGTON, Ind.—WHAY.
HUTCHINSON, Kan.—KFHX.
HUTCHINSON, Minn.—WFAN.

INDEPENDENCE, Mo.—KFIX.
IOLA, Kan.—KFID.
IOWA CITY, Iowa—WHAA.
ITHACA, N. Y.—WEAI.

JACKSONVILLE, Fla.—WABG.
JACKSONVILLE, Fla.—WDAI.
JEFFERSON CITY, Mo.—WOS.
JOHNSTOWN, Pa.—WTAC.
JOPLIN, Mo.—WHAH.
JUNEAU, Alaska—KFIU.

KALAMAZOO, Mich.—WLAQ.
KALAMAZOO, Mich.—WOAP.
KANSAS CITY, Mo.—WDAF.
KANSAS CITY, Mo.—WMAJ.
KANSAS CITY, Mo.—WHB.
KANSAS CITY, Mo.—WOQ.
KEARNEY, Neb.—KFHP.
KELLOGG, Idaaho—KFEY.
KENOSHA, Wis.—WOAR.
KNOXVILLE, Tenn.—WNAV.

LACEY, Wash.—KGY.
LACONIA, N. H.—WKAV.
LA CROSSE, Wis.—WABN.
LAKE FOREST, Ill.—WABA.
LAKESIDE, Colo.—KFKH.
LAMONI, Iowa—KFFV.
LANCASTER, Pa.—WDBC.
LANCASTER, Pa.—WGAL.
LANSING, Mich.—WHAL.
LAPORTE, Ind.—WRAF.
LARAMIE, Wyo.—KFBU.
LAREDO, Texas—WWAX.
LAWRENCEBURG, Tenn.—WOAN.
LE MARS, Iowa—KFCY.
LE MARS, Iowa—WIAC.
LEXINGTON, Ky.—WQAH.
LIHUE, Hawaii—KFHS.
LIMA, Ohio—WOAC.
LINCOLN, Neb.—KFDU.
LINCOLN, Neb.—WFAV.
LINCOLN, Neb.—WJAB.
LINCOLN, Neb.—WKAC.
LINCOLN, Neb.—WMAH.
LINDSBORG, Kan.—WDAD.
LITTLE ROCK, Ark.—WCAV.
LOCKPORT, N. Y.—WMAK.
LONG BEACH, Cal.—KSS.
LOS ANGELES, Cal.—KDZF.
LOS ANGELES, Cal.—KFI.
LOS ANGELES, Cal.—KHJ.
LOS ANGELES, Cal.—KJS.
LOS ANGELES, Cal.—KNR.
LOS ANGELES, Cal.—KNV.
LOS ANGELES, Cal.—KNX.
LOS ANGELES, Cal.—KUS.
LOS ANGELES, Cal.—KWH.
LOS GATOS, Cal.—KFHQ.
LOUISBURG, Kan.—KFIL.
LOUISVILLE, Ky.—WHAS.
LOUISVILLE, Kan.—WLAP.
LOWELL, Mass.—WQAS.

MACON, Ga.—WMAZ.
MADISON, Wis.—WGAY.
MADISON, Wis.—WHA.
MANHATTAN, Kan.—WTG.
MARIETTA, Ohio—WBAW.
MARIETTA, Ohio—WSAA.
MARION, Ind.—WIAQ.
MARION, Kan.—WRAD.
MARSHALL, Mo.—WJAT.
MARSHALLOWN, Iowa—KFJB.
MATTOON, Ill.—WQAL.
MAYVILLE, N. D.—KFHU.
McKEESPORT, Pa.—WIK.
McLEANSBORO, Ill.—WRAS.
MEDFORD, Ore.—KFAY.
MEDFORD HILLSIDE, Mass.—WGI.
MEMPHIS, Tenn.—WMC.
MIAMI, Fla.—WQAM.
MIDDLEPORT, Ohio—WSAK.
MIDDLETOWN, Conn.—WOAS.
MILWAUKEE, Wis.—WAAK.
MILWAUKEE, Wis.—WCAY.
MILWAUKEE, Wis.—WHAD.
MILWAUKEE, Wis.—WIAO.
MINNEAPOLIS, Minn.—KFDZ.
MINNEAPOLIS, Minn.—KFEX.
MINNEAPOLIS, Minn.—WBAD.
MINNEAPOLIS, Minn.—WBAH.
MINNEAPOLIS, Minn.—WCAS.
MINNEAPOLIS, Minn.—WCE.
MINNEAPOLIS, Minn.—WLAG.
MINNEAPOLIS, Minn.—WLB.
MISHAWAKA, Ind.—WOAO.
MOBERLY, Mo.—KFFP.
MOBILE, Ala.—WEAP.
MODESTO, Cal.—KXD.
MONTEREY, Cal.—KLN.
MONTGOMERY, Ala.—WKAN.
MOORESTOWN, N. J.—WBAF.
MOOREHEAD, Minn.—WPAU.
MORGANTOWN, W. Va.—WHD.
MOSCOW, Idaho—KFAN.
MOUNT VERNON, Ill.—WABF.
MUNCIE, Ind.—WJAF.

NEAH BAY, Wash.—KFHH.
NEENAH, Wis.—WIAJ.
NEWARK, N. J.—WAAM.
NEWARK, N. J.—WBS.
NEWARK, N. J.—WOR.
NEWARK, N. J.—WRAZ.
NEWARK, Ohio—WBBA.
NEW BEDFORD, Mass.—WDAU.
NEW HAVEN, Conn.—WPAJ.
NEW LEBANON, Ohio—WPG.
NEW ORLEANS, La.—WAAB.
NEW ORLEANS, La.—WAAC.
NEW ORLEANS, La.—WCAG.
NEW ORLEANS, La.—WGV.
NEW ORLEANS, La.—WIAF.
NEW ORLEANS, La.—WWL.
NEWTON, Iowa—WIAH.
NEW YORK, N. Y.—WBAY.
NEW YORK, N. Y.—WEAF.
NEW YORK, N. Y.—WJX.
NEW YORK, N. Y.—WJY.
NEW YORK, N. Y.—WJZ.
NEW YORK, N. Y.—WLAW.
NEW YORK, N. Y.—WQAO.
NEW YORK, N. Y.—WSAP.
NEW YORK, N. Y.—WWZ.
NORFOLK, Neb.—WJAG.
NORMAN, Okla.—WNAD.
NORTHFIELD, Minn.—WCAL.
NORTH PLAINFIELD, N. J.—WEAM.

OAK, Neb.—KFEQ.
OAKLAND, Cal.—KLS.
OAKLAND, Cal.—KLX.
OAKLAND, Cal.—KZM.
OCEAN CITY, N. J.—WIAD.
OGDEN, Utah—KFCP.
OKLAHOMA CITY, Okla.—WMAB.
OKLAHOMA CIY, Okla.—WKY.
OKMULGEE, Okla.—WPAC.
OMAHA, Neb.—KFCZ.
OMAHA, Neb.—KFFX.
OMAHA, Neb.—WAAW.
OMAHA, Neb.—WIAK.
OMAHA, Neb.—WNAL.
OMAHA, Neb.—WOAW.
ORANGE, Texas—KFGX.
OSKALOOSA, Iowa—KFHL.
PADUCAH, Ky.—WIAR.
PARKESBURG, Pa.—WQAA.
PARSONS, Kan.—WOAJ.
PATERSON, N. J.—WBAN.
PENDLETON, Ore.—KFFE.
PENSACOLA, Fla.—WGAN.
PENSACOLA, Fla.—WLAV.
PEORIA, Ill.—WJAN.
PEORIA, Ill.—WQAX.
PHILADELPHIA, Pa.—WCAU.
PHILADELPHIA, Pa.—WDAR.
PHILADELPHIA, Pa.—WFI.
PHILADELPHIA, Pa.—WGL.
PHILADELPHIA, Pa.—WIP.
PHILADELPHIA, Pa.—WNAT.
PHILADELPHIA, Pa.—WOO.
PHILADELPHIA, Pa.—WWAD.
PHOENIX, Ariz.—KDYW.
PHOENIX, Ariz.—KFAD.
PINE BLUFF, Ark.—WOK.
PITTSBURG, Kan.—KFIV.
PITTSBURG, Pa.—KQV.
PITTSBURG, Pa.—WCAE.
PITTSBURG, Pa.—WJAS.
PLAINVIEW, Texas—WSAT.
PLATTE, S. D.—KFIJ.
PORT ARTHUR, Texas—WFAH.
PORTLAND, Ore.—KDYQ.
PORTLAND, Ore.—KFEC.
PORTLAND, Ore.—KFIF.
PORTLAND, Ore.—KGG.
PORTLAND, Ore.—KGN.
PORTLAND, Ore.—KGW.
PORTSMOUTH, Va.—WOAQ.
POUGHKEEPSIE, N. Y.—WFAF.
PROVIDENCE, R. I.—WEAN.
PROVIDENCE, R. I.—WJAR.
PROVIDENCE, R. I.—WRAH.
PROVIDENCE, R. I.—WSAD.
PROVIDENCE, R. I.—WTAG.
PULLMAN, Wash.—KFAE.

RALEIGH, N. C.—WLAC.
RAPID CITY, S. D.—WCAT.
READING, Pa.—WBBD.
READING, Pa.—WRAW.
REEDLEY, Cal.—KMC.
RENO, Nev.—KDZK.
RICHMOND, Cal.—KFCM.
RICHMOND, Va.—WQAT.
RIDGEWOOD, N. Y.—WHN.
ROCHESTER, N. Y.—WABO.
ROCHESTER, N. Y.—WHAM.
ROCKFORD, Ill.—WIAB.
ROCKPORT, Mo.—WMAD.
ROSWELL, N. M.—KNJ.

SACRAMENTO, Cal.—KFBK.
SAGINAW, Mich.—WABM.
SAGINAW, Mich.—WIAW.
S. CLOUD, Minn.—WFAM.
ST. CROIX FALLS, Wis.—WRAL.
ST. JOSEPH, Mo.—KFHD.
ST. JOSEPH, Mo.—WEAK.
ST. LOUIS, Mo.—KFEZ.
ST. LOUIS, Mo.—KFGJ.
ST. LOUIS, Mo.—KFIB.
ST. LOUIS, Mo.—KSD.
ST. LOUIS, Mo.—WCK.
ST. LOUIS, Mo.—WEB.
ST. LOUIS, Mo.—WEW.
ST. LOUIS, Mo.—WMAY.
ST. LOUIS, Mo.—WRAO.
ST. PAUL, Minn.—WAAH.
ST. PETERSBURG, Fla.—WSAG.
SALEM, Ore.—KFCD.
SALT LAKE CITY, Utah—KDYL.
SALT LAKE CITY, Utah—KZN.
SAN ANTONIO, Cal.—KFCL.
SAN ANTONIO, Texas—WCAR.
SAN ANTONIO, Texas—WOAI.
SAN DIEGO, Cal.—KDPT.
SAN DIEGO, Cal.—KDYM.
SAN DIEGO, Cal.—KFBC.
SAN DIEGO, Cal.—KFFA.
SANDUSKY, Ohio—WABH.
SANDUSKY, Ohio—WQAF.
SAN FRANCISCO, Cal.—KFDB.
SAN FRANCISCO, Cal.—KPO.
SAN FRANCISCO, Cal.—KUO.
SAN JOSE, Cal.—KFAQ.
SAN JOSE, Cal.—KQW.
SAN JOSE, Cal.—KSC.
SAN JUAN, P. R.—WKAQ.
SAN LUIS OBISPO, Cal.—KFBE.
SANTA ANA, Cal.—KFAW.
SANTA BARBARA, Cal.—KFHJ.

Broadcasting Stations and Schedule of Programs

Continued from Poge 2.

company, 380 meters.
WHA—Madison, Wis., University of Wisconsin, 360 meters.
WHAA—Iowa City, Iowa, State University of Iowa, 283 meters.
WHAB—Galveston, Texas, Clark W. Thompson, 360 meters.
WHAC—Waterloo, Iowa, Cole Brothers Electric company, 360 meters.
WHAD—Milwaukee, Wis., Marquette university, 280 meters.
WHAG—Cincinnati, Ohio, University of Cincinnati, 222 meters.
WHAH—Joplin, Mo., Hafer Supply company, 360 meters.
WHAI—Davenport, Iowa, Radio Equipment and Manufacturing company, 360 meters.
WHAK—Clarksburg W. Va., Roberts Hardware company, 360 meters.
WHAL—Lansing, Mich., Lansing Capital News, 248 meters.
WHAM—Rochester, N. Y., University of Rochester (Eastman School of Music), 360 meters.
WHAP—Decatur, Ill., Otta & Kuhn, 360 meters.
WHAQ—Washington, D. C., Semmes Motor company, 360 meters.
WHAR—Atlantic City, N. J., Paramount Radio and Electric company (W. H. A. Paulus), 231 meters.
WHAS—Louisville, Ky., Courier-Journal and Louisville Times, 400 meters.
WHAV—Wilmington, Dela., Wilmington Electrical Special company, 360 meters.
WHAZ—Troy, N. Y., Rensselaer Polytechnic Institute, 380 meters.
WHB—Kansas City, Mo., Sweeney School company, 411 meters.
WHD—Morgantown, W. Va., West Virginia University, 360 meters.
WHK—Cleveland, Ohio, Radiovox company (Warren R. Cox), 360 meters.
WHN—Ridgewood, N. Y., George Schubel, 360 meters.
WIAB—Rockford, Ill., Joslyn Automobile company, 252 meters.
WIAC—Galveston, Texas, Galveston Tribune, 360 meters.
WIAD—Ocean City, N. J., Ocean City Yacht club (Howard R. Miller), 254 meters.
WIAF—New Orleans, La., 139 North Alexander street, Gustav A. DeCortin, 234 meters.
WIAH—Newton, Iowa, Continental Radio and Manufacturing company, 258 meters.
WIAI—Springfield, Mo., Heer Stores company, 360 meters.
WIAJ—Neenah, Wis., Fox River Valley Radio Supply company (Quinn Brothers), 224 meters.
WIAK—Omaha, Neb., Journal-Stockman company, 278 meters.
WIAO—Milwaukee, Wis., School of Engineering of Milwaukee, 360 meters.
WIAQ—Marion, Ind., Chronicle Publishing company, 226 meters.
WIAR—Paducah, Ky., Paducah Evening Sun, 360 meters.
WIAS—Burlington, Iowa, Home Electric company, 360 meters.
WIAT—Tarkio, Mo., Leon T. Noel, 360 meters.
WIAU—Le Mars, Iowa, American Trust and Savings bank, 360 meters.
WIK—McKeesport, Pa., K. & L. Electric company (Herbert F. Kelso and Hunter J. Lohman), 360 meters.
WIL—Washington, D. C., Continental Electric Supply company, 360 meters.
WIP—Philadelphia, Pa., Gimbel Brothers, 509 meters.
WJAB—Lincoln, Neb., American Electric company, 360 meters.
WJAD—Waco, Texas, Jackson's Radio Engineering laboratories, 360 meters.
WJAF—Muncie, Ind., Press Publishing company, 360 meters.
WJAG—Norfolk, Neb., Norfolk Daily News (Huse Publishing company), 360 meters.
WJAK—Greentown, Ind., Clifford L. White, 252 meters.
WJAM—Cedar Rapids, Iowa, 302 3d avenue, West, D. M. Perham, 268 meters.
WJAN—Peoria, Ill., Peoria Star, 280 meters.
WJAQ—Topeka, Kan, Capper Publications, 360 meters.
WJAR—Providence, R. I., The Outlet company (J. Samuels and Brother), 360 meters.
WJAS—Pittsburg, Pa., Pittsburg Radio Supply house, 360 meters.
WJAT—Marshall, Mo., Kelly-Vawter Jewelry company, 360 meters.
WJAX—Cleveland, Ohio, Union Trust company, 390 meters.
WJAZ—Chicago, Ill., Chicago Radio laboratory, 448 meters.
WJD—Granville, Ohio, Richahrd H. Howe, 229 meters.
WJH—Washington, D. C., White & Boyer company, 273 meters.
WJX—New York, N. Y., Deforest Radio Telephone and Telegraph company, 360 meters.
WJY—New York, N. Y., R. C. A. 405 meters.
WJZ—New 2York, N. Y., R. C. A., 455 meters.
WKAA—Cedar Rapids, Iowa, 1444 2d avenue, East, H. F. Paar, 268 meters.
WKAD—East Providence, R. I., Charles Loof (Cresent park), 240 meters.
WKAF—Wichita Falls, Texas, W. S. Radio Supply company, 360 meters.
WKAN—Montgomery, Ala., United Battery Service company, 226 meters.
WKAP—Cranston, R. I., Dutee W. Flint, 360 meters.
WKAQ—San Juan, P. R., Radio Corporation of Porto Rico, 360 meters.
WKAR—East Lansing, Mich., Michigan Agriculture college, 280 meters.
WKAS—Springfield, Mo., L. E. Lines Music company, 360 meters.
WKAV—Laconia, N. H., Laconia Radio club, 254 meters.
WKAW—Beloit, Wis., Turner Cycle company, 242 meters.
WKAX—Bridgeport, Conn., 1789 Park avenue, William A. MacFarlane, 231 meters.
WKAY—Gainesville, Ga., Brenau college, 280 meters.
WKC—Baltimore, Md., Joseph M. Zamoiski company, 360 meters.
WKY—Oklahoma, Okla., WKY Radio Shop, 360 meters.
WLAC—Raleigh, N. C., North Carolina State college, 360 meters.
WLAG—Minneapolis, Minn., Cutting and Washington Radio corporation, 417 meters.
WLAH—Syracuse, N. Y., 425 Brownell street, Samuel Woodworth, 234 meters.
WLAJ—Waco, Texas, Waco Electrical Supply company, 360 meters.
WLAK—Bellows Falls, Vt., Vermont Farm Machine corporation, 360 meters.
WLAL—Tulsa, Okla., Naylor Electric company, 360 meters.
WLAN—Houlton, Maine, Putnam Hardware company, 283 meters.
WLAP—Louisville, Ky., 306 West Breckenridge street, W. V. Jordon, 360 meters.
WLAQ—Kalamazoo, Mich., 108 Elm street, Arthur E. Schilling, 360 meters.
WLAT—Burlington, Iowa., Radio and Specialty company, 360 meters.
WLAV—Pensacola, Fla., Electric Shop, 254 meters.
WLAW—New York, N. Y., police department, City of New York, 360 meters.
WLAX—Greencastle, Ind., Putnam Electric company (Greencastle Community Broadcasting station), 231 meters.
WLB—Minneapolis, Minn., University of Minneosta, 360 meters.
WLW—Cincinnati, Ohio, Crosley Manufacturing company, 309 meters.
WMAB—Oklahoma, Okla., Radio Supply compnay, 360 meters.
WMAC—Cazenovia, N. Y., Fernwood street, J. Edw. Page (Olive B. Meredith), 261 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WMAH—Lincoln, Neb., General Supply company, 254 meters.
WMAJ—Kansas City, Mo., Drovers Telegram company, 275 meters.
WMAK—Lockport, N. Y., Norton Laboratories, 360 meters.
WMAL—Trenton, N. J., Trenton Hardware company, 256 meters.
WMAM—Beaumont, Texas, Beaumont Radio Equipment company, 360 meters.
WMAP—Easton, Pa., Utility Battery service, 246 meters.
WMAQ—Chicago, Ill., Chicago Daily News, 448 meters.
WMAV—Auburn, Ala., Alabama Polytechnic institute, 250 meters.
WMAY—St. Louis, Mo., Kingshighway Presbyterian church, 280 meters.
WMAZ—Macon, Ga., Mercer university, 268 meters.
WMC—Memphis, Tenn., "Commercial Appeal" (Commercial Publishing company), 500 meters.
WMH—Cincinnati, Ohio, Precision Equipment company, 248 meters.
WMU—Washington, D. C., Doubleday-Hill Electric company, 261 meters.
WNAC—Boston, Mass., Shepard stores, 278 meters.
WNAD—Norman, Okla, University of Oklahoma, 360 meters.
WNAL—Omaha, Neb., 5019 Capitol avenue, R. J. Rockwell, 242 meters.
WNAM—Evansville, Ind., Ideal Apparatus company, 360 meters.
WNAN—Syracuse, N. Y., Syracuse Radio Telephone company, 286 meters.
WNAP—Springfield, Ohio, Wittenberg college, 231 meters.
WNAQ—Charleston, S. C., Charleston Radio Electric company, 360 meters.
WNAR—Butler, Mo., C. C. Rhodes, 231 meters.
WNAS—Austin, Texas, Texas Radio Corporation and Austin Statesman, 360 meters.
WNAT—Philadelphia, Pa., Lemmig Brothers company (Frederick Lennig), 360 meters.
WNAV—Knoxville, Tenn., Peoples Telephone and Telegraph company, 236 meters.
WNAW—Fort Monroe, Va., Peninsular Radio club (Henry Kunzmann), 360 meters.
WNAX—Yankton, S. D., Dakota Radio Apparatus company, 244 meters.
WNJ—Albany, N. Y., Shotton Radio Manufacturing company, 360 meters.
WOAA—Ardmore, Okla., Dr. Walter Hardy, 360 meters.
WOAC—Lima, Ohio, Maus Radio company, 266 meters.
WOAD—Sigourney, Iowa, Friday Battery and Electric corporation, 360 meters.
WOAE—Fremont, Neb., Midland college, 360 meters.
WOAF—Tyler, Texas, Tyler Commercial college, 360 meters.
WOAG—Belvidere, Ill., Apollo theater (Belvidere Amusement company), 224 meters.
WOAH—Charleston, S. C., Palmetto Radio corporation, 360 meters.
WOAI—San Antonio, Texas, Southern Equipment company, 385 meters.
WOAJ—Parsons, Kan., Ervins Electrical company, 258 meters.
WOAK—Frankfort, Ky., Collins Hardware company, 240 meters.
WOAL—Webster Groves, Mo., 4 Jefferson road, William E. Woods, 229 meters.
WOAN—Lawrenceburg, Tenn., Vaughn Conservatory of Music (James D. Vaughn), 360 meters.
WOAO—Mishawka, Ind., Lyradion Manufacturing company, 360 meters.
WOAP—Kalamazoo, Mich., Kalamazoo college, 240 meters.
WOAQ—Portsmouth, Va., Portsmouth Kiwanis club, 360 meters.
WOAT—Wilmington, Del., 215 Market street, Boyd M. Hamp, 360 meters.
WOAV—Erie, Pa., Pennsylvania National Guard, 2d Battalion, 112th Infantry, 242 meters.
WOAW—Omaha, Neb., Woodmen of the World, 526 meters.
WOAX—Trenton, N. J., 600 Ingham avenue, Franklyn J. Wolff, 240 meters.
WOAZ—Stamford, Texas, Penick & Hughes company, 360 meters.
WRAP—Winter Park, Fla., Winter Park Electrical Construction company, 360 meters.
WRAU—Amarillo, Texas, Amarillo Daily News, 360 meters.
WRAV—Yellow Springs, Ohio, Antioch college, 360 meters.
WRAW—Reading, Pa., Avenue Radio shop (Horace D. Good), 238 meters.
WRAX—Gloucester City, N. J., Flaxon's garage, 268 meters.
WRAY—Scranton, Pa., Radio Sales corporation, 280 meters.
WRAZ—Newark, N. J., Radio Shop of Newark (Herman Lubinsky), 233 meters.
WRC—Washington, D. C., Radio Corporation of America.
WRK—Hamilton, Ohio, Doron Bros. Electric company, 360 meters.
WRL—Schenectady, N. Y., Union college, 360 meters.
WRM—Urbana, Ill., University of Illinois, 360 meters.
WRR—Dallas, Texas, City of Dallas (police and fire signal department), 360 meters.
WRW—Tarrytown, N. Y., Tarrytown Radio Research laboratory, 273 meters.
WSAB—Cape Girardeau, Mo., Southeast Missouri State Teachers' college, 360 meters.
WSAC—Clemson College, S. C., Clemson Agricultural college, 360 meters.
WSAD—Providence, R. I., J. A. Foster company, 261 meters.
WSAG—St. Petersburg, Fla., City of St. Petersburg (Loren V. Davis), 244 meters.
WSAH—Chicago, Ill., 4801 Woodlawn avenue, A. J. Leonard, Jr., 248 meters.
WSAI—Cincinnati, Ohio, United States Playing Cards company, 309 meters.
WSAJ—Grove City, Pa., Grove City college, 360 meters.
ESAK—Middleport, Ohio, Foster Egner (Daily News, Pomeroy, Ohio), 258 meters.
WSAL—Brookville, Ind., Franklin Electric company, 246 meters.
WSAN—Allentown, Pa., Allentown Radio club, 229 meters.
WSAP—New York, N. Y., Seventh Day Adventist church, 360 meters.
WSAR—Fall River, Mass., Doughty & Welch Electrical company, 254 meters.
WSAT—Plainview, Texas, Donohoo-Ware Hardware company, 268 meters.
WSAU—Chesham, N. H., Camp Marienfeld, 229 meters.
WSAW—Canandaigua, N. Y., Curtice and McElwee, 275 meters.
WSAX—Chicago, Ill., Chicago Radio laboratory, 268 meters.
WSAY—Port Chester, N. Y., Port Chester Chamber of Commerce, 233 meters.
WSB—Atlanta, Ga., Atlanta Journal, 429 meters.
WSI—Utica, N. Y., J. and M. Electrical company, 273 meters.
WSY—Birmingham, Ala., Alabama Power company, 360 meters.
WTAB—Fall River, Mass., Fall River Daily Herald Publishing company, 248 meters.
WTAC—Johnstown, Pa., Penn Traffic com-

Continued on Page 15.

RADIO PROGRAMS

Continued from Page 3.

p. m., religious service by Rev. Toykmann and choir of the Mission Tabernacle church.

WJAN—Peoria, Ill.; 280 meters; daily except Sunday.

Day—9 a. m., live stock market; 9:15 a. m., weather; 11:30 a. m., Chicago, Peoria and St. Louis live stock and grain markets; 1:30 p. m., Chicago and Peoria grain and produce markets; United States agriograms.

Evening—Tuesday and Thursday, special musical program to be announced by radiophone.

WRM—Urbana, Ill., University of Illinois; 360 meters; 8:50 to 9:30 p. m., lectures and news.

WTAS—Elgin, Ill.; 286 meters.

FOREIGN STATIONS

CKAC—Montreal, Canada; 430 meters;

Note—This station broadcasts only on Sundays, Tuesdays, Thursdays and Saturdays.

Evening—9:00 p. m., L. O. Armstrong of Washington, D. C., will lecture.

PWX—Havana, Cuba; 400 meters. Jose Isquierdo, chief operator; Urbano del Castilla, program director; Remberto O'Farrill, announcer. Regular broadcasting nights, Wednesday and Saturday, 7:30 to 10 p. m., central standard time.

OUT-OF-TOWN STATIONS

Eastern Programs.

(Central Time Is Shown.)

KDKA—East Pittsburg; 326 meters:

Day—8:45 a. m., Union live stock market reports from the National Stockman and Farmer; 10:55 a. m., Arlington time signals; 11 a. m., United States bureau of market reports furnished thru the National Stockman and Farmer; 11:30 a. m., music, weather forecast; 5:30 p. m., musical program.

Evening—6 p. m., weekly chat with the farmers by Frank E. Mullen, radio editor of the National Stockman and Farmer; 6:15 p. m., National Stockman and Farmer market reports; 6:30 p. m., feature of interest to farmers; 6:45 p. m., the children's period; 7 p. m., chamber of commerce father and sons banquet; 10 p. m., special late evening concert by KDKA Little Symphony orchestra and assisting artists.

WBZ—Springfield, Mass.; 337 meters:

Day—10:55 a. m., Arlington time signals, weather reports, Boston and Springfield market reports; 5 p. m., dinner concert by the WBZ quintet.

Evening—7 p. m., concert by Mrs. A. N. Winton, soprano; 8 p. m., bedtime story for grown-ups by Orison S. Marden; 8:55 p. m., Arlington time signals.

WEAF—New York city; 495 meters:

Day—10 a. m., "The World Court," by Helen Clarkson Miller; "Forecast of Motion Pictures," by Mrs. Adele Woodard; American Agriculturist market reports; market reports by the United States department of agriculture; 4:30 p. m., Bertha Miller, dramatic reader; Irene Barbara Eckes, soprano, accompanied by Walter C. Rogers; Edward H. Matthews, barytone, and Ada Rubin, pianist.

Evening—6 to 11 p. m., midweek services under the auspices of the New York Federation of Churches. United Cigar Stores daily sport talk by Thornton Fisher; Helen Gaubis, coloratura soprano; Lorna Drew, pianist; talk under the auspices of the Museum of Natural History; "Radio Possibilities for 1924," by O. E. Dunlap Jr., radio editor of the New York Times; Olcott Vail, violinist; Jessie Mitchell, lyric soprano; Columbia Phonograph company's program from Columbia Recording studio, New York city; program by Gimbel Brothers, New York city; Vincent Lopez and his orchestra direct from the Grill of the Hotel Pennsylvania.

WHN—New York city, Lowe's State broadcasting station; 360 meters:

Day—1:15 to 1:20 p. m., Jack Sheehan singing "Annabelle"; 1:25 to 1:30 p. m., Christ Trayner singing "Say It with a Ukelele"; 1:30 to 1:35 p. m., James White singing "Stay Home, Little Girl, Stay Home"; 1:35 to 1:40 p. m., Jack Sheehan singing "Last Night on the Back Porch"; 1:40 to 1:45 p. m., Christ Traynor singing "Why Should I Weep About One Sweetie?"; 1:45 to 1:55 p. m., Phil Ellis in piano selections; 1:55 to 2:15 p. m., Fritzie Leyton, Lew Pollock, Sidney Mitchell and Milton Berle, popular Song composers, singing "I'm Going South," "I'm Sitting Pretty" and "Midnight Rose"; 2:45 to 3:30 p. m., Will Tyler's orchestra in popular music; 3:30 to 3:45 p. m., Miss Eva Werbe, mezzo soprano, of Detroit, singing "The Cave," "Slumber Song" and "All for You," accompanied by Pansy Andreds at the piano; 3:45 to 3:55 p. m., Sherman and Mayo, whistlers and singers; 3:55 to 4 p. m., Inez Johnston singing "You" and "Lovey"; 4 to 4:05 p. m., Joe Sherman singing "If the Rest of the World Can Take you"; 4:05 to 4:15 p. m., James Clarke in syncopated melodies; 4:15 to 4:25 p. m., Jean Winslow singing "Love My Heart Is Calling You" and "Old Gang of Mine"; 4:25 to 4:30 p. m., Bob Schaefer singing "Sittin' in a Corner"; 8:30 to 9 p. m., Lou Gold's Wigwam Club orchestra; 9 to 9:15 p. m., Miss Eva Werbe, mezzo soprano, of Detroit, singing "The Cave," "Slumber Song and "All for You," accompanied by Miss Pansy Andrews at the piano; 9:15 to 9:30 p. m., "Temperament of Singers," by John J. Levbarg; 9:30 to 9:40 p. m., Frank Marvin, formerly of Ziegfeld Follies, Harry Warren pianist, in popular songs; 9:30 to 9:50 p. m., Axy La Skere, double-voiced singer, in popular songs; 9:50 to 10:30 p. m., "Buddies' Society Dance orchestra," Martin Konigsberg leader; 10:30 to 10:40 p. m., Richard Douglas tenor in popular songs; 10:40 to 11 p. m., musical program to be announced.

WGI—Medford Hillside, Mass.; 360 meters:

Day—11 a. m., program of selections on the Edison laboratory phonograph and by the Ampico in the Chickering; 11:40 a. m., New England weather forecast, furnished by the United States weather bureau; 11:45 a. m., closing report on farmers' produce market report; 12:30 p. m., closing stock market reports, furnished by Elmer H. Bright & Co., members of the New York and Boston stock exchange; agriograms, furnished by the United States department of agriculture; live stock market reports.

Evening—Lectures, music.

WHAZ—Troy, N. Y.; 330 meters. This station broadcasts only on Monday evenings.

WGY—Schnectady, N. Y.; 380 meters.

Silent night Wednesday.

Day—10:55 a. m., time signals; 10:30 a. m., stock market report; 10:40 a. m., produce market report; 10:45 a. m., weather forecast; 1 p. m., music and address, 5 p. m., produce and stock market quotations; news bulletins; 5:30 p. m., children's program.

Evening—Music.

WGR—Buffalo; 319 meters:

Day—Lakes Erie and Ontario, special report from Buffalo and Oswego, N. Y., for marine and aviation interests, weather forecast for western New York; 11 a. m., weather, produce and live stock market reports; 11:30 a. m., organ, dining-room, Hotel Statler; George Albert Bouchard. Program: From Italy (Italian folk songs), selected. "Nocturn" from "Midsummer Night's Dream," "Mississippi Ripples," Earl and Hanley; 1:30 p. m., closing prices of Chicago Board of Trade; 2:30 p. m., closing prices of New York Stock exchange; 3 p. m., tea time music, Palm room, Hotel Statler; Miss Martha Gomph, harpist; Miss Elise de Grood, violinist.

Evening—6:30 p. m., digest of the day's news; 7 p. m., addresses on "Good Will" week—"Industrial and Commercial Development," by George C. Lehman, general manager Buffalo Chamber of Commerce; "Educational," by Walter D. Head; "City Government," by Chauncey J. Hamlin, president Civic Planning commission; 9:30 p. m., charity ball, Hotel Statler, Armbruster's orchestra.

WJY—New York city; 405 meters:

This station broadcasts only on Sundays at 2:30 p. m. to 6 p. m.

WJZ—New York city; 455 meters: No silent night.

Day—2 p. m., organ recital on the Hotel Astor organ by Leo Riggs, by direct wire from the Hotel Astor; 3:45 p. m., concert.

Evening—6:30 p. m., dinner music from Hotel Adelphia Concert orchestra, A. Candelori, director; 7 p. m., Ralph Bingham.

WOO—Philadelphia; 509 meters. Silent Sunday, Tuesday, Thursday, Friday and Saturday evenings.

Day—10 a. m., grand organ; 10:30 a. m., United States weather forecast; 10:55 a. m., United States naval observatory time signal; 11 a. m., luncheon music by the Tea Room orchestra; 3:45 p. m., grand organ and trumpets; 4 p. m., sport results and police reports.

Evening—8:55 p. m., United States naval observatory time signal; 9:02 p. m., United States weather forecast.

WOR—Newark, N. J.; 405 meters:

Day—3:30 p. m., Andrew Wotherspoon, barytone; 1:45 to 2:15 p. m., Louise S. Hammond in Chinese songs and lore with flute accompaniment; 2:15 p. m., continuation of barytone solos by Andrew Wotherspoon; 2:30 to 3 p. m., Rosalie Stewart in a talk entitled "What Women Have Done in Theatrical Productions"; 5:15 p. m., a talk by Mrs. Vernon Quinn on "Beautiful America"; 5:30 to 6:30 p. m., "Music While You Dine," Tom Cooper's Country Club orchestra.

WRC—Washington, D. C., 469 meters: Silent Tuesday, Thursday and Saturday evenings.

Day—4:15 p. m., instructions in code practice; 5 p. m., children's hour, by Peggy Albion.

Evening—7 to 10 p. m., music.

WRW—Tarrytown, N. Y., 273 meters:

WDAR—Philadelphia, Pa.; 395 meters:

Day—11 a. m., organ recital from the Stanley theater; features from the studio; Arcadia Concert orchestra; Fery Sarkozi, director; 1 p. m. to 2 p. m., Arcadia Concert orchestra, artist recital, Mrs. B. F. Maschal, director; 3:30 p. m., Woman's club.

Evening—6:30 p. m., Dream Daddy with the boys and girls.

Midwest Programs.

WCAL—Northfield, Minn., St. Olaf College, P. Skifter, director; Ellu Hjertaas, program director; 360 meters:

Sunday, 11 a. m. and 8:30 p. m.; Thursday, 9 p. m.; Friday, 7 p. m.; Saturday, 12 noon.

WCX—Detroit, Mich.; 517 meters:

Silent Saturdays.

Day—1 p. m., news bulletins; 1:15 p. m., stock quotations; 1:50 p. m., government weather forecast; 3:15 p. m., music.

Evening—5 p. m., dinner concert; Pete Bontsema's orchestra, broadcast from Hotel Tuller; 7:30 p. m., musical program, Cornell Glee clubs, broadcast from Arcadia auditorium.

WJAX—Cleveland; 390 meters: Silent every night except Tuesday and Thursday.

WLAG—Minneapolis, Minn.; 417 meters: No silent nights.

Day—9:30 to 11:35 a. m., announcements, markets, news, household hints; 11:35 a. m., surprise program; 2 p. m., dancing lesson, Tess Cooperman; 2:35 p. m., daylight studio program, Garns Players and Elsie Wolf, piano; 4 p. m., story, "The Doubtful Inheritance," by Lucy Marsh Royer; 5:30 p. m., children's hour, Tess Cooperman, story teller.

Evening—6 p. m., sport program; 6:15, Minneapolis Athletic club orchestra; 7:30 p. m., farm lecture program; 9:15 p. m., weather report.

WLW—Cincinnati; 309 meters: Silent Friday and Saturday.

Day—10:30 a. m., weather forecast and business reports; 1:30 p. m., market reports; 3 p. m., business reports; 4 p. m., piano solos by Adelaide Apfel; talk by Mrs. Helen Peters Wallace (Cincinnati League of Woman Voters), subject, "What women can do to bring peace on earth, good will to men."

Evening—10 p. m., Christmas program of sacred music by the Choral society of the St. Paul's M. E. church, Cincinnati; Ben C. Decamp, director and accompanist; Rev. Fred Riley, pastor.

WOC—Davenport, Iowa; 481 meters: Silent Tuesdays.

Day—10 a. m., opening and present quotations on cotton and grain, on the New York, New Orleans and Chicago markets; aviation weather conditions; 11 a. m., late cotton and grain quotations; late flashes from the Chicago, St. Louis and Kansas City markets by department of agriculture leased wire; fruits and vegetables division quotations; United States weather forecast and cotton region bulletin report; 12:05 to 12:30, noon concert; 1 p. m., late market quotations; 2 p. m., Fort Worth cattle market; Forth Worth cash grain markets; close on grain; 2:20 p. m., close on cotton markets; 3 p. m., Forth Worth produce markets; Bradstreet's special telegraphic review of the nation's business for the week, on Saturday only; United States metal market review telegraphic report furnished every Thursday by the Engineering and Mining Journal Press; 4 p. m., financial review; Dun's special telegraphic review of the nation's business pulse, on Saturday only.

Evening—7:30 to 8:30 p. m., concert by a group of Fort Worth talent (E. L. O. announcing); 9:30 to 10:45 p. m., dance program from the Crystal ballroom of the Texas hotel by Jimmie's Joys orchestra (G. C. A. announcing).

WTAM—Cleveland; 390 meters: Broadcasts only Wednesday and Saturday evenings at 7 to 8 p. m.

WWJ—Detroit, Mich.; 517 meters: Silent Saturday.

Day—12 noon, dance music by Jean Goldkette's orchestra, broadcast from the Graystone ballroom.

Evening—Music.

Southern Programs.

KSD—St. Louis; 546 meters: Silent Friday.

Day—Opening midseason and closing quotations on the St. Louis grain markets; live stock conditions; Liverpool and New York cotton market; New York stocks, bonds and money market; hay and clover; poultry and butter market; metal markets, weather reports, forecast and news bulletins are broadcast at 8:40, 9:40, 10:40, 11:40, 12:40, 1:40, 2:40 and 4 daily.

Evening—8 p. m., Harvard Glee club concert.

WBAP—Fort Worth, Texas; 476 meters:

Day—10 a. m. to 4 p. m., markets and financial review.

Evening—7 to 11 p. m., music.

WDAF—Kansas City, Mo.; 411 meters:

Day—3:30 to 4:30 p. m., musical matinee, the D. Ambert Haley Dance and Concert orchestra.

Evening—6 to 7 p. m., tuning-in piano number on the Duo-Art; marketgram, weather forecast and road report; address, speaker from the William Jewell college, Liberty, Mo.; the children's story and information period; music, Fritz Hanlein's Trianon ensemble, Hotel Muchlbach; 11:45 p. m. to 1 a. m., "The Merry Old Chief" and the Coon-Sanders Novelty-Singing orchestra, Plantation grill, Hotel Muchlbach.

WFAA—Dallas, Texas; 447 meters: Silent Wednesday.

Day—10:30 a. m., United States weather bureau report and forecast and C. A. M. A. A. highway condition bulletin for the southwest, followed by Dallas produce market quotations, early cotton market report and Wall street review; 12:30 to 1 p. m., address, Charles J. Crampton, secretary Dallas safety council; 2:30 to 2:45 p. m., Dallas live stock market, late general markets, sport news; 3:30 to 4 p. m., Agriograms, health bulletins, Texas market news, sports, news; 5:30 to 6 p. m., bedtime story and fairy tale, told by Miss Mary C. Tooney.

Evening—8:30 to 9:30 p. m., recital by Wednesday Morning Choral club, Mrs. Ralph C. Smith, roadio chairman.

WGM—Atlanta, Ga.; 429 meters:

Evening—6 to 7 p. m., concert; 9:30 to 10:30 p. m., concert.

WGV—New Orleans; 359 meters:

Evening—7 to 8 p. m., concert.

WHAS—Louisville; 400 meters: Silent Mondays.

Day—4 to 5 p. m., selections by the Walnut theater orchestra; Walter Davison, conductor; selections by the Strand theater orchestra; Harry S. Currie, conductor.

WHB—Kansas City, Mo.; 411 meters: Silent Monday, Wednesday and Friday.

Day—3:25 to 8:30, estimated five stock receipts; 9:25 to 9:40, live stock, grain quotations; 10:25 to 10:40, live stock and grain quotations, weather and shippers' forecast, road conditions and foreign exchange; 11:25 to 11:40, live stock, grain quotations; 12:25 to 12:40 p. m., closing grain quotations.

WNAV—Knoxville, Tenn.; People's Telephone and Telegraph company; 236 meters, 500 watts:

Evening—7:30 to 8:30 p. m., musical program, given by the Popular Colored quartet, known as the Logan temple, A. M. E. Zion church Ushers' Board quartet; 8:50 to 9 p. m., road conditions in and out of Knoxville, prepared by the Knoxville Automobile club; 9 to 10 p. m., mixed musical program.

WMC—Memphis; 500 meters: Silent Wednesday.

Evening—8:30 p. m., program given by the Chisca Philharmonic orchestra, Miss Clara Ahern directing.

WOAI—San Antonio, Texas; 385 meters: Silent nights, Mondays, Wednesdays and Thursdays.

WSB—Atlanta, Ga.; 428 meters:

Day—12 to 1 p. m., musical entertainment; 4 p. m., music by the Howard theater orchestra; 5 p. m., late news flashes, sport summary, markets; 5:25 p. m., kiddie program and Burgess bedtime story, by Miss Bonnie Barnhardt.

Evening—8 to 9 p. m., silent night; 10:45 p. m., transcontinental radiowl entertainment.

WHAB—Galveston, Texas; 360 meters:

Pacific Coast Concerts.

KDZE—Seattle, Wash.; 455 meters: Silent nights, Tuesdays, Thursdays and Sundays.

KFDR—San Francisco; 509 meters:

Evening—Music.

KHJ—Los Angeles; 395 meters:

Evening—10:45, 11:30 p. m. to 1 a. m.

KPO—San Francisco; 423 meters; 500 watts: Crair F. Morrison, station director; Ada Morgan O'Brien, program director. Friday nights silent.

Day—2 p. m., time signals from the naval observatory; 3 to 4 p. m., Rudy Seiger's Fairmont Hotel orchestra, by remote control.

Evening—6:30 to 7.30 p. m., Rudy Seiger's Fairmont Hotel orchestra by remote control; 8 to 9 p. m., dinner concert by George Lipschultz and Music Masters from the Loews' Warfield theater; Miss Lela Johnstone, leading lady with the Ferris-Hartman Opera company of San Francisco, will be the soloist, with George Lipschultz and Music Masters; 10 to 10:30 p. m., G. Herold Montague Schulteis will be at the console of the Robert Morton organ; some of his selections are: Overture, "Bohemian Girl" (Balfe); "Kammenoi Ostrow" (Rubinstein); selection, "Katinka" (Friml); extra request numbers; 11:30 to 12 p. m., program under the direction of the Pacific Musical society, broadcast by remote control from the Fairmont hotel.

Solder Ground Wire

When making the ground connection to the water pipe in your antenna system, do not merely wrap the wire around it. First scrape, file or sandpaper the pipe. Next wrap the wire around the bright surface and solder it.

Radio Locates Trouble in High Speed Machines

A British mechanical engineer has discovered how to detect flaws in running machinery by radio.

It is well known that the very beginnings of trouble with large rotating machinery, like high-power steam turbines or high-speed dynamos, is indicated by a slight change in the humming sound given out by the machine. Experienced engineers have been accustomed to press an ear now and then against shaft-hangers that they suspected of being not quite true or against bearings that showed signs of trying to get hot.

Now this listening is being done by radio. A small microphone is pressed against the suspected machine. Amplifiers increase the sound so that the faintest beginning of an abnormal chatter can be detected at once.

It is suggested that permanent microphones may be installed attached to important machines or bearings, as, for example, to the vital parts of marine engines. These can be connected by wires to an amplifier and a telephone in the office of the chief engineer. By plugging in for each microphone in turn this official can keep a continual eye, or rather ear, on all the machinery under his charge.

WCAL Returns to Air After Absence of Months

WCAL, St. Olaf college, Northfield, Minn., has returned to the air after being silent since the destruction by fire in September of Hoyne Memorial chapel at St. Olaf, and with it the broadcasting studio of WCAL. The opening program has been reported heard in forty-one states and five Canadian provinces.

Homemade Loading Coils

Loading coils may be made easily. Procure several 1½-inch lengths of 3-inch fiber tubing. Wind them with various windings of No. 22 DCC wire, from twenty turns to 100 each. These are almost as effective as honeycomb coils and one may have many for experimental purposes at the cost of one.

BROADCASTING STATIONS AND SCHEDULE OF PROGRAMS

Continued from Page 14.

pany, 360 meters.

WTAD—Carthage, Ill., First Presbyterian church, 229 meters.

WTAF—New Orleans, La., Louis J. Gallo, 242 meters.

WTAH—Belvidere, Ill., Carmen Ferro, 236 meters.

WTAG—Providence, R. I., Kern Music company, 258 meters.

WTAJ—Portland, Me., The Radio shop, 236 meters.

WTAL—Toledo, Ohio, Toledo Radio and Electric company, wave length unrecorded.

WTAM—Cleveland, Ohio, Willard Storage Battery company, 390 meters.

WTAN—Mattoon, Ill., Orndorff Radio shop, 240 meters.

WTAP—Cambridge, Ill., Cambridge Radio and Electric company, 242 meters.

WTAQ—Osseo, Wis., S. H. Van Gordon and Son, 226 meters.

WTAR—Norfolk, Va., Reliance Electric company, 226 meters.

WTAS—Elgin, Ill., (near) R. F. D. 6, Box 75, Charles E. Erbstein, 275 meters.

WTAT—Boston, Mass., Edison Electric Illuminating company, portable, 244 meters.

WTAU—Tecumseh, Neb., Ruegg Battery and Electric company, 360 meters.

WTAW—College Station, Texas, Agricultural and Mechanical college of Texas, 280 meters.

WTAX—Streator, Ill., Williams Hardware company, 231 meters.

WTAY—Oak Park, Ill., Iodar-Oak Leaves Broadcasting station, 226 meters.

WTAZ—Lambertville, N. J., Thomas J. McGuire, 283 meters.

WTG—Manbattan, Kans., Kansas State Agricultural college, 485 meters.

WWAB—Trenton, N. J., Hoenig, Swern & Co., 226 meters.

WWAC—Waco, Texas, Sanger Brothers, 360 meters.

WWAD—Philadelphia, Pa., Wright & Wright (Inc.), 360 meters.

WWAX—Laredo, Texas, Wormser Brothers, 360 meters.

WWB—Canton, Ohio, Daily News Printing company, 268 meters.

WWI—Dearborn, Mich., Ford Motor company, 273 meters.

WWJ—Detroit, Mich., Detroit News (Evening News association), 517 meters.

WWL—New Orleans, La., Loyola university, 280 meters.

WWZ—New York, N. Y., John Wanamaker, 360 meters.

WZAZ—Pomeroy, Ohio, Chase Electric, 258 meters.

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1,500	Turns, Coto-Coil	$1.50
1,250	Turns, Coto-Coil	1.50
1,000	Turns	1.25
750	Turns	1.00
250	Turns, Coto-Coil	.75
150	Turns	.60
100	Turns	.50
75	Turns	.40
50	Turns	.40
35 and 25	Turns	.40

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Consisting of	Our Price.
6x6½ Mission Finished Oak Cabinet	$ .95
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23-Plate Variable Condenser	1.35
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2	Erla Sockets	1.30
1	Erla Reflex No. 1 Transformer	4.45
1	Erla A. F. Transformer	4.85
1	Erla .002 Mica Condenser	.30
1	Erla .001 Mica Condenser	.30
1	Erla .00025 Mica Condenser	.25
1	Erla Fixed Crystal Detector	1.00
1	Howard Rheostat	1.00
2	Bakelite Dials	.50
8	Binding Posts	.40
1	Dozen Switch Points and 4 Stops	.30
2	Switch Levers	.50
1	6½x14x⅜-inch Formica Panel	1.37

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3 Bakelite Sockets.
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18 Binding Posts.
1 Baseboard.

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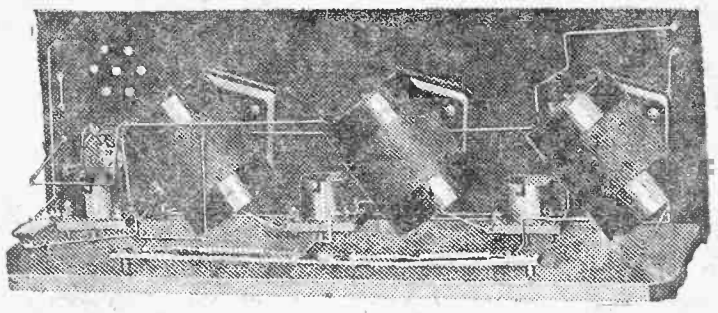

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8 Binding posts.
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25 feet tinned copper bus bar wire and complete instructions for assembling and wiring.

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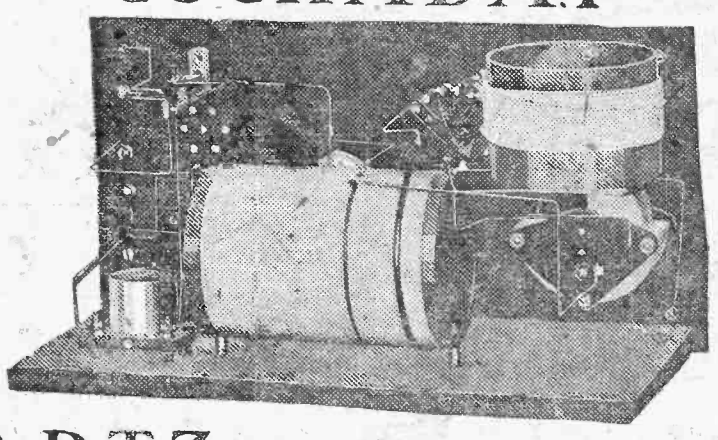
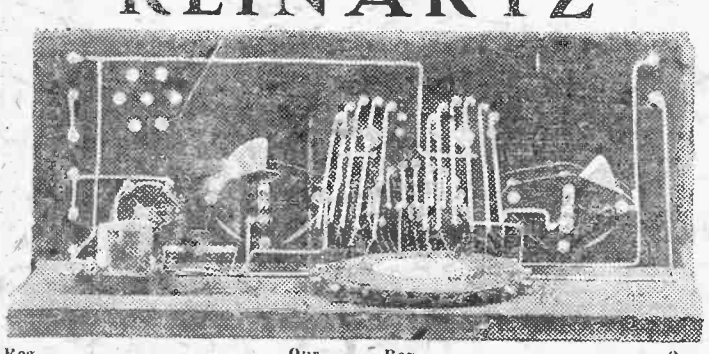


REINARTZ



Reg. Price.		Consisting of	Our Price.
$1.89		7x18 Formica Panel	$1.70
1.00		Bakelite Socket	.45
1.50		Howard Vernier Rheostat	1.35
3.30		23-Plate Variable Condenser	1.45
3.10		11-Plate Variable Condenser	1.35
3.00	1	Schoonhoven Reinartz Coil	1.95
1.00		Freshman Variable Grid Leak and Condenser combined	.75

Reg. Price.		Consisting of	Our Price.
$ .80	2	Dozen Switch Points	$ .40
1.50	3	Switch Levers	.75
.80	8	Binding Posts	.40
.30		25 Feet Tinned Wire	.15
.50		Baseboard for mounting	.25
1.00		Blueprint with complete instructions for assembling and wiring	.50

Regular Price, $21.69
Our Price .. $11.45

Regular Price EACH		Consisting of	Our Price EACH
$3.00	1	Cockaday Coil	$1.95
1.00	2	Bakelite Dials	.25
1.00	1	John Firth Socket	.45
1.00		Freshman Grid Leak and Condenser	.65
1.50	1	Howard Vernier Rheostat	1.35
1.00	1	Pacent Double Circuit Jack	.50
.10	8	Binding Posts	.05
.02	7	Switch Points	.01
.50	1	Switch Lever	.25
	1	7x14x⅛ Formica Panel	1.44
		Blueprint and Wire	1.00
	1	Baseboard	.25
3.80	2	23-Plate Condensers	1.45

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Western Electric VT-2 TUBES

5-Watt "E" Type CW-931

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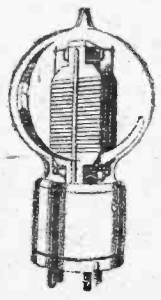

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Made from Anhydrous Redmanol Resins
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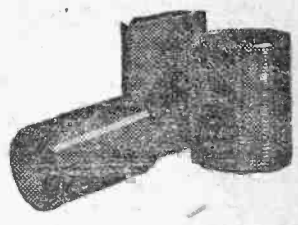


We are prepared to furnish promptly and saw Formica panels of any dimensions. Cutting charge is included in the following prices:

3-16-inch Formica, square inch 2c
⅛-inch Formica, square inch 1½c
Tubing (2 to 4-inch diameter), per running inch 10c

Special Cabinets

7x21 in. and 7x18 in.

Special at $2.95

Unity Vernier Rheostat

$1.45

Variable Condensers

$7.00	value, 43-Plate Vernier	$3.95
6.50	value, 23-Plate Vernier	3.45
6.00	value, 11-Plate Vernier	2.95
1.75	value, 3-Plate Vernier	1.15
4.30	value, 43-Plate, NOW	1.65
3.75	value, 23-Plate, NOW	1.35
3.30	value, 11-Plate, NOW	1.20
2.25	value, 5-Plate, NOW	1.25

Rector's Famous Two-Rotor Tuning Coil

$5.45

Complete Parts for
Power Amplifier

1 Set of Push and Pull Thordarson or All-American Power Transformers.
1 Double Firth Socket.
1 Howard Power Rheostat.
8 Binding Posts.
5 Switch Points and Stops.
1 Switch Lever.
1 Cutler-Hammer Filament Switch.
1 7x9 Panel.
Baseboard and instructions for assembling and mounting.

$25.00 Elsewhere

Our Price $16.95

Prices Smashed Kellogg Parts

11-Plate Vernier Condenser with 4-inch bakelite dial and knob	$4.95
23-Plate Vernier Condenser with 4-inch bakelite dial and knob	5.95
43-Plate Vernier Condenser with 4-inch bakelite dial and knob	6.45
3-Inch Bakelite Dials	.65
4-Inch Bakelite Dials	.95
Bakelite Sockets	.55
Grid Condensers	.55
Double Mountings	.60
Transformers (high or low ratio)	2.95

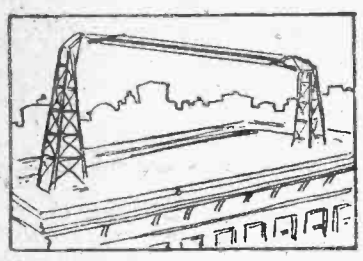
Complete Parts for
Autoplex

9½x13¾x⅛-inch Formica Panel, drilled and machined	$1.89
9½x13¾x¾-inch Mahogany Cabinet with hinged top	2.95
1 John Firth Socket	.35
1 Frost Plain Rheostat	1.00
2 Moulded Autoplex Variometers	7.30
3 3-inch Bakelite Dials	.50
6 Binding Posts	.30
1 Single Circuit Pacent Jack	.35
1 1,250 or 1,500 Turn Honeycomb Coil	1.50
1 4x4x¼-inch Formica sub base panel, drilled	.25
1 2¼x2¼x¾-inch Formica Panel, Coil, clamp drilled	.07
1 Complete set machine screws for assembling various parts, (no charge)	
1 Hook-up for assembling and wiring (no charge)	
4 Lengths square bus bar wire	.10

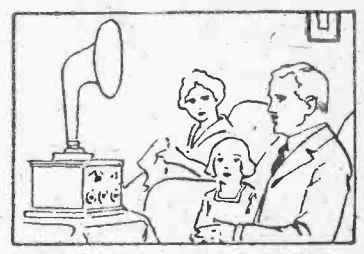
Our Special Price $16.45

THE CHICAGO EVENING POST

RADIO MAGAZINE



Published Every Thursday



THURSDAY, JANUARY 3, 1924.

Issued as a Supplement to
The Chicago Evening Post

BROADCASTING

HOME RADIO

RADIO SETS

HOOK-UPS

AMATEUR RECEPTION

HOME-WORKSHOP

RADIO SCIENCE-

RADIO PROGRAMS

LOCAL NEWS

U.S. RADIO NEWS

FOREIGN RADIO NEWS

HOME LABORATORY

AMATEUR TRANSMISSION

RADIO STATIONS

INVENTIONS

D.X. RECORDS

RADIO PRACTICE-

COMMERCIAL

NEW EQUIPMENT-

MANUFACTURERS NEWS

DEALERS NEWS

JOBBER NEWS

ANGELO MINGHETTI of the Chicago Civic Opera company sang at WJAZ (Chicago) the evening of Dec. 30. He rendered a program that gave broadcast listeners-in a real treat over a considerable portion of the evening's schedule.

IN THIS ISSUE

New "Superduc" Hook-up from Post Laboratory Described—Wiring Details on "Old Reliable"—How to Make a Distortionless Amplifier—Complete List of Broadcasting Stations and Programs of the Day—Questions You Ask and Our Answers—Letters from Radiophans

Broadcasting Stations and Schedules

Central, or Chicago time, is shown on all stations. If necessary to ascertain local time on any station deduct two hours from time shown for Pacific coast stations, one hour from time shown for the Rocky mountain stations and add one hour to those stations using eastern time. Hawaiian island time is four hours and a half slower than Chicago time. In the list the call number of the station is first given, followed by the location, the owner's name, wave length used and broadcasting schedule in order named, THE POST is making a thoro canvass of all stations in order that this directory may be complete and accurate. Changes are so frequent in stations and schedules that no list can be satisfactory which is not corrected frequently. Corrections and additions to this list will be made from week to week. Stations are urged to co-operate by sending information of changes in schedule to Radio Editor, The Chicago Evening Post.

KDKA—East Pittsburg, Westinghouse Electric and Manufacturing company, 326 meters.
KDPM—Cleveland, Ohio, Westinghouse Electric and Manufacturing company, 270 meters.
KDPT—San Diego, Calif., Southern Electrical company, 244 meters.
KDYL—Salt Lake City, Utah, Telegram Publishing company, 360 meters.
KDYM—San Diego, Calif., Savoy theater, 252 meters.
KDYQ—Portland, Ore., Oregon Institute of Technology, 360 meters.
KDYS—Great Falls, Mont., The Tribune, 360 meters.
KDYW—Phoenix, Ariz., Smith Hughes & Co., 360 meters.
KDYX—Honolulu, Hawaii, Star Bulletin, 360 meters.
KDZB—Bakersfield, Calif., 1402 20th street, Frank E. Siefert, 240 meters.
KDZE—Seattle, Wash., The Rhodes company, 455 meters.
KDZF—Los Angeles, Calif., Automobile Club of Southern California, 278 meters.
KDZI—Wenatchee, Wash., Electric Supply company, 360 meters.
KDZK—Reno, Nev., Nevada Machinery and Electric company, 360 meters.
KDZQ—Denver, Colo., Nichols Academy of Music, 360 meters.
KDZR—Bellingham, Wash., Bellingham Publishing company, 261 meters.
KDZT—Seattle, Wash., Seattle Radio association, 360 meters.
KFAD—Phoenix, Ariz., McArthur Bros. Mercantile company, 360 meters.
KFAE—Pullman, Wash., State College of Washington, 360 meters.
KFAF—Denver, Colo., Western Radio corporation, 360 meters.
KFAJ—Boulder, Colo., University of Colorado, 360 meters.
KFAN—Moscow, Idaho, The Electric shop, 360 meters.
KFAP—Butte, Mont., Standard Publishing company, 360 meters.
KFAR—Hollywood, Calif., Studio Lighting Service company (O. K. Olsen), 280 meters.
KFAU—Boise, Idaho, Independent School District of Boise City, Boise High school, 270 meters.
KFAV—Venice, Calif., Abbot Kinney company, 224 meters.
KFAW—Santa Ana, Calif., The Radio Den (W. B. Ashford and H. T. White), 280 meters.
KFAY—Medford, Ore., Virgin's Radio service, 283 meters.
KFBB—Havre, Mont., F. A. Buttrey & Co., 360 meters.
KFBC—San Diego, Calif., W. K. Azbill, 278 meters.
KFBE—San Luis Obispo, Calif., Reuben H. Horn, 360 meters.
KFBG—Tacoma, Wash., First Presbyterian church, 360 meters.
KFBK—Sacramento, Calif., Kimball-Upson company, 283 meters.
KFBL—Everett, Wash., Leese Bros., 224 meters.
KFBS—Trinidad, Colo., Trinidad Gas and Electric Supply company and the Chronicle News, 360 meters.
KFBU—Laramie, Wyo., The Cathedral (Bishop N. S. Thomas), 283 meters.
KFCB—Phoenix, Ariz., Nielsen Radio Supply company, 238 meters.
KFCD—Salem, Ore., Salem Electric company, 360 meters.
KFCF—Walla Walla, Wash., 707 Baker building, Frank A. Moore, 360 meters.
KFCH—Billings, Mont., Electric Service station (Inc.), 360 meters.
KFCK—Colorado Springs, Colo., Colorado Springs Radio company, 258 meters.
KFCL—San Antonio, Calif., Los Angeles Union Stock yards, 360 meters.
KFCM—Richmond, Calif., Richmond Radio shop (Frank T. Doeing), 360 meters.
KFCP—Ogden, Utah, 2421 Jefferson avenue, Ralph W. Flygare, 360 meters.
KFCV—Houston, Texas, Fred Mahaffey, Jr., 360 meters.
KFCY—Le Mars, Iowa, Western Union college, 252 meters.
KFCZ—Omaha, Neb., Omaha Central High school, 258 meters.
KFDA—Baker, Ore., Adler's Music store, 360 meters.
KFDD—Boise, Idaho, St. Michael's cathedral, 252 meters.
KFDH—Tucson, Ariz., University of Arizona, 360 meters.
KFDJ—Corvallis, Ore., Oregon Agricultural college, 360 meters.
KFDL—Denver, Colo., Knight-Campbell Music company, 360 meters.
KFDO—Bozeman, Mont., 420 West Koch street, H. Everett Cutting, 248 meters.
KFDP—Des Moines, Iowa, Hawkeye Radio and Supply Co., 278 meters.
KFDR—York, Neb., Bullock's Hardware and Sporting Goods (Robert G. Bullock), 360 meters.
KFDU—Lincoln, Neb., Nebraska Radio Electric company, 240 meters.
KFDV—Fayetteville, Ark., Gilbrech & Stinson, 360 meters.
KFDX—Shreveport, La., First Baptist church, 360 meters.
KFDY—Brookings, S. D., South Dakota State College of Agriculture and Mechanic Arts, 360 meters.
KFDZ—Minneapolis, Minn., 2510 South Thomas avenue, Harry O. Iverson, 360 meters.
KFEC—Portland, Ore., Meier & Frank company, 360 meters.
KFEJ—Tacoma, Wash., 1724 South Jay street, Guy Greason, 360 meters.
KFEL—Denver, Colo., Winner Radio corporation, 360 meters.
KFEP—Denver, Colo., Radio Equipment company (Joseph L. Turre), 240 meters.
KFEQ—Oak, Neb., J. L. Scroggin, 360 meters.
KFER—Fort Dodge, Iowa, Auto Electric Service company, 231 meters.
KFEV—Douglas, Wyo., Radio Electric Shop, 263 meters.
KFEX—Minneapolis, Minn., Augsburg Seminary, 261 meters.
KFEY—Kellogg, Idaho, Bunker Hill and Sullivan Mining and Concentrating company, 360 meters.
KFEZ—St. Louis, Mo., American Society of Mechanical Engineers (F. H. Schubert), 360 meters.
KFFA—San Diego, Cal., 3443 5th street, Dr. R. O. Shelton, 242 meters.
KFFB—Boise, Idaho, Jenkins Furniture company, 240 meters.
KFFE—Pendleton, Ore., Eastern Oregon Radio company, 360 meters.
KFFO—Hillsboro, Ore., Dr. E. H. Smith, 229 meters.
KFFP—Moberly, Mo., First Baptist church 275 meters.
KFFQ—Colorado Springs, Colo., Marksheffel Motor company, 360 meters.
KFFR—Sparks, Nev., Nevada State Journal (Jim Kirk), 226 meters.
KFFV—Lamoni, Iowa, Graceland college, 360 meters.
KFFX—Omaha, Neb., McGraw company, 278 meters.
KFFY—Alexandria, La., Pincus & Murphy, 275 meters.
KFFZ—Dallas, Tex. (portable), Al. G. Barnes Amusement company, 226 meters.
KFGG—Baton Rouge, La., Louisiana State university, 254 meters.
KFGD—Chickasha, Okla., Chickasha Radio and Electric company, 248 meters.
KFGH—Stanford University, Cal., Leland Stanford university, 360 meters.
KFGJ—St. Louis, Mo., Missouri National guard, 138th infantry, 266 meters.
KFGL—Arlington, Ore., Arlington garage, 234 meters.
KFGP—Cheney, Kan., Cheney Radio company, 229 meters.
KFGQ—Boone, Iowa, Crary Hardware company, 226 meters.
KFGV—Utica, Neb., Heidbreder Radio Supply company, 224 meters.
KFGX—Orange, Texas, First Presbyterian church, 250 meters.
KFGZ—Berrien Springs, Mich., Emmanuel Missionary college, 268 meters.
KFHA—Gunnison, Colo., Colorado State Normal school, 252 meters.
KFHB—Hood River, Ore., Rialto theater (P. L. Beardwell), 280 meters.
KFHD—St. Joseph, Mo., Utz Electric Shop company, 226 meters.
KFHF—Shreveport, La., Central Christian church, 266 meters.
KFHH—Neah Bay, Wis, Ambrose A. McCue, 283 meters.
KFHJ—Santa Barbara, Cal., Fallon & Co., 360 meters.
KFHQ—Los Gatos, Cal., Curtis Brothers Hardware store, 242 meters.
KFHR—Seattle, Wash., Star Electric and Radio company, 270 meters.
KFHS—Lihue, Hawaii, Clifford J. Dow, 275 meters.
KFHU—Mayville, N. D., M. G. Sateren, 261 meters.
KFHX—Hutchinson, Kan., 407 East 1st street, Robert W. Nelson, 229 meters.
KFI—Los Angeles, Cal., Earle C. Anthony (Inc.), 469 meters.
KFIB—St. Louis, Mo., 5666 Vernon avenue, Franklin W. Jenkins, 244 meters.
KFID—Iola, Kan., Ross Arbuckle's garage, 246 meters.
KFIE—Portland, Ore., Benson Polytechnic institute, 360 meters.
KFIK—Gladbrook, Iowa Gladbrook Electric company, 234 meters.
KFIL—Louisburg, Kan., Windisch Electric Farm Equipment company, 234 meters.
KFIO—Spokane, Wash., North Central high school, 252 meters.
KFIQ—Yakima, Wash., Yakima Valley Radio Broadcasting association, 224 meters.
KFIU—Juneau, Alaska, Alaska Electric Light and Power company, 226 meters.
KFIV—Pittsburg, Kan., 706 East 10th street, V. H. Broyles, 240 meters.
KFIX—Independence, Mo., Reorganized Church of Jesus Christ of Latter Day Saints, 240 meters.
KFIY—Seattle, Wash., Brott laboratories, 236 meters.
KFIZ—Fond du Lac, Wis., Daily Commonwealth, 237 meters.
KFJA—Grand Island, Neb., Central Power company, 244 meters.
KFJB—Marshalltown, Iowa, Marshalltown Electrical company, 248 meters.
KFJC—Seattle, Wash., Post Intelligencer, 233 meters.
KFJD—Greeley, Colo., Weld County Printing and Publishing company, 236 meters.
KFJF—Oklahoma City, Okla., National Radio Manufacturing company, 252 meters.
KFJH—Selma, Cal., The Sugar Bowl (H. R. Shaw), 273 meters.
KFJI—Astoria, Oreg., Liberty theater (E. E. Marsh), 252 meters.
KFJJ—Carrollton, Mo., Carrollton Radio shop, 236 meters.
KFJK—Bristow, Okla., Delano Radion and Electric company, 233 meters.
KFJL—Ottumwa, Iowa, Hardsaog Manufacturing company, 242 meters.
KFJM—Grand Forks, N. D., University of North Dakota, 229 meters.
KFJQ—Grand Forks, N. D., Electric Construction company (portable), 252 meters.
KFJR—Stevensville, Mont., Ashley C. Dixon and Son, 258 meters.
KFJV—Dexter, Iowa, Thomas H. Warren, 224 meters.
KFJW—Towanda, Kan., Le Grand Radio company, 226 meters.
KFJX—Cedar Falls, Iowa, State Teachers' college, 229 meters.
KFJY—Fort Dodge, Iowa, Tunwall Radio company, 246 meters.
KFJZ—Fort Worth, Texas, Texas National Guard, 112th Cavalry, 254 meters.
KFKA—Greeley, Colo., Colorado State Teachers' college, 248 meters.
KFKB—Milford, Kas., Brinkley-Jones Hospital association, 286 meters.
KFKH—Lakeside, Colo., Denver Park and Amusement company, 248 meters.
KFKQ—Conway, Ark., Conway Radio laboratories, 224 meters.
KFKV—Butte, Mont., F. F. Gray, 283 meters.
KFKX—Hastings, Neb., Westinghouse Electric and Manufacturing company, 286 meters.
KFLA—Butte, Mont., Abner R. Wilson, 283 meters.
KFLB—Menominee, Mich., Signal Electric Manufacturing company, 248 meters.
KFLD—Franklinton, La., Paul E. Greenlaw, 234 meters.
KFLE—Denver, Colo., National Educational Service, 268 meters.
KFLH—Salt Lake City, Utah, Erickson Radio company, 261 meters.
KFLP—Cedar Rapids, Ohio, Everette M. Foster, 240 meters.
KFLQ—Little Rock, Ark., Bizzell Radio shop, 261 meters.
KFLR—Albuquerque, N. M., University of New Mexico, 254 meters.
KGB—Tacoma, Wash., Wm. A. Mullins Electric company, 360 meters.
KGG—Portland, Ore., Hallock & Watson Radio service, 360 meters.
KGN—Portland, Ore., Northwestern Radio Manufacturing company, 360 meters.
KGU—Honolulu, Hawaii, Waikiki Beach, Marion A. Mulrony, 360 meters.
KGW—Portland Ore., Portland Morning Oregonian, 492 meters.
KGY—Lacy, Wash., St. Martins college (Rev. Sebastian Ruth), 258 meters.
KHJ—Los Angeles, Cal., Times-Mirror company, 395 meters.
KHQ—Seattle, Wash, 419 13th avenue, Louis Wasmer, 360 meters.
KJQ—Stockton, Cal., 615 East Main street, C. O. Gould, 360 meters.
KJR—Seattle, Wash, Northwest Radio Service company, 270 meters.
KJS—Los Angeles, Cal., Bible Institute of Los Angeles, 360 meters.
KLN—Monterey, Cal., Monterey Electric Shop, 360 meters.
KLS—Oakland, Cal., 2201 Telegraph avenue, Warner Brothers, 360 meters.
KLX—Oakland, Cal., Tribune Publishing company, 360 meters.
KLZ—Denver, Colo., Reynolds Radio company, 360 meters.
KMJ—Fresno, Cal., San Joaquin Light and Power corporation, 360 meters.
KMO—Tacoma, Wash., Love Electric company, 360 meters.
KNJ—Roswell, New Mexico, Roswell Public Service company, 250 meters.
KNT—Aberdeen, Wash., Grays Harbor Radio company (Walter Hemrich), 263 meters.
KNV—Los Angeles, Cal., Radio Supply company, 360 meters.
KNX—Los Angeles, Cal., Electric Lighting Supply company, 360 meters.
KOB—State College, New Mexico, New Mexico College of Agriculture and Mechanic Arts, 360 meters.
KOP—Detroit, Mich, Detroit Police department, 286 meters.
KPO—San Francisco, Cal., Hale Brothers, 423 meters.
KQI—Berkeley, Cal., University of California, 360 meters.
KQP—Hood River, Ore., Apple City Radio club, 360 meters.
KQV—Pittsburg, Pa., Doubleday-Hill Electric company, 360 meters.
KQW—San Jose, Cal., 467 1st street, Charles D. Herrold, 360 meters.
KRE—Berkeley, Cal., Berkeley Daily Gazette, 278 meters.
KSD—St. Louis, Mo., Post Dispatch (Pulitzer Publishing company), 546 meters.
KSS—Long Beach, Cal., Prest & Dean Radio company and Radio Research Society of Long Beach, Cal., 360 meters.
KTW—Seattle, Wash., First Presbyterian church, 360 meters.
KUO—San Francisco, Cal., Examiner Printing company, 360 meters.
KUS—Los Angeles, Cal., City Dye Works and Laundry company, 360 meters.
KUY—El Monte, Cal., Coast Radio company, 360 meters.
KWG—Stockton, Cal., Portable Wireless Telephone company, 360 meters.
KWH—Los Angeles, Cal., Los Angeles Examiner, 360 meters.
KXD—Modesto, Cal., Modesto Herald Publishing company, 360 meters.
KYQ—Honolulu, Hawaii, Electric Shop, 360 meters.
KYW—Chicago, Ill., Westinghouse Electric and Manufacturing company, 345 meters.
KZM—Oakland, Cal., 13th and Harrison streets, Preston D. Allen, 360 meters.
KZN—Salt Lake City, Utah, The Deseret News, 360 meters.
KTKZ—Colorado Springs, Colo., Nassour Bros. Radio company, 234 meters.
KZV—Wenatchee, Wash, Wenatchee Battery and Motor company, 360 meters.
WAAB—New Orleans, La., 137 South St. Patrick street, Valdemar Jensen, 268 meters.
WAAC—New Orleans, La., Tulane university, 360 meters.
WAAD—Cincinnati, Ohio, Ohio Mechanics institute, 360 meters.
WAAF—Chicago, Ill., Chicago Daily Drovers Journal, 360 meters.
WAAH—St. Paul, Min., Commonwealth Electric company, 360 meters.
WAAK—Milwaukee, Wis., Gimbel Brothers, 280 meters.
WAAM—Newark, N. J., I. R. Nelson company, 263 meters.
WAAN—Columbia, Mo., University of Missouri, 254 meters.
WAAW—Omaha, Neb., Omaha Grain Exchange, 360 meters.
WAAZ—Emporia, Kans., Hollister-Miller Motor company, 360 meters.
WABB—Harrisburg, Pa., Dr. John B. Lawrence, 266 meters.
WABC—Anderson, Ind., Fulwider-Grimes Battery company, 229 meters.
WABD—Dayton, Ohio, Parker high school, 283 meters.
WABE—Washington, D. C., Young Men's Christian association, 283 meters.
WABF—Mount Vernon, Ill., Mount Vernon Register-News company, 234 meters.
WABG—Jacksonville, Fla., Arnold Edwards Piano company, 248 meters.
WABH—Sandusky, Ohio, Lake Shore Tire company, 240 meters.
WABI—Bangor, Me., Bangor Railway and Electric company, 240 meters.
WABA—Lake Forest, Ill., Lake Forest college, 266 meters.
WABJ—South Bend, Ind., The Radio Laboratories, 240 meters.
WABK—Worcester, Mass., First Baptist church, 252 meters.
WABL—Storrs, Conn., Connecticut Agricultural college, 283 meters.
WABM—Saginaw, Mich., F. E. Doherty Automotive and Radio Supply company, 254 meters.
WABN—La Crosse, Wis., Waldo C. Grover, 234 meters.
WABO—Rochester, N. Y., Lake Avenue Baptist church, 252 meters.
WBAA—West Lafayette, Ind., Purdue university, 360 meters.
WBAD—Minneapolis, Minn., Sterling Electric company, 360 meters.
WBAH—Minneapolis, Minn., The Dayton company, 360 meters.
WBAN—Paterson, N. J., Wireless Phone corporation, 244 meters.
WBAO—Decatur, Ill., James Millikin university, 360 meters.
WBAP—Fort Worth, Texas, Wortham-Carter Publishing company (Star-Telegram), 476 meters.
WBAV—Columbus, Ohio, Erner & Hopkins company, 390 meters.
WBAW—Marietta, Ohio, Marietta college, 246 meters.
WBAX—Wilkesbarre, Pa., 66 Gildersleeve street, John H. Stenger Jr., 360 meters.
WBAY—New York, N. Y., Western Electric company, 492 meters.
WBBA—Newark, Ohio, Newark Radio Laboratories, 240 meters.
WBBC—Sterling, Ill., Sterling Radio Equipment company, 229 meters.
WBBD—Reading, Pa., Barbey Battery Service, 234 meters.
WBL—Anthony, Kan., T & H. Radio company, 261 meters.
WBS—Newark, N. J., D. W. May, Inc., 360 meters.
WBT—Charlotte, N. C., Southern Radio corporation, 360 meters.
WBU—Chicago, Ill., City of Chicago, 286 meters.
WBZ—Springfield, Mass., Westinghouse Electric and Manufacturing company, 337 meters.
WCAD—Canton, N. Y., St. Lawrence university, 280 meters.
WCAE—Pittsburg, Pa., Kaufmann & Baer company, 462 meters.
WCAG—New Orleans, La., 2813 Calhoun street, Clyde R. Randall, 268 meters.
WCAH—Columbus, Ohio, Entrekin Electric company, 286 meters.
WCAJ—University Place, Neb., Nebraska Wesleyan university, 360 meters.
WCAK—Houston, Texas, 2504 Bagby street, Alfred P. Daniel, 360 meters.
WCAL—Northfield, Minn., St. Olaf college, 360 meters.
WCAM—Villanova, Pa., Villanova college, 360 meters.
WCAO—Baltimore, Md., Sanders & Stayman company, 360 meters.
WCAP—Washington, D. C., Chesapeake & Potomac Telephone company, 469 meters.
WCAR—San Antonio, Texas, Alamo Radio Electric company, 360 meters.
WCAS—Minneapolis, Minn., William Hood Dunwoody Industrial institute, 360 meters.
WCAT—Rapid City, S. D., South Dakota State School of Mines, 240 meters.
WCAU—Philadelphia, Pa., Durham & Co., 286 meters.
WCAV—Little Rock, Ark., J. C. Dice Electric company, 360 meters.
WCAX—Burlington, Vt., University of Belmont, 360 meters.
WCAY—Milwaukee, Wis., Kesselman O'Driscoll company, 261 meters.
WCAZ—Carthage, Ill., Carthage college, 246 meters.
WCBA—Allentown, Pa., 1015 Allen street, Charles W. Heimbach, 280 meters.
WCBB—Greenville, Ohio, K. & K. Radio Supply company (Charles H. Katzenberger), 240 meters.
WCBD—Zion, Ill., Wilbur G. Voliva, 345 meters.
WCE—Minneapolis, Minn., Findley Electric company, 360 meters.
WCK—St. Louis, Mo., Stix, Baer & Fuller Dry Goods company, 360 meters.
WCM—Austin, Texas, University of Texas, 360 meters.
WCX—Detroit, Mich., Detroit Free Press, 517 meters.
WDAD—Lindsborg, Kans., Central Kansas Radio Supply company (Wm. L. Harrison), 360 meters.
WDAE—Tampa, Fla., Tampa Daily Times, 360 meters.
WDAF—Kansas City, Mo., Kansas City Star, 411 meters.
WDAG—Amarillo, Texas, J. Laurance Martin, 360 meters.
WDAH—El Paso, Texas, Trinity Methodist church (South), 360 meters.
WDAI—Syracuse, N. Y., Hughes Radio corporation, 246 meters.
WDAK—Hartford, Conn., The Courant, 261 meters.
WDAL—Jacksonville, Fla., Florida Times-Union, 360 meters.
WDAO—Dallas, Texas, Automotive Electric company, 360 meters.
WDAP—Chicago, Ill., Board of Trade, 360 meters.
WDAR—Philadelphia, Pa., Lit Brothers, 395 meters.
WDAS—Worcester, Mass., 692a Main street, Samuel A. Waite, 360 meters.
WDAU—New Bedford, Mass., Slocum Kilburn, 360 meters.
WDAX—Centerville, Iowa, First National bank, 360 meters.
WDAY—Fargo, N. D., Fargo Radio Service company, 244 meters.
WDBC—Lancaster, Pa., Kirk, Johnson & company, 258 meters.
WDBF—Youngstown, Ohio, 254 West Federal street, Robert G. Phillips, 261 meters.
WDM—Washington, D. C., Church of the Covenant, 360 meters.
WDT—Stapleton, N. Y., Ship Owners Radio Service 405 meters.
WDZ—Tuscola, Ill., Star Store building, James L. Bush, 278 meters.
WEAA—Flint, Mich., Fallain & Lathrop, 280 meters.
WEAB—Fort Dodge, Iowa, Standard Radio Equipment company, 360 meters.
WEAF—New York, N. Y., American Telephone and Telegraph company, 492 meters.
WEAG—Edgewood, R. I., Nichols-Hineline-Bassett Laboratory, 231 meters.
WEAH—Wichita, Kans., Witchita Board of Trade, 244 meters.
WEAI—Ithaca, N. Y., Cornell university, 286 meters.
WEAJ—Vermillion, S. D., University of South Dakota, 360 meters.
WEAM—North Plainfield, N. J., Borough of North Plainfield (W. Gibson Buttfield), 250 meters.
WEAN—Providence, R. I., Shepard company, 273 meters.
WEAO—Columbus, Ohio, Ohio State University, 360 meters.
WEAP—Mobile, Ala., Mobile Radio company, 360 meters.
WEAR—Baltimore, Md., Baltimore American and News Publishing company, 360 meters.
WEAS—Washington, D. C., Hecht company, 360 meters.
WEAU—Sioux City, Iowa, Davidson Brothers company, 360 meters.
WEAY—Houston, Texas, Iris theater (Will Horowitz Jr.), 360 meters.
WEB—St. Louis, Mo., Benwood company, 360 meters.
WEV—Houston, Texas, Hurlburt-Still Electrical company, 360 meters.
WEW—St. Louis, Mo., St. Louis University, 261 meters.
WFAA—Dallas, Texas, Dallas News and Dallas Journal, 476 meters.
WFAB—Syracuse, N. Y., 802 McBride street, Carl F. Woese, 234 meters.
WFAF—Poughkeepsie, N. Y., H. C. Spratley Radio company, 360 meters.
WFAH—Port Arthur, Texas, Electric Supply company, 360 meters.
WFAJ—Asheville, N. C., Hi-Grade Wireless Instrument company, 360 meters.
WFAM—St. Cloud, Minn., Times Publishing company, 360 meters.
WFAN—Hutchinson, Minn., Hutchinson Electric Service company, 360 meters.
WFAQ—Cameron, Mo., Missouri Wesleyan college, 360 meters.
WFAT—Sioux Falls, S. D., Daily Argus-Leader, 360 meters.
WFAV—Lincoln, Neb., University of Nebraska, department of electrical engineering, 360 meters.
WFI—Philadelphia, Pa., Strawbridge & Clothier, 395 meters.
WGAL—Lancaster, Pa., Lancaster Electric Supply and Construction company, 248 meters.
WGAN—Pensacola, Fla., 216 West Romana street, Cecil E. Lloyd, 360 meters.
WGAQ—Shreveport, La., Glenwood Radio corporation (W. G. Patterson), 360 meters.
WGAR—Fort Smith, Ark., Southwest American, 360 meters.
WGAU—Wooster, Ohio, Radio Manufacturing and Service company (Marcus G. Limb), 226 meters.
WGAW—Altoona, Pa., 1918 West Chestnut street, Ernest C. Albright, 261 meters.
WGAY—Madison, Wis., Northwestern Radio company, 360 meters.
WGAZ—South Bend, Ind., South Bend Tribune, 360 meters.
WGI—Medford Hillside, Mass., American Radio and Research corporation, 360 meters.
WGL—Philadelphia, Pa., 2303 North Broad street, Thomas F. J. Howlett, 360 meters.
WGR—Buffalo, N. Y., Federal Telephone and Telegraph company, 319 meters.
WGV—New Orleans, La., Interstate Electric company, 360 meters.
WGY—Schenectady, N. Y., General Electric

THE CHICAGO EVENING POST TABLOID RADIO SCHEDULES

These stations are those most commonly tuned in evenings by the Chicago broadcast listeners. The time given is central standard. Pacific coast time is two hours earlier than that shown here. Mountain time is one hour earlier, and eastern time one hour later. Evening program schedules only are given. This list was compiled by The Chicago Evening Post Radio Department and is protected by copyright.

STATION	Miles	Met	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Chicago—									
KYW, Comm. Edison Bldg.		536	.....	6:30- 9:30	6:30-12:00	6:30- 9:30	6:30- 9:30	6:30-12 m.	6:30- 9:30
WAAF, Union Stock Yards		286	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00	.....	.....
WMAQ, Hotel La Salle		448	.....	7:00- 9:55	7:00- 9:55	7:00- 9:55	7:00- 9:55	8:00-10:00	.....
WDAP, Drake Hotel		360	.....	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	9:15-10:30
WJAZ, Edgewater Beach Hotel		448	.....	10:00-12:30	10:00-12:30	10:00-12:30	10:00-12:30	10:00- 2:00	6:00- 9:00
Suburban—									
WCBD, Zion, Ill.	39	345	8:00- 9:00	.....	.....	.....	8:00- 9:00	.....	.....
WIAB, Rockford, Ill.	77	252	.....	.....	8:00- 9:00	.....	.....	.....	.....
WRM, Urbana, Ill.	120	360	.....	.....	8:50- 9:30	.....	.....	.....	.....
WTAS, Elgin, Ill.	37	275	.....	.....	7:30-10:00	.....	.....	.....	.....
Eastern—									
KDKA, East Pittsburg	430	326	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	.....
WBZ, Springfield, Mass.	802	337	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	.....
WEAF, New York City	733	495	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10.00
WGI, Medford Hillside, Mass.	875	360	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	7:30- 9:00
WHAZ, Troy, N. Y.	748	380	8:00- 9:30	.....	.....	.....	.....	.....	.....
WGY, Schnectady, N. Y.	698	280	6:45-11:30	6:45- 9:00	6:45- 9:00	6:45- 9:00	6:45-11:30	6:45- 9:00	.....
WGR, Buffalo	472	319	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	.....
WJY, New York City	733	405	.....	.....	.....	.....	.....	.....	2:30- 6:00
WJZ, New York City	733	455	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	.....
WOO, Philadelphia	677	509	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	.....
WRC, Washington, D. C.	612	469	8:00-10:00	.....	8:00-10:00	.....	8:00-10:00	.....	.....
Midwest—									
WCX, Detroit	245	517	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	.....	.....
WJAX, Cleveland	323	390	.....	7:30- 9:30	.....	8:00-10:30	.....	.....	.....
WLAG, Minneapolis	358	417	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	.....
WLW, Cincinnati	262	309	8:00-10:00	10:00-12:00	8:00-10:00	10:00-12:00	.....	.....	.....
WOC, Davenport	105	481	7:00-11:00	.....	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	.....
WTAM, Cleveland	323	300	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30
WWJ, Detroit	245	517	8:30-10:00	8:30-10:00	8:30-10:00	8:30-12 m.	8:30-10:00	.....	.....
Southern—									
KSD, St. Louis	270	546	8:00-11:00	8:00-11:00	8:00-11:00	.....	8:00-11:00	8:00-11:00	.....
WBAP, Fort Worth, Texas	855	476	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00	.....	.....
WDAF, Kansas City, Mo	430	411	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	.....
WFAA, Dallas, Texas	853	476	6:45- 9:30	6:45- 9:30	6:45- 9:30	6:45- 7:30	6:45- 9:30	6:45- 9:30	9:30-11:00
WGV, New Orleans	858	350	7:00- 8:00	.....	7:00- 8:00	.....	.....	7:00- 8:00	.....
WHAS, Louisville	271	400	.....	.....	7:30- 9:00	.....	.....	.....	4:00- 5:00
WHB, Kansas City, Mo	430	411	.....	7:00- 9:00	.....	.....	7:00- 9:00	7:00- 9:00	8:00-10:00
WMC, Memphis	480	500	.....	11:00-12:00	.....	.....	11:00-12:00	8:00-10:00	8:00-10:00
WOAI, San Antonio, Texas	1,080	385	.....	9:30-10:30	.....	.....	.....	9:30-10:30	.....
WOS, Jefferson City, Mo	337	441	8:00- 9:30	.....	8:00- 9:30	.....	8:00- 9:30	.....	.....
WSB, Atlanta, Ga	605	428	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	7:30- 9:00
Pacific Coast—									
KFDB, San Francisco	1,910	509	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30
KGW, Portland, Ore.	1,895	492	1:00-2 a.m.	10:00-11:00	10:00-11:00	10:00 11:00	1:00-2 a.m.	10:00-11:00	9:00-10:00
KHJ, Los Angeles	1,795	395	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	10:00-12:00
KPO, San Francisco	1,910	423	6:30-12 m.	6:30-12 m.	.....	6:30-12 m.	.....	6:30-12 m.	10:30-12 m.

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IVERSON C. WELLS
EDITOR

Assisted by a Staff of Regular and Special Contributing Writers.

The RADIO MAGAZINE Section is edited with the view of giving authentic news of the radio broadcasting field and authoritative information on the subjects of home construction of receiving and transmission sets, of the operation and maintenance of apparatus, and as an exchange of opinion for its readers.

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Prowler Predicts Big Year in Radio

By THE NIGHT PROWLER.

Here's another week. It's been a busy one for everyone that had a set and wanted to listen in, because the air was full of signals. As one radiophan writes in to me, "The whole world seemed to be hammering away at my receiver."

You're right, friend, the weather conditions are getting better and better day by day. Radio reception IS fine. Receivers are better. Broadcasting stations broadcast better. Why shouldn't we get just everything that we want?

The coming year ought to be a humdinger in radio. They're just beginning to learn how to work the darn thing. I look for some highly important announcements before the twelve months have passed.

Someone is going to come across with a real tuning unit. Someone is going to discover that by hooking in a thingmegig into the ground circuit you won't need anything but a radiator to be in London, England, and Aberdeen, Scotland.

Then, they are not thru with the tubes by a long shot. Wouldn't be surprised if some heavy-browed fellow did not discover that we have all been wrong on the vacuum tubes and that all that is necessary is a soft sponge to absorb the radio energy and hold it long enough for a painless extractor of some sort to get it out and put it in the telephones.

That "Superduc" I was telling you last week is out on page 7 today. It is worth trying out. You probably have all the parts lying around the house or out in the junk box. You don't have to be so very particular about high-priced parts. It will work well on pretty much any old thing.

Radio Programs

Below are given the complete schedules of all the Chicago and suburban broadcasting stations and those of the out-of-town stations which are most commonly tuned by local radiophans.

These schedules are a regular daily feature in The Chicago Evening Post.

On Thursday of each week a complete list and schedule of every broadcasting station in the United States is published in The Chicago Evening Post's sixteen-page Radio Magazine section.

CHICAGO STATIONS

Central Time Is Shown.)

KYW—Located in Commonwealth Edison building; 536 meters; Wilson J. Wetherbee, director.

Day—9:30 a. m., news and markets; 10 a. m., market reports; 10:30 a. m., financial news and comment; 10:58 a. m., naval observatory time signals; 11 a. m., market reports; 11:05 a. m., weather report; 11:30 a. m., news and comment of the financial and commercial market; 11:35 a. m., table talk by Mrs. Anna J. Peterson; 6:30 p. m., children's bedtime story; 2:35 p. m., studio program.

Evening — 6:50 p. m., children's bedtime story; 8 to 8:20 p. m., "Twenty Minutes of Good Reading," by Rev. C. J. Pernin, S. J., head of department of English, Loyola university, Chicago; 8:30 to 9:30 p. m., musical program (this program will be phoned from Orchestra hall, Chicago); popular concert by the Edison Symphony orchestra, Morgan L. Eastman conductor; soloist, Sybil Comer, soprano; (1) "Marcheta" (Schertzinger), by Edison Symphony orchestra; (2) Tom Jones dances (a) "Morris Dance," (b) "Gavotte" and (c) "Jig," by Edison Symphony orchestra; (3) operatic aria, selected, by Sybil Comer; (4) "Rakoczy Overture Keler" (Bela), by Edison Symphony orchestra; (5) (a) "Saeterjentens Sondag" (Bull), (b) "Reverie" (Fauconier), by Edison Symphony orchestra; (6) "Gertana Waltz" (Haines), by Edison Symphony orchestra; (7) two soprano solos, sleected, by Sybil Comer; (8) light opera selection, "Madam Sherry" (Hoschna), by Edison Symphony orchestra.

WAAF—Located at Union stock yards; 286 meters.

Day—Live stock reports at 8:40, 10:30, 10:45 a. m., 12:30, 12:45, 4:30 p. m.

Evening—No schedule.

WMAQ—Located on Hotel LaSalle; 447.5 meters. Miss Judith C. Waller, station director.

Day—4:30 p. m., Balieff's "Chauve-Souris."

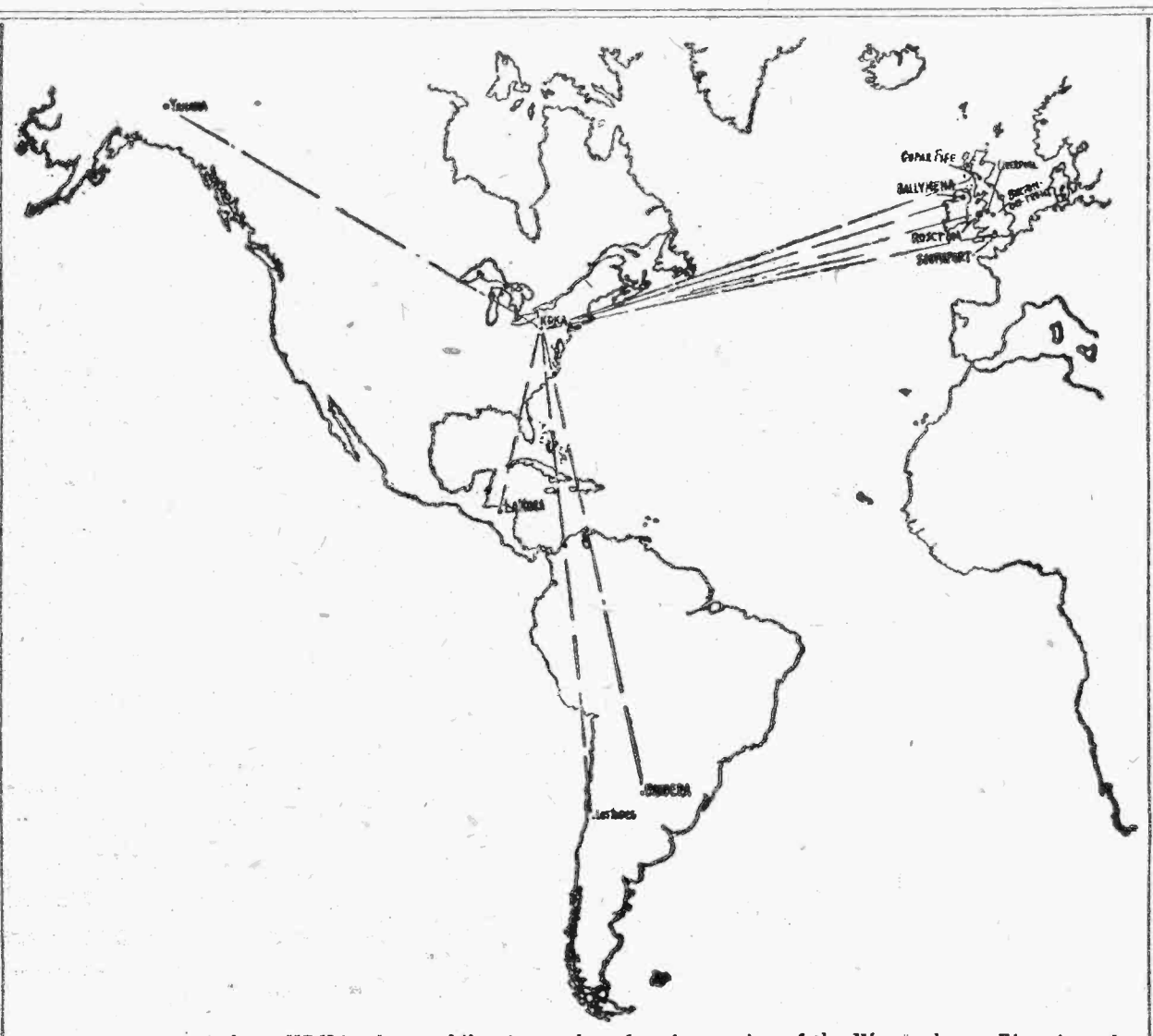
Evening—7 p. m., Babson report; talk by Rockwell R. Stephens, automobile editor of the Daily News; Mrs. Pauline Gertin Funk, soprano; weekly talk to Boy Scouts; 7:30 p. m., Axel Christenson, entertainer; 8:30 p. m., WMAQ's orchestra; 9:15 p. m., program arranged by Polish consulate, one of a series of programs by foreign consuls in Chicago.

WJAZ—Located on Edgewater Beach hotel; 447.7 meters. E. Warren Howe, program director.

Day—This station has no regular day schedule.

Evening—10 p. m. to 2 a. m., Walter D.

Continued on Page 6.



Map shows where KDKA, the world's pioneer broadcasting station of the Westinghouse Electric and Manufacturing company, East Pittsburg, Pa., has been heard in the last two weeks.

No Radio Tax on Listeners-In, Says Saranoff

NEW YORK, Jan. 3.—With the general trend of thought among radio enthusiasts leaning toward the question, "Who will pay for broadcasting?" the remarks of David Sarnoff, vice president and general manager of the Radio Corporation of America, in a recent address, are especially timely.

"It has been said by a great many people and a great many corporations, some very large and able," said Sarnoff, "that broadcasting depends upon a solution of the problem whereby the consumer will pay for the entertainment which he receives.

"In other words, it has been said that unless some method is provided whereby a means is created for collecting revenue from the whole industry is founded on sand, and that it is bound to collapse in time, because there will be no means of supporting it.

No Need of Tax.

"It is my firm conviction that that sort of solution to the problem is not necessary, that broadcasting can be made commercially practicable without any means being found for collecting from the consumer, that the greatest advantage of broadcasting lies in its universality, free entertainments, culture, instruction and all the items which constitute a program, in doing that which no other agency has yet been able to do.

"It is up to us, with intelligence and technique and broadness of spirit and vision as to the future, to preserve that most delightful element in the whole situation—the freedom of radio.

"Just so soon as we destroy that freedom and universality of radio and confine it to only those who pay for it—those who pay for the service, in other words—just so soon as we make of broadcasting 'narrowcasting,' we destroy the fundamental of the whole situation.

Says Today's Plan Is Right.

"And, therefore, I believe very definitely that broadcasting as constituted today is commercially sound, and that it will remain so in the future, altho there may be selective methods and narrowest methods which will do no harm. These may supplement the situation.

"There may be wired-wireless and the like. All of these will make their contributions. But, fundamentally, there will remain, and there must remain and be preserved that element of the broadcast situation, which makes it possible for grand opera to go to the slums and to the districts of the poor as well as the rich, everywhere in the world, without any charge.

"The real picture of a $15 or a $25 set in the home of the slums, if you please, receiving the magnificent things in the air, is the picture we must preserve."

Reception of WGY was so successful in Queenstown, Ireland, during the transatlantic tests on the morning of Nov. 27 that A. N. C. Horne was able to make a fifteen-second log covering the transmission from the opening announcement to the "sign-off."

In his letter to the General Electric company station Mr. Horne stated that reception was made on three valves—detector and two low-frequency, with an aerial 25 feet high and 250 feet long, inclosed by tall trees. He explains that he has studied radio for the last ten years and that the highest degree of accuracy was aimed at in recording his observations.

His log is the very essence of neatness, and it is concise and readable. Every fifteen seconds he recorded the type of emission, that is speech or music, and then recorded the signal strength. The greater part of the WGY program recorded was reported "good" or "strong." This classification was particularly noted on the address of Owen D. Young, chairman of the board of directors of the General Electric company and of the board of the Radio Corporation of America. The concluding number, "God Save the King," played by the WGY orchestra, was also "good," according to the log.

Mr. Horne sent records of WGY for Nov. 22, 23, 24 and 25, indicating that he has little difficulty in picking up the Schenectady station whenever it is on the air. Accompanying the WGY records were logs on reception of English broadcasting stations, and it was observable that the WGY transmission faded less than that of the English stations.

England Hears Pittsburg.

LONDON, Jan. 3.—Success has attended attempts to hear thruout Britain a program broadcast from America. The North Downs receiving station in the County of Kent, notwithstanding much atmospheric disturbance, Dec. 28 received distinctly a program from East Pittsburg, which included organ and piano solos and a lecture to Boy Scouts.

The program came thru with remarkable clarity, the lecturer's voice being heard especially well, and the North Downs station promptly relayed it to all the broadcasting stations of the British isles. Hundreds of owners of crystal sets reported that they heard it clearly.

Device Records Sounds Human Ear Overlooks

NEW YORK, Jan. 3.—Harnessing for the use of practical science the potentialities of ultra-audible ether vibration was seen today by scientists as the practical significance of the announcement by the Westinghouse Electric and Manufacturing company of the perfection by Dr. Philips Thomas of an electric microphone which, it was claimed, recorded sounds too faint for perception by the human ear.

The possible uses of ultra-audible vibrations, it was pointed out, were clearly imaginable in the light of the practical uses to which X-rays, electric waves, ultra-violet rays and radio waves have been put.

Employs New Principle.

The microphone, said to employ an entirely new principle, it was asserted, would open vast fields of entomological research by making possible the recording of sounds made by insects apparently mute.

The new device, S. M. Kintner, Westinghouse research director, asserted, would do for the human ear what the microscope had done for the human ear, and possibly would add as much to the store of human knowledge of physical and biological phenomena.

The microphone was developed during the study of a radio broadcasting problem—that of recording perfectly sound vibrations too rapid for ordinarily sensitized instruments.

Works by "Glow Discharge."

The instrument consists of two small electrodes placed diametrically opposite each other in a ring of insulating material. A high voltage applied to the electrodes is said to form between them a "glow discharge" having the peculiar property of being affected by sound waves and causing changes exactly corresponding to the sound waves in the flow of current to the electrode.

The glow discharge, which is said to be neither a spark nor an arc, will, it was said, respond to the uttermost limit of sound vibrations and thus will permit the identification and study of all sounds in the ultra-audible region.

Investigation of the ultra-audible field probably will be left for the time being at least to pure physicists while Westinghouse engineers will soon begin a study of the practical application of the new field's potentialities.

New Tube Is Aid to Industry In 1923

IMPORTANT improvements in vacuum tubes for radio purposes marked developments in 1923. These were mostly in the direction of increased efficiency of operation and a general betterment of electrical characteristics.

It is also interesting to note that during the year there was started in regular production a new tube of the highest power so far standardized and also the smallest tube requiring the least power expenditure in the filament that has so far been made available to the public for radio receiving sets.

The smallest standard receiving tube, UV-199, operates with an expenditure of only .18 watts for the filament, which is of a new type and insures high electron emission, silent operation and long life.

Makes New Amplifier Possible.

The development of the new filament made possible the remodeling of the radiotron UV-201, the previous standard receiving tube, so that it only required one-quarter the former amount of filament power. At the same time the characteristics of the tube were changed so that it became a better detector and amplifier.

A new highly efficient fifty-watt transmitting tube, UV-203-A, was developed and put into production. This tube also incorporated the new filament which enabled the filament energy required to be cut to one-half its former value for this size of tube and at the same time the characteristics were greatly improved. The operating life also was increased several fold by the change to the new filament.

A new tube of 250 watts, UV-204-A, output also employed the new filament, which decreased the power consumption to about one-quarter of its former value and also improved the life.

A transmitting tube of twenty kw. output operates from a direct current source of 12,000 to 15,000 volts. In this tube, UV-207, the anode also is the container and the tube is designed to operate with the anode container immersed in running water to dissipate the heat developed in the interior of the tube. Several of these equipments were placed in service and more than a dozen other sets are being installed or were under construction.

New Designs in Receivers.

Many important improvements were made in the design and production of the radio apparatus, the advances being especially notable in broadcast receivers. The public's interest in broadcasting continued unabated and the demand for apparatus was so insistent that a considerable number of new styles were standardized.

The sectional units which formerly were standardized were combined in various groups to meet different requirements. One of these units, a detector amplifier, was used in conjunction with the tuning unit, and suitable means were devised for combining the two to form a receiver set suitable for use without outside antenna.

The set is very simple in operation, having a single-tuned circuit, and is provided with regeneration when operated with a tube detector. A crystal detector is a part of the receiver for giving head telephone reception on near-by broadcasting stations when desired. These sets were adapted for the dry battery radiotrons, thereby entirely eliminating the necessity of storage batteries.

Another set was made by combining the same detector and amplifier unit with a three-stage radio-frequency amplifier unit to make a set suitable for use with loop aerial. This set is very simple in construction, there being but one tuning control, the variable condenser in parallel with the tuning loop.

Tubes Bring New Parts to Light.

New component parts were added to the line of standardized parts already available for use by amateurs and those desirous of constructing their own sets. The principal additions included socket and rheostats for the new low filament current radiotrons as well as adaptors for using these

Continued on Page 4.

Tubes Make History for Radio in 1923

Continued From Page 3.

tubes in the sockets originally supplied in many sets.

Of the new circuits announced during the year, the Hazeltine neutrodyne created the most interest.

A loud speaker was developed for use as an addition to sets not already equipped with one. It is very sensitive and reproduces signals with clear equality, and a single adjustment is provided for the diaphragm, which gives good operating efficiency over a considerable range of signal intensities.

Early in the year the requirements for receivers took on a new aspect. Portable and self-contained receivers had become possible, due to the new tube developments, and those suddenly were widely demanded. The receiver designed to meet this need utilizes a single-circuit regenerative system with a detector and an audio-amplifier tube, functioning well over the broadcast range. The method of control is exceptionally simple. The telephones and plug are carried in the front cover, while the batteries are in the rear. Having a complete weight of but eighteen pounds, the set is made portable easily by the addition of a leather carrying handle.

Self-contained Receiver.

One of the best examples of the adaptation of the new radiotrons to a complete receiver is to be found in the self-contained cabinet receiver, which utilizes a single circuit tuning system with regeneration and has a detector and two audio-frequency stages. The batteries are supported inside the cabinet and the loud speaker is built into it. The tunning controls, two in number, easily are accessible.

Developments in the line of commercial receivers included the standardization of those used in the transatlantic and transpacific stations of the Radio Corporation of America. The layout of these communication channels consists of three separate divisions: first, the transmitting station, usually located at some advantageous position near the coast for sending the communications across the sea; second, a receiving station, also advantageously located for reception from across the sea, but usually removed from the transmitter; and, third, the operating division, usually located in the heart of the business or financial center to which the communication service is to be rendered. The operating division frequently may be separated by 100 to 200 miles from either of the two other divisions, but it directly controls thru suitable remote-control relays the operation of these two divisions. Thus communication is directly carried on from the desired point without transcription by the other divisions.

The equipment in the receiving stations consists of eight separate large units, not including the relays necessary for transposing the signals on the land wires.

Aids World News of Jap Disaster.

It is interesting to note that both the stations which took part in bringing the news of the recent Japanese disaster in September, 1923, to the world were equipped with the above standard receiving equipment. On the Japanese side, the operating division of station JAA was located in Tokyo, while the transmitting division was in Haranomachi, some 155 miles away, and the receiving division 187 miles away at Tomioka.

On the American side a similar situation existed. Station KET has its operating division in San Francisco, its transmitting station at Bolines, about fifty miles away, and its receiving station at Marshall, forty-four miles away.

Station JAA usually works thru the Radio corporation station at Koko Head, Honolulu, but in this emergency communication was carried on directly across the water. The personnel of both stations worked incessantly at fever heat, while Japan told of her terrible calamity and needs. With all other communication systems out of order radio stood as the only means by which the call for assistance could be brought to mankind.

For the purpose of securing a high voltage direct current supply for the operation of radio vacuum tube transmitters and for experimental work there was developed and built for the United States navy department a kenotron rectifier, rated at 30 kw. at 15,000 volts direct current. It contains twelve model UV-219 kenotrons, so connected that so-called three-phase full wave rectification is obtained.

Rectifier Smooths Out Ripples.

The rectifier has associated with it the necessary controls, whereby the output can be adjusted from full output to a small fraction thereof. The filter system is associated with the rectifier, which smooths out the remaining ripple in the rectified alternating current to less than one-tenth of 1 per cent. This rectifier is now installed on the navy department laboratories at Bellevue, near Washington, D. C.

As a link in the communication system of the United States signal corps there was built for installation at Fort Douglas, Utah, a 10 kw. vacuum tube telegraph transmitter. Many novel features of construction were included, due to the wide band of wave lengths which it covers and to the necessity for including switching mechanism whereby wave length (frequency) could be readily changed to any one of five predetermined values.

Air condensers of a new design were utilized. A number of vacuum tube telegraph transmitters were built for the communication system of the United Fruit company.

These transmitters mostly are installed in Central and South America, and, when in service, will form what probably will be one of the most modern commercial radio communication systems in existence. They have an output of 20 kw. at any wave length between 2,500 and 4,500 meters and include switching mechanism, so that any one of two predetermined wave lengths readily can be obtained.

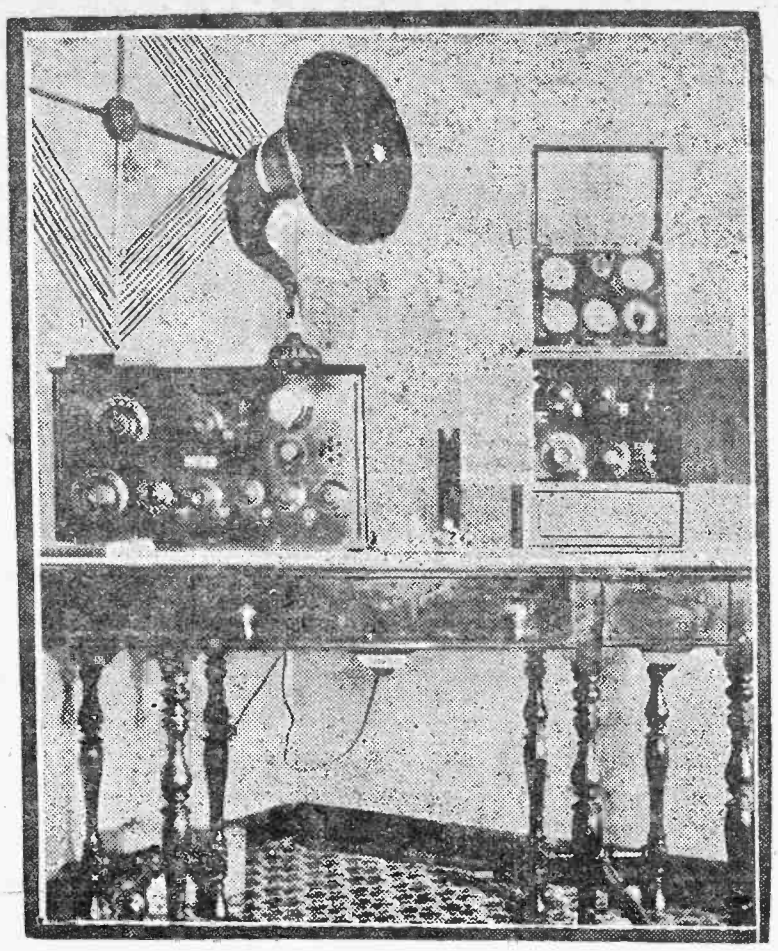
Makes Frequency More Constant.

The sets include recently developed circuits which insure constant frequency of the output and the practical elimination of harmonics. The transmitters consist primarily of a so-called "master oscillator," the output of which is amplified by means of a water-cooled philotron, which delivers its output to a "tank" circuit, which is coupled to the antenna. They are designed to operate on antennas of the multiple-tuned type, having two tuning points.

In connection with the air-mail service of the United States postoffice department there was designed an aircraft transmitter and receiver for use on the airplanes. The transmitter of this equipment puts approximately 200 watts into a trailing wire antenna. The power for the operation of the set is obtained from storage batteries which are kept charged by the engineer of the plane, and these batteries operate a high-voltage dynamotor, which supplies high voltage direct current power for the operation of the transmitter.

The set consists of three major units—the transmitter, receiver and control box—together with a number of auxiliaries. The equipment was designed so that it can be advantageously installed in the fusilage of the plane and so that maximum accessibility is given to the operator.

The planes which will utilize the sets are built to carry the pilot only, and it was necessary to develop and design this equipment so that it readily can be operated by the pilot without interfering with the navigation of the plane.



This is the home set, or rather two home sets, of H. M. Harries, Eastwood Beech hotel, Clarendon and Eastwood avenues. On the left is a five-tube set, which uses a loop aerial and, according to Mr. Harries, brings 'em in when nothing else will. The smaller set is an army signal corp set and setting on top of it is a Jewell testing set. Mr. Harries has an outside aerial seventy feet in length.

Radio Gives Chance to Voices Stage Rejects

MINNEAPOLIS, Jan. 3.—Radio is developing an entirely new type of vocal artists with voices surpassing in sweetness and technique those of concert and theatrical stage stars, it was declared today by Miss Eleanor Poehler, musical educational leader of the northwest and said to be one of the only three woman executive directors in complete charge of a large radio broadcasting station.

Miss Poehler, as director of the Cutting & Washington Radio corporation's station, WLAG, popularly known as "the Twin City Radio Central," for some time has been experimenting with "radio voices" and developing them.

"This extraordinary invention, radio, is opening up a field that is epochal for new artists and giving the public the benefit," said Miss Poehler. "There are thousands of 'radio voices' in this country alone which are of surpassing sweetness, but because they have not the volume required to fill even small halls heretofore have not been heard outside of small circles of friends. The professional stage, the concert platform and operatic companies have all been forced to choose only the voices of the greatest power, and in so doing they have been forced to sacrifice that quality of sweetness which was most appealing.

"The singer on the stage must have a voice that will carry out over the audience and into the third and fourth balcony. The 'acoustics of the air'—the system of sound amplification which has made possible the present development of radio broadcasting—has supplied the volume and power necessary to these sweeter voices.

"Although they would not be heard distinctly across the footlights, radio waves carry them hundreds and thousands of miles to millions of listeners, WLAG has drawn largely from this new group of voices for its programs and the hundreds of letters received bespeak their popularity.

"New voices also are popularizing new songs or old ones. Favorites develop as they do from the stage. Again and again, requests have come in for such numbers as "By the Waters of Minnetonka," "One Fleeting Hour," "Lindy Lou" and "I Passed by Your Window."

"The war between jazz and studio music is waging hotter and hotter among radiophans. The time is coming when an armistice will have to be declared or a peace treaty signed between the two factions. The cry for music of the jazz type sounds with louder volume, but the voices rising above it constantly demand the ambitious offerings."

Before taking charge of WLAG Miss Poehler was prominent in western musical circles as a soprano soloist, and took a leading part, as she still does, in musical educational work of Minnesota.

Listeners-In Enjoy Radio Christmas Party

A Christmas party was given by the home service department of the Peoples Gas Light and Coke company Saturday afternoon, Dec. 15, between 2 and 4 o'clock.

The party was given to the "listeners-in" of Westinghouse station KYW, Chicago, known to the home service department as "Radio Pals," their children and friends. All received their invitations by radio in the daily talks given at 11:35 a. m. by Mrs. Anna J. Peterson and Vivette Gorman, and on Wednesday evenings at 9:05 p. m. by Vivette Gorman.

More than 2,700 children and their parents enjoyed the program, which was given by the entertainers to whom they had so often listened. Mr. Swift, who daily announces the home service talks, stepped on the stage and announced each one personally, as he had by radio.

In turn came Mrs. Anna J. Peterson, smiling always with that sweet, motherly expression that all love so well. It was a real treat for her radio "pals" to see her and to hear her say "Good-morning, girls and boys," and give a short talk.

The applause of the children and grown-ups expressed the pleasure they received from listening to Sally Menkes play the piano, and hearing a story from "Uncle Bob," as well as the vocal selections rendered by John Stamford, all of KYW's staff.

Miss Vivette Gorman said "Hello, everybody," and then told the children of old St. Nicholas, finishing with "Good-by, everybody," which made them all laugh.

The children particularly enjoyed the beautifully trimmed and lighted Christmas tree and were more than happy when they each received a box of candy and a gingerbread man.

CODE INCREASES JOYS.

Knowing how to pick up code messages increases the joy of radio life 75 per cent. And anyone can learn the code in a week's practice.

Here Is KFKX Announcer; Heard by You These Days

RADIOPHANS thruout the west should be interested in seeing W. G. Hay, whose voice is already familiar to them because of announcements made from station KFKX, first radio repeating station in the world, located at Hastings, Neb.

Mr. Hay started announcing at station KFKX soon after the Westinghouse Electric and Manufacturing company started its repeating service thru KFKX and has been continuously "on the air" since.

The voice of KFKX, as Mr. Hay's well-modulated announcements have been termed, has created quite a bit of comment among radiophans because of the clarity of the announcements and because of its versatility. On a number of occasions Mr. Hay has filled in on the programs at KFKX with both tenor and barytone announcements.

Mr. Hay was born in Scotland and came to the United States about twenty-two years ago. He therefore comes naturally by his Scotch accent, and the news explains some of the Scotch expressions he has used in acknowledging telegrams from people whose names are characteristically Scotch. Mr. Hay has spent many years in the study of vocal expression and is at present director of the Methodist choir at Hastings. He is also the song leader of the various civic societies and conducts a school for vocal training.

W. G. Hay.

Jap Fishers Use Radio

A newspaper dispatch reports that the chief of the Nagasaki Perfectural Marine Products Bureau of Japan, together with a committee of men interested in marine products, is reported to be investigating the possibilities of installing radiophone outfits on the larger sized fishing boats whch have their base at Nagasaki, to enable them to communicate with shore when in difficulties, and to report the catch in time for their owners to realize on it.

Solid Gold Receiver

Among the countless wedding presents received by the Duke and Duchess of York was a wonderful gold mounted radio receiving set. It is a portable loop receiver, mounted on a mahogany tea wagon, complete in every detail, with loudspeaker and even a charger for the storage battery attached to the shelf beneath.

Finds Friends by Radio

The bishop of Birmingham, in England, broadcast a talk recently and was surprised to receive many letters from old friends of whom he had altogether lost track and who communicated with him after hearing his voice again thru the ether. Radio provides, the bishop says, a new and unexampled way to extend one's personal touch to thousands of people whom one cannot hope to meet face to face.

Kinks in Phone Cords

Do not leave kinks in your telephone cords, as this will finally allow them to wear thru the fine braided wire and result in a loose connection. Make a practice of untwisting the cords each time you put the telephones on your head and the cords will last a much longer time.

"Jack" Nelson Tells Us How WDAP Is Operated and Lets Us In on Some Secrets

HERE is something new in the way of station write-ups. This time we have the station to tell us all about itself. The station is WDAP (Chicago), and the author is none other than "Jack" Nelson, program director and announcer.—The Editor.

By JACK NELSON.
(Program Director, WDAP Station.)

IT IS a disadvantage to have one of the personnel of a radio station write concerning it. To tell the truth about its achievements would sound too self-satisfied, and to tell some of the most humorous things concerning it would hardly be kind to some of us at the station.

There is a certain lure about the distant and the unseen, and therein may be the whole reason for the popularity of radio transmission and reception. The listener tries to imagine what the artists look like, how the studio is furnished, how the operating room is arranged, and, perhaps, how a studio director possibly could arrange such a terrible program, while we at the other end of the line are wondering just where these voices, which we actually hear, are being heard thru the medium which is so amazing in its magnitude.

Keeps Out Monotony.

It is that very thing that keeps our work interesting and prevents us from becoming tired of saying, "This is the Chicago Board of Trade Station, WDAP, located on the Drake hotel, Chicago." Now, that I think of it, we have said that quite a few times but it hasn't become monotonous yet, and the reason is that we try to say it very distinctly so that we may believe, perhaps, England may again be tuned in, or Honolulu or Rio de Janeiro, or even some spot on the globe from which we have not yet received word.

One of the fascinating features of being in a radio station is that old puzzle—old to us—that is: "Wonder how many are tuned in to this station right now? How many on 5th avenue, New York—how many coal miners in Pennsylvania, how many farmers in Iowa—how young is the youngest—how old is the oldest—how many crystal sets how many super-whatever-you-call-its, how many city parties, how many lonely souls miles from the nearest railroad station?" I could think up a hundred more questions, if it would show you how interesting is our work.

Where the Real Work Is.

But, now that I have mentioned work, let us offer up a little pity for the engineering department. To be modest, of course, I must admit it is a terrific job to procure sufficient talent to provide excellent programs six nights a week. Terrific! But "seein' as how" the programs I attempt to arrange are not excellent six nights a week, I have an easy job.

But the work is really out in the operating room. It is the easiest thing in the world for me to escort somebody thru our station, explaining everything very fully, because when we get to the operating room, it is easy to say, "Now, the sound is carried on the microphone line into this room, where it enters this apparatus somewhere, and eventually gets into the antenna, which you can partially see thru that skylight up there." Simple, isn't it, and complete as far as I am concerned.

But it takes Elliott Jenkins, our executive engineer (that means it is his responsibility to keep the set going), or Ralph Shugart or Paul Neal, the operators, two hours and a half to act as a guide on an inspection tour.

When the set of a listener suddenly goes wrong, he can say to himself, "Oh, well, I ought to get to bed now, anyway," and fix the thing tomorrow. But when there is the least bit of a waver in our standards, it must be smoothed out immediately. And the apparatus maintained is such that every part, to me, seems extremely sensitive. A little variation on a certain meter, to me means nothing more than that variat . but to the operators, it may mean that a big tube is about to "blow," or one of a hundred other things which would prove disastrous to our transmission.

What Operators Do.

Give a thought to that some time when you are tuned in. The announcer you hear and the artists you hear may be interesting and entertaining, but don't forget those boys you seldom hear about, out there in the other room listening for variations, and watching the meters for variations—turning dials carefully, and politely asking guests to leave the operating room so that they may be less polite to the transmitter—which to us is almost a human thing—sometimes a sweet, peaceful person, and sometimes a diabolical plotting individual, working desperately against all the efforts of the boys to make her sweet and peaceful again.

I have known Elliott, Paul and Ralph stay up all night experimenting on the outfit, to get it tuned right (for our wave length) or to perfect our modulation, which you must know is the "proudest thing an engineer can be of."

Some of you late tuners have undoubtedly heard, "This is WDAP testing. One, two, three, fo-o-o-our." Well that was the engineering department hard at work.

Please do not misunderstand me, however, it is not always dark as I may have pictured it. We all enjoy our work, and have friendly dispositions most of the time.

All Stations Operate Same Way.

You have seen many pictures and read many articles by representatives of various stations. In principle, every station is very similar. Each one has its operating room with its technical staff. Each one has its studio and its staff. Some of them have a larger staff than others. Just how many are necessary to conduct a program in the studio is a question. Each has its business staff, Miss M. E. Stahl is our business manager, who, with her assistants, handles the business affairs and most of the correspondence. Another group of people most neecssary but about whom you hear nothing.

The pictures printed herewith are self-explanatory. We have included some of our more or less regular artists, because we almost consider them as part of the station. They have been very kind with their help and we appreciate it.

We would like to show pictures (if space permitted) of the "whole gang"—Jenny Sullivan, Bob Brown (and his "famous overseas ukelele"), Betty Holmes, George Hill, Rosemary Hughes, Fred Rose, Cambridge Sisters, Roy Nobles, Fern Bay, The Melodians, etc., etc., but they're all bashful about such things.

The Sheik Is Still Here.

I mentioned Ralp Shugart a while back. To the oldtimers this will be interesting, for Ralph is none other than the famous old "Sheik of the Drake," whose rich voice and clever talk gave him that title. We regretted very much that in rearranging our station last summer it was necessary to have the operator and announcer in different rooms. Ralph at the time was operating and announcing at the same time, so now he is the one you hear anouncing market reports at night, and the "cut-ins" between Jack Chapman's orchestra numbers. (One week Paul Neal has the night shift and the next week the "Old Sheik" has it.)

Now, I mentioned Jack Chapman: Need I say more? We claim and we'll all go to the mat about it, that there isn't a better broadcasting orchestra in the country. The instrumentation and their perfect style cannot be beat for radio purposes.

I've had my say. Gotta sign off. And that's that.

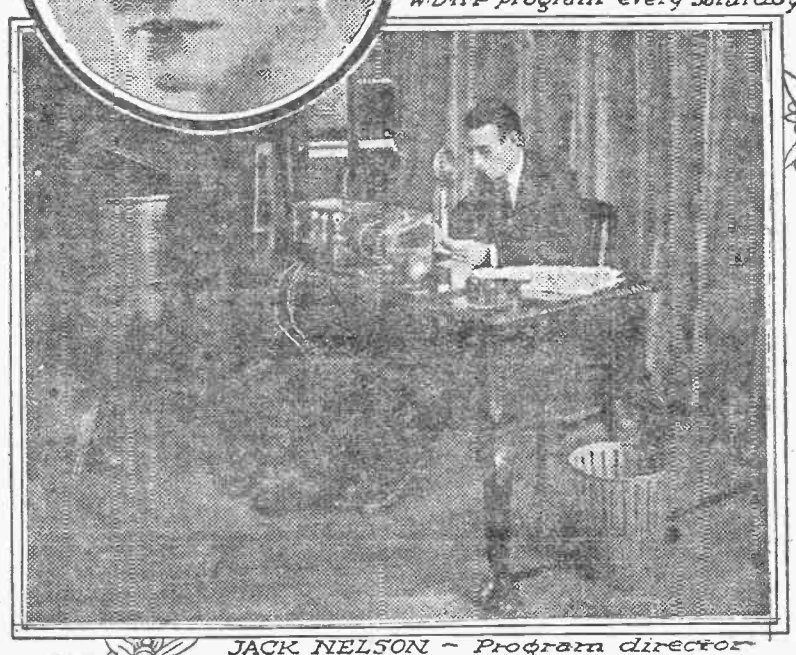
May you laugh in your dreams! Your comeback to that should be something like Jenkins' "And may you choke in your dreams." And Happy New Year.

The DRAKE HOTEL on which is located the Chicago Board of Trade Station W·D·A·P·

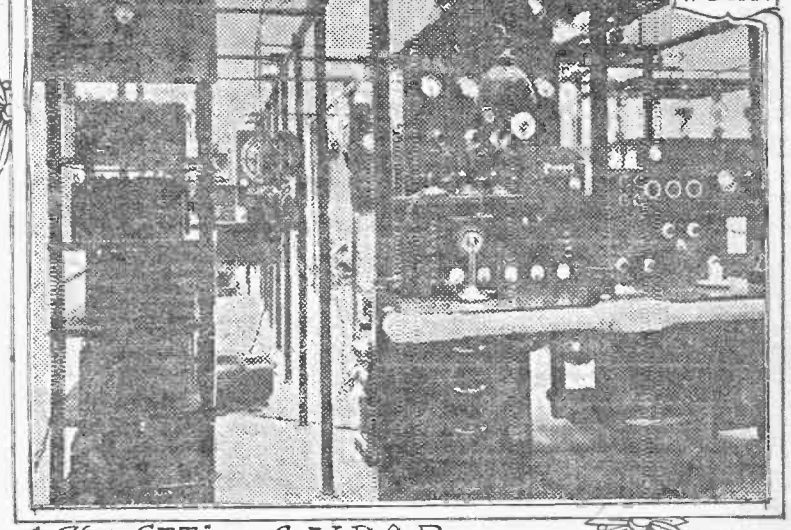
Miss Edith Carpenter ~ One of the Harmony Sisters

"The Sheik" Ralph Shugart of W·D·A·P.

Left – Miss Grace Ingram on W·D·A·P program every Saturday



JACK NELSON – Program director and announcer of W·D·A·P



"The SET" of W·D·A·P Chicago.

"BOB COUGLE Accompanist and Frederick W Agard Tenor W·D·A·P

The Studio of the Chicago Board of Trade Station W·D·A·P.

Radio Finds Daughter for Sick Mother in Iowa

As an efficacious means of locating people in an emergency, radio is demonstrating its ability with repeated success. A clear-cut instance has just been brought to the attention of WGY, the radio broadcasting station of the General Electric company, located at Schenectady, N. Y.

This station received a request not long ago from Fort Ann, N. Y., that a message be broadcast notifying Miss Ruby Wood, a health nurse from the health department at Albany, of the serious illness of her mother in Iowa.

The announcement was broadcast the same evening it was received and was heard by Miss Donald of the Albany hospital, who was listening in to the program of the evening. She is an acquaintance of Miss Wood, whom she succeeded in locating in Albany and advising her of the message. Miss Wood at once started for her home in Iowa.

Battery Switches Big Aid

A battery switch costs but a few cents, but when mounted on your panel increases the joy of broadcast listening immeasurably.

Rheostats Aid Tuning

Do not overlook the value of your detector rheostat in fine tuning. A good rheostat that has a vernier adjustment will bring in more stations than any other one instrument—if you know how to use it and have a critical rheostat to begin with.

NOT ALL STATIC.

Lots of radiophans blame static for the clutter-clutter in the phones. Better test out your "B" battery connections or the batteries themselves. Most of the so-called "static" comes from poor plate voltage batteries.

Today's Radio Programs and Schedules

Continued From Page 3.

Barnitz, tenor; Helen P. Goldsmith, pianist; Mida Burch Anderson, soprano; Oriole orchestra. (1) "Faded Love Letters," "Pekin," by Oriole orchestra; (2) tenor solos, selected, by Walter D. Barnitz; (3) selections, Colispius Preludes, opus 28, No. 20, opus. 28, No. 6, by Helen P. Goldsmith; (4) "Robin, Robin, Sing Me a Song" (Spross), "H. Mr. Piper" (Curran), by Mida Burch Anderson; (5) "Unfortunate Blues," "Silvery Moon," by Oriole orchestra; (6) tenor solos, selected, by Walter D. Barnitz; (7) Mazurka No. 2 (Godard), "Air de Ballet" (Chaminade), by Helen P. Goldsmith; (8) "It Came on the Midnight Clear" (Speaks), "O Divine Redeemer" (Gounod), by Mida Burch Anderson; (9) "Sobbing Blues," "So This Is Venice," by Oriole orchestra; (10) tenor solos, selected, by Walter D. Barnitz; (11) "Mystery" (Wach), Valse No. 2 (Godard), by Helen P. Goldsmith; (12) "Care Selve" (Handel), "Yesterday and Today" (Spross), by Mida Burch Anderson; (13) "Sunshine of Mine," "Susie," by Oriole orchestra; (14) tenor solos, selected, by Walter D. Barnitz; (15) selections from "Preludes" (Cellopius), opus, No. 4, opus 28, No. 7, by Helen P. Goldsmith; (16) "Song of the Robin Woman" (Cadman), "Butterflies" (Seiler), by Mida Burch Anderson.

WDAP—Chicago Board of Trade, located at Drake hotel; 390 meters.

Day—9:30 a. m., 10 a. m., 10:30 a. m., 11 a. m., 11:30 a. m., 12 noon, 12:30 p. m., 1 p. m., 1:30 p. m., quotations and market reports direct from the Chicago Board of Trade.

Evening—10 p. m., program by the Hinshaw Conservatory of Music.

WPAD—Formerly on W. A. Wieboldt & Co.'s, School street and Ashland avenue.

Notice—This station has closed and is being moved to Armour institute, where it will be operated by the radio department of that institution.

WSAH—Located at 4801 Woodlawn avenue; 248 meters.

WSAX—Located on Chicago Radio laboratory; 268 meters.

SUBURBAN STATIONS

(Central Time Is Shown.)

WCBD—Zion, Ill.; 345 meters: J. H. Dspew, station manager.

Day—2:30 p. m. to 3:45 p. m., sacred solos and duets, and an address either by Wilbur Glenn Voliva, general overseer of the Christian Catholic Apostolic church in Zion, or one of hs representatives.

WCAY—Milwaukee, Wis.; 261 meters: No silent nights.

Day—1 p. m. to 4:30 p. m., special concert; novelty and test programs as announced.

Evening—7:30 p. m., regular concert program.

WHAD—Marquette University, Milwaukee, Wis.; 280 meters:

Wednesdays—At 7:30 p. m. only.

WIAB—Rockford, Ill.; 252 meters: Wednesday and Friday evenings. Monday evening, 9 p. m., MacDonaid's Melody orchestra, in latest hits. Friday evening, 8 p. m., vocal and instrumental selections. Sunday, 12:30 p. m., religious service by the Rev. Toykmann and choir of the Mission Tabernacle church.

WJAN—Peoria, Ill.; 280 meters; daily except Sunday.

Day—9 a. m., live stock market; 9:15 a. m., weather; 11:30 a. m., Chicago, Peoria and St. Louis live stock and grain markets; 1:30 p. m., Chicago and Peoria grain and produce markets; United States agriograms.

Evening—Tuesday and Thursday, special musical program to be announced by radiophone.

WRM—Urbana, Ill., University of Illinois; 360 meters: 8:50 to 9:30 p. m., lectures and news.

WTAS—Elgin, Ill.; 286 meters.

FOREIGN STATIONS

CKAC—Montreal, Canada; 430 meters: Note—this station broadcasts only on Sundays, Tuesdays, Thursday and Saturdays.

Evening—7 p. m., kiddies' stories in French and English; 7:20 p. m., classical selections by Mount Royal Hotel Concert orchestra; 8 p. m., concert of vocal selections under the direction of J. Houde; 10:30 p. m., Joseph Smith's famous Mount Royal hotel dance orchestra.

PWX—Havana, Cuba; 400 meters: Jose Isquierdo, chief operator; Urbano del Castila, program director; Remberto O'Farrill, announcer. Regular broadcasting nights, Wednesday and Saturday, 7:30 to 10 p. m., central standard time.

TSF—Paris, France; French Post and Telegraph department, 103 Rue de Grenelle. Director, M. G. Valensi; assistant, M. Chanton; 400 meters; 500 watts:

Daily except Tuesday at 2:21 p. m. Tuesday at 1:51 p. m., music, classical theater and a course in English literature. Tuesdays, a course in the Morse code. Every ten days, scientific lectures.

OUT-OF-TOWN STATIONS

Eastern Programs.

(Central Time Is Shown.)

The first woman in the United States to receive a commercial wireless operator's license is Mrs. Frank B. Chambers of Philadelphia, shown here at her instruments. She is an instructor in a wireless school and who, while not teaching future radio operators, dons working clothes and in the radio laboratory builds and assembles radio apparatus.

KDKA—East Pittsburg; 326 meters:

Day—8:45 a. m., Union live stock market reports furnished by the National Stockman and Farmer; 10:55 a. m., Arlington time signals; 11 a. m., weather forecast, United States bureau of market reports furnished by the National Stockman and Farmer; 11:10 a. m., noonday concert; 5:15, dinner concert.

Evening—6:30 p. m., weekly chat with the farmer by Frank E. Mullen, radio editor National Stockman and Farmer; 6:45 p. m., the children's period; 7 p. m., National Stockman and Farmer market reports; 7:15 p. m., farm program continued; 7:30 p. m., concert by KDKA Little Symphony orchestra under the direction of Victor Saudek, assisted by Mrs. Jane Caldwell Harrold, soprano; Norman Tate, tenor; Mrs. Edna G. Mars, accompanist. Program: Orchestra selections—Overture, "Rosamunde," Schubert; "Dances of Elizabethan Days" (string ensemble; "The Lost Chord" (trumpet solo by J. H. Harvey), Sullivan; "Molly on the Shore," Grainger; Processional from "Queen of Sheba," Goldmark; "Pomp and Circumstance," Elgar; soprano solos, "Still We die Nacht," Bohm; "Serenity," Salter; "Home from School," Rohrer; "Ho, Mr. Piper," Curran; tenor solos, "Ma Lindy Lou," Strickland; "Mighty Lak a Rose," Nevin., "Twilight," Glenn; "Jean," Spross. 8:55 p. m., Arlington time signals; weather forecast. 10:30 p. m., special late evening concert.

WBZ—Springfield, Mass.; 337 meters:

Day—10:55 a. m., Arlington time signals; weather reports, Boston and Springfield market reports.

Evening—6:30 p. m., twilight tales for the kiddies; farmers' period, letter from the New England Homestead; 7 p. m., concert by Minnie Kohler Warner contralto, Mrs. Eleanor Turner la Zazzera accompanist, Burton Cornwall barytone and Harriet Crane Pitblado accompanist; 8 p. m., bedtime story for grown-ups by Orison S. Marden; 8:55 p. m., Arlington time signals.

WCAE—Pittsburg, Pa.; 462 meters:

Day—11:30 a. m., news, weather reports, reading of daily program; 2:30 p. m., news; 3:30 p. m., stock market reports, Sunshine Girl, news; 4:30 p. m., dinner concert transmited from William Penn hotel.

Evening—7:30 p. m., concert by violin pupils from the studio of Prof. Fayette Lloyd.

WEAF—New York city; 492 meters.

Day—10 a. m., popular Thursday morning talks; market report by American Agriculturist and United States department of agriculture; 3:5:30 p. m., Ida Weirich, contralto; Ruth Friedman, pianist, and Emilie Saunders, dramatic soprano, accompanied by Harry Israel.

Evening—6-11 p. m., midweek services under auspices of the New York Federation of Churches; United Cigar Stores daily sport talk by Thornton Fisher; Clara Du Val, soprano; talk sponsored by the National Carbon company; Ned Lincoln, traveler and explorer in a talk and songs of the Congo; 8:30 p. m., musical program direct from Hunter college, New York city; talk under the auspices of the Bank of America; musical program direct from the studio of the Columbia Phonograph company; radio talk by John V. L. Hogan; Lillian May Challenger, lady barytone; program by Gimbel Bros., New York city; Vincent Lopez orchestra, direct from the grill of the Hotel Pennsylvania.

WHN—New York city, Lowe's State broadcasting station; 360 meters:

Day—1:15 to 1:20 p. m., Jack Sheehan singing "Annabelle"; 1:20 to 1:25 p. m., Chris Traynor singing "Say It with a Ukulele"; 1:25 to 1:30 p. m., James White singing "Stay Home, Little Girl, Stay Home"; 1:30 to 1:30 p. m., Jack Sheehan singing "When It's Nightime in Italy"; 1:35 to 1:45 p. m., Philip Ellis playing piano solos; 1:45 to 1:55 p. m., James White singing "Who's the Meanest Girl in Town"; 1:55 to 2 p. m., Chris Traynor singing "Mississippi Ripples"; 2 to 2:15 p. m., Walter Richardson, tenor, singing "Mickey Donahue" and "It's a Man"; 2:45 to 2:55 p. m., Ethel Stanley in songs; 2:55 to 3:05 p. m., James Clarke in piano solos; 3:04 to 3.10 p. m., Kathryne Behnke, contralto soloist; 3:15 to 4 p. m., Oreste and his Pekin orchestra from the Pekin restaurant; 4 to 4:30 p. m., Fritzi Leyton, Saul Bernheim, Tom Dunne and Martha Unger singing "I'm Sitting Pretty in a Pretty Little City," "I'm Going South" and "Midnight Rose."

Evening—8:30 to 9 p. m., Lou Gold's Wigwam orchestra; 9 to 9:05 p. m., Max Hitrig singing "Somebody's Wrong"; 9:05 to 9:10 p. m., Gertrude Van Diense singing "First, Last and Always"; 9:10 to 9:20 p. m., William Berkes singing "I Wonder Who's Dancing with You Tonight"; 9:20 to 9:30 p. m., Matty Levine in piano solos; 9:30 to 9:40 p. m., Judith Roth and Al Wilson singing "Barefoot Days"; 9:40 to 9:45 p. m., Al Wilson singing "There'll Be Some Changes Made"; 9:45 to 9:55., James Brennan playing popular piano solos; 9:55 to 10 p. m., Judith Roth singing "Spanish Dancer"; 10 to 10:15 p. m., Harry Richman of Benny Benard's "Wigwam club" singing "No Hot Water in the Bronx" and "When the Wind Blows North"; 10:15 to 10:30 p. m., Marion Hamilton of the Ziegfield Follies in songs and harp selections; 10:30 to 10:45 p. m., Irene Delroy of "Greenwich Village Follies" at the Winter Garden singing "Lovey" and "Moonlight Kisses"; 10:45 to 11 p. m., Al Newman, concert pianist and leader of the orchestra at the Greenwich Village Follies, in piano recital.

WGI—Medford Hillside, Mass.; 360 meters:

Day—11 a. m., program of selections on the Edison laboratory phonograph and by the Ampico in the Chickering; 11:40 a. m., New England weather forecast, furnished by the United States weather bureau; 11:45 a. m., closing report on farmers' produce market report; 12:30 p. m., closing stock market reports, furnished by Elmer H. Bright & Co., members of the New York and Boston stock exchange; agriograms, furnished by the United States department of agriculture; live stock market reports.

Evening—Lectures, music.

Evening—Lecture; music.

WHAZ—Troy, N. Y.; 330 meters: This station broadcasts only on Monday evenings.

WGY—Schnectady, N. Y.; 380 meters:

Silent night Wednesday.

Day—10:55 a. m., time signals; 10:30 a. m., stock market report; 10:40 a. m., produce market report; 10:45 a. m., weather forecast; 1 p. m., music and address, 5 p. m., produce and stock market quotations; news bulletins; 5 p. m., news, markets.

Evening—6:45 p. m., musical program by WGY orchestra, assisted by Leah Damsky, dramatic reader, and Ivan Stough, pianist, with address, "A Few Moments with New Books," by L. T. Hopkins, assistant librarian of General Electric company; instrumental selection, "Fantasia on Old Songs" (Rollinson), by WGY orchestra; piano solos, (a) Nocturne (Chopin) (b) Valse, opus 64, No. 2 (Chopin), by Ivan Stough; instrumental selection, "Intermezzo" (Bohn), by orchestra; dramatic reading, "Green Stockings" (Mason), by Leah Damsky; instrumental selection, "Artists' Life" (Strauss), by orchestra; piano solo, "Bagatelle and Reverie" (Barnard), by Ivan Stough; dramatic reading, "Pygmalion and Galatea," part 1 (Gilbert), by Leah Damsky; instrumental selection, "Serenade" (Drdla), by orchestra; dramatic reading, "Pygmalion and Galatea," part 2 (Gilbert), by Leah Damsky; piano solo, "Adagio Cantabile," from "Sonata Pathetique" (Beethoven), by Ivan Stough; instrumental selection, "Italian Romance" (Bohn), by orchestra.

WGR—Buffalo; 319 meters:

Day—Lakes Erie and Ontario, special report from Buffalo and Oswego, N. Y., for marine and aviation interests, weather forecast for western New York; 11 a. m., weather, produce and live stock market reports; 11:30 a. m., organ, dining-room, Hotel Statler; 1:30 p. m., closing prices of Chicago Board of Trade; 2:30 p. m., closing prices of New York Stock exchange; 5:30 p. m., Vincent Lopez, Hotel Statler orchestra.

Evening—6:30 p. m., digest of the day's news, second broadcasting of all daily reports.

WJY—New York city; 405 meters:

This station broadcasts only on Sundays at 2:30 p. m. to 6 p. m.

WJZ—New York city; 455 meters: No silent night.

Day—2 p. m., organ recital on the Hotel Astor organ by Leo Riggs, by direct wire from the Hotel Astor; 3:45 p. m., concert.

Evening—6:30 p. m., dinner music from Hotel Adelphia Concert orchestra, A. Candelori, director.

WOO—Philadelphia; 509 meters: Silent Sunday, Tuesday, Thursday, Friday and Saturday evenings.

Day—10 a. m., grand organ; 10:30 a. m. United States weather forecast; 10:55 a. m., United States naval observatory time signals; 11 a. m., luncheon music by the Tea Room orchestra; 3:45 p. m., grand organ and trumpets; 4 p. m., sport results and police reports.

WOR—Newark, N. J.; 405 meters:

Day—1:30 p. m., Edna Marie Scheller, soprano; 1:45 p. m., Mrs. Nova H. Large will speak on "The Freedom of the West"; 2:15 p. m., Jean Spira, tenor, of New York; 2:30 p. m., continuation of soprano solos by Edna Marie Scheller; 2:45 p. m., Jean Spira, tenor, of New York; 5:15 to 6:30 p. m., "Music While You Dine," featured by Tom Cooper and his Country Club orchestra.

WRC—Washington, D. C., 469 meters: Silent Tuesday, Thursday and Saturday evenings.

Day—2 p. m., fashion developments of the moment, prepared by Women's Wear; 2:10 p. m., piano recital by Eloise Winters; 2:25, farm and home reports; 2:30, violin recital by Albert Sand; 2:45, the Magazine of Wall Street; 2:50, song recital by Charles Glennow, barytone; 3 p. m., Bradstreet's financial statement; 4:15, instruction in code practice; 5 p. m., children's hour, by Peggy Albion.

WRW—Tarrytown, N. Y.; 273 meters.

WDAR—Philadelphia, Pa.; 395 meters.

Day—11 a. m., organ recital from the Stanley theater; features from the studio: Arcadia Concert orchestra, Fery Sarkozi director; 12 m., Arcadia Concert orchestra: artist recital from the studio; Mrs. Anna B. Scott, talk, "The Market Basket"; 3:30 p. m., woman's club hour; 6:30 p. m., Dream Daddy with the boys and girls.

Midwest Programs.

WCAL—Northfield, Minn., St. Olaf college. P. Skifter, director; Ellu Hjertass, program director; 360 meters:

Sunday, 11 a. m. and 8:30 p. m.; Thursday, 9 p. m.; Friday, 7 p. m.; Saturday, 12 noon.

WCX—Detroit, Mich.; 517 meters:

Day—1 p. m., news bulletins; 1:15 p. m., stock quotations; 1:50 p. m., government weather forecast; 3:15 p. m., music; 5 p. m., dinner concert from Hotel Tuller.

Evening—6 p. m., musical program.

WJAX—Cleveland; 390 meters: Silent every night except Tuesday and Thursday.

Evening—Program by faculty of Oberlin conservatory and jazz quartet: Aria, "O Sleep, Why Dost Thou Leave me?" (Handel), by Mrs. Florence Jenny Hall; "Preislied for Violin" (Wagner-Wilhelm), by Maurice Kessler; "Oh Wings of Song" (Mendelssohn), waltz in E minor (Chopin), by Leslie Jolliff; "Rocky Mountain Sketches for Violin" (Cecil Burleigh), by Maurice Kessler; "Trees" (Oscar Rasbach), "The Crying of Water (Campbell-Tipton), by Mrs. Florence Jenny Hall; talk on "Viola d'Amore, by Mr. Kessler; "Soir d'Automne" (Woefelghem), "Plaisir d'Amour" (Martini), "Andante and Minuet" (Milandre), by Viola d'Amore, Mr. Kressler; "The Good Little King of Yvetot" (old French folk song), "Humoresque" (Grieg), "Spring Song" (Mendelssohn), by Miss Ruth Brown; "Staccato Etude" (Rubinstein), piano solo, by Leslie Jolliff; "A-Mia Sposa Sara le Mia Bandiera" (L. Rotoli), "Goleale" (Tosti), "Sogno" (Tosti), by Gaetano Manno; instrumental quartet (two banjos, guitar and bass), J. R. Frew, Eddie Peabody, Colby Hubbard and Otto Horn; Hawaiian guitar duet, "Kawaihau," by J. R. Frew, Eddie Peabody; banjo solo, selected, by Eddie Peabody; instrumental quartet (madolin, mandola, guitar and bass viol), by J. R. Frew, Eddie Peabody, Colby Hubbard and Otto Horn; "I Know a Lovely Garden" (O'Hartelot), "Pagliacci-Arioso" (Leoncarvalla), "At Twilight" (Knowlton), by Gaetano Manno; steel guitar solo, selected, by J. R. Frew; ukelele and guitar duet, "Kiawana Hula," by J. R. Frew and Eddie Peabody; violin solo (instrumental accompaniment), by Eddie Peabody; instrumental quartet (Hawaiian guitars, flute and bass), (2) "Hawaiian Hula," (2) "Mauno Lua," by J. R. Frew, Eddie Peabody, Colby Hubbard and Otto Horn.

WLAG—Minneapolis, Minn.; 417 meters: No silent nights.

Day—9:30 to 11:35 a. m., announcements, markets, news, household hints; 11:35 a. m., surprise program; 1:30 p. m., market reports; 2 p. m., woman's club hour; 2:35 p. m., daylight musical program; 4 p. m., short story; 4:30 p. m., market reports; 5:30 p. m., children's hour, Kay Westerveld, story-teller.

Eveing—5:30 p. m., children's hour, Tess Cooperman, story teller; 6 p. m., sport program, Dr. J. S. Dick Jr., "More About Dogs"; 6:15 p. m., Minneapolis Athletic Club orchestra, led by George Osborn; 7:30 p. m., farm lectures; 9:15 p. m., weather reports and time.

WLW—Cincinnati; 309 meters: Silent Friday and Saturday.

Day—10:30 a. m., weather forecast and business reports; 1:30 p. m., market reports; 3 p. m., business reports.

WOC—Davenport, Iowa; 484 meters: Silent Tuesdays.

Day—10 a. m., opening market quotations; 10:55 a. m., time signals; 11 a. m., weather and river forecast; 11:05 a. m., market quotations; 12 noon, chimes concert; 2 p. m., closing stocks and markets; 3:30 p. m., educational program and concert; 5:45 p. m., chimes concert; 6:30 p. m., Sandman's visit.

WTAM—Cleveland; 390 meters: Broadcasts only Wednesday and Saturday evenings at 7 to 8 p. m.

WWJ—Detroit, Mich.; 517 meters: Silent Saturday.

Day—12 noon, dance music by Jean Goldkette's orchestra, broadcast from the Graystone ballroom.

Evening—Music.

Southern Programs.

KSD—St. Louis; 546 meters: Silent Friday.

Day—Opening midseason and closing quotations on the St. Louis grain markets; live stock conditions; Liverpool and New York cotton market; New York stocks, bonds and money market; hay and clover; poultry and butter market; metal markets, weather reports, forecast and news bulletins are broadcast at 8:40, 9:40 10:40, 11:40, 12:40, 1:40, 2:40 and 4 daily.

Evening—8 p. m., broadcasting the concert of the St. Louis Symphony orchestra, Rudolph Ganz, conductor; Ossip Gabrilowitsch, pianist; soloist as given at the Odeon.

WBAP—Fort Worth, Texas; 476 meters:

Day—10 a. m. to 4 p. m., markets and financial review.

Evening—7:30 to 8:30 p. m., concert by Swayne's Southern Serenaders orchestra; 9:30 to 10:45 p. m., concert by the Gold Medal band of Weatherford, Texas, Conway E. King director.

WDAF—Kansas City, Mo.; 411 meters:

Day—3:30 to 4:30 p. m., musical matinee, the D. Ambert Haley Dance and Concert orchestra.

Evening—6 to 7 p. m., tuning-in piano number on the Duo-Art; marketgram, weather forecast and road report; address, speaker from the William Jewel college, Liberty, Mo.; the children's story and information period; music, Fritz Hanlein's Trianon ensemble, Hotel Muehlbach; 11:45 p. m. to 1 a. m., "The Merry Old Chief" and the Coon-Sanders Novelty-Singing orchestra. Plantation grill, Hotel Muehlbach.

WFAA—Dallas, Texas; 147 meters: Silent Wednesday.

Day—10:30 a. m., United States weather bureau report and forecast and C. A. M. A. A. highway condition bulletin for the southwest, followed by Dallas produce market quotations, early cotton market report and Wall street review; 12:30 p. m., address by Dr. J. D. Boon; 2:30 to 2:45 p. m., Dallas live stock market, late general markets, sport news; 3:30 to 4 p. m., Agriograms, health bulletins, Texas market news, sports news; 5:30 to 6 p. m., bedtime story and fairy tale, told by Miss Mary C. Tooney.

Evening—8:30 to 9:30 p. m., J. Wesley Hubbell club singers, with Mr. Hubbell assisting.

WGV—New Orleans; 359 meters:

Evening—7 to 8 p. m., concert.

WHAS—Louisville; 400 meters: Silent Mondays.

Day—4 to 5 p. m., selections by the Walnut theater orchestra, Walter Davison, conductor; selections by the Strand theater orchestra, Harry S. Currie, conductor.

Evening—9 to 10:30, music.

WHB—Kansas City, Mo.; 411 meters: Silent Monday, Wednesday and Friday.

Day—8:25 to 8:30, estimated live stock receipts; 9:25 to 9:40, live stock, grain quotations; 10:25 to 10:40, live stock and grain quotations, weather and shippers' forecast, road conditions and foreign exchange; 11:25 to 11:40 live stock, grain quotations; 12:35 to 1 p. m., popular music: "That's My Baby," "Havana," "Pretty Peggy," "That Old Gang of Mine," "I Never Miss the Sunshine," "Waitin' for the Evening Mail." 1:25 to 1:50 p. m., closing grain and live stock quotations; 2 to 3 p. m., ladies' hour program of classical and popular musical selections by the Sweeney Radio orchestra; overture, "Light Cavalry" (Suppe), by Sweeney Radio orchestra; "Blossom Time" (Schubert-Romberg), by Sweeney Radio orchestra; piano duet, "Nola" (Arndt), by George Parrish and Floyd Estep; "Les Patineurs" ("The Skaters") (Waldteufel), by Sweeney Radio orchestra; "Ballet of the Flowers," part 3 (Hadley). Mignonette, Batchelor Buttons, Hollyhocks Poppies; saxophone solo, "Saxelogy" (Finder), by Floyd Estep; "Japanese Sunset" (Deppin), by Sweeney Radio orchestra, selected popular music. 3 to 3:05 p. m., information from the United States weather bureau. 3:05 to 3:20 p. m., grain market review.

Evening—7 to 7:45 p. m., regular program given by the Missouri branch of the National Congress of Mothers and Parent-Teachers' association, the first Tuesday of each month: Trombone solo, "Evening Star" (Wagner), by James Sell; piano solo, "Alla Mazurka" (Nemeransky), by Francis Payne; talk by the state historian of the Parent-Teachers' association, Mrs. Herbert E. Fairchild; piano solo, "Juba Dance" (Dett), and "Valcik" (Mokreys), by Julis Payne; cornet solo, selected, by Arthur Winter; program arranged by Mrs. H. R. Graham, press and publicity chairman of the Parent-Teachers' Association of Missouri; 8 to 10 p. m., dance program especially for those wishing radio music for their holiday dances, by the Sweeney Rado orchestra, assisted by the varsatile soloist, Bud Eubank.

WNAV—Knoxville, Tenn.; People's Telephone and Telegraph company; 236 meters; 500 watts:

Evening—7:30 to 8:30 p. m., musical program.

WMC—Memphis; 500 meters: Silent Wednesday.

Day—Stocks and news every half hour from 9 a. m. to 10 p. m.

Evening—8:30 p. m., the regular Thursady evening program given by the Hotel Chisca Philharmonic orchestra, Miss Clara Ahern directing.

WOAI—San Antonio, Texas; 385 meters: Silent nights, Mondays, Wednesdays and Thursdays.

WSB—Atlanta, Ga.; 428 meters:

Evening—8 to 9 p. m., Georgia Railway and Power Company band, D. N. Baldwin director; 10:45 p. m., transcontinental Radiowl organ recital from the First Presbyterian church, presenting Dr. Charles A. Sheldon.

WHAB—Galveston, Texas; 360 meters:

Pacific Coast Concerts.

KDZE—Seattle, Wash.; 455 meters: Silent nights, Tuesdays, Thursdays and Sundays.

KFDR—San Francisco; 509 meters:

Evening—Music.

KHJ—Los Angeles; 395 meters:

Evening—10:45, 11:30 p. m. to 1 a. m.

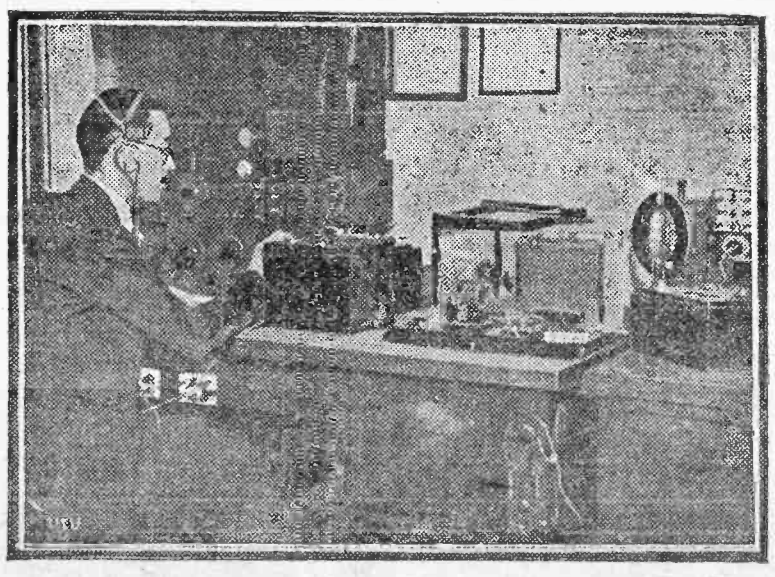
KPO—San Francisco; 424 meters; 500 watts: Crair F. Morrison, station director; Ada Morgan O'Brien, program director. Friday nights silent.

Day—2 p. m., time signals from the naval observatory; 3 to 4 p. m., Rudy Seiger's Fairmont Hotel orchestra, by remote control.

Evening—6:30 to 7:30 p. m., Rudy Seiger's Fairmont Hotel orchestra, by wire telephony; 8 to 9 p. m., a delightful dinner concert will be given by George Lipschultz and music masters from the Loew's Warfield theater; 10 to 11 p. m., G. Herold Montague Schulteis will be at the console of the Robert Morton organ; 11 to 12 p. m., an hour of sacred music will be given by Harrison Coles, fenor; Harold Pracht, basso; Miss Lillian Clarke, pianist. Their program is as follows: That famous trio from Saint-Saens, Christmas Oratorio, "The Crucifix" (Faure), "Contique de Noel (Adams), selections from "The Messiah"; 12 to 1 a. m., E. Max Bradfield's versatile band playing in the Palace hotel Rose room bowl.

LEARNING THE CODE.

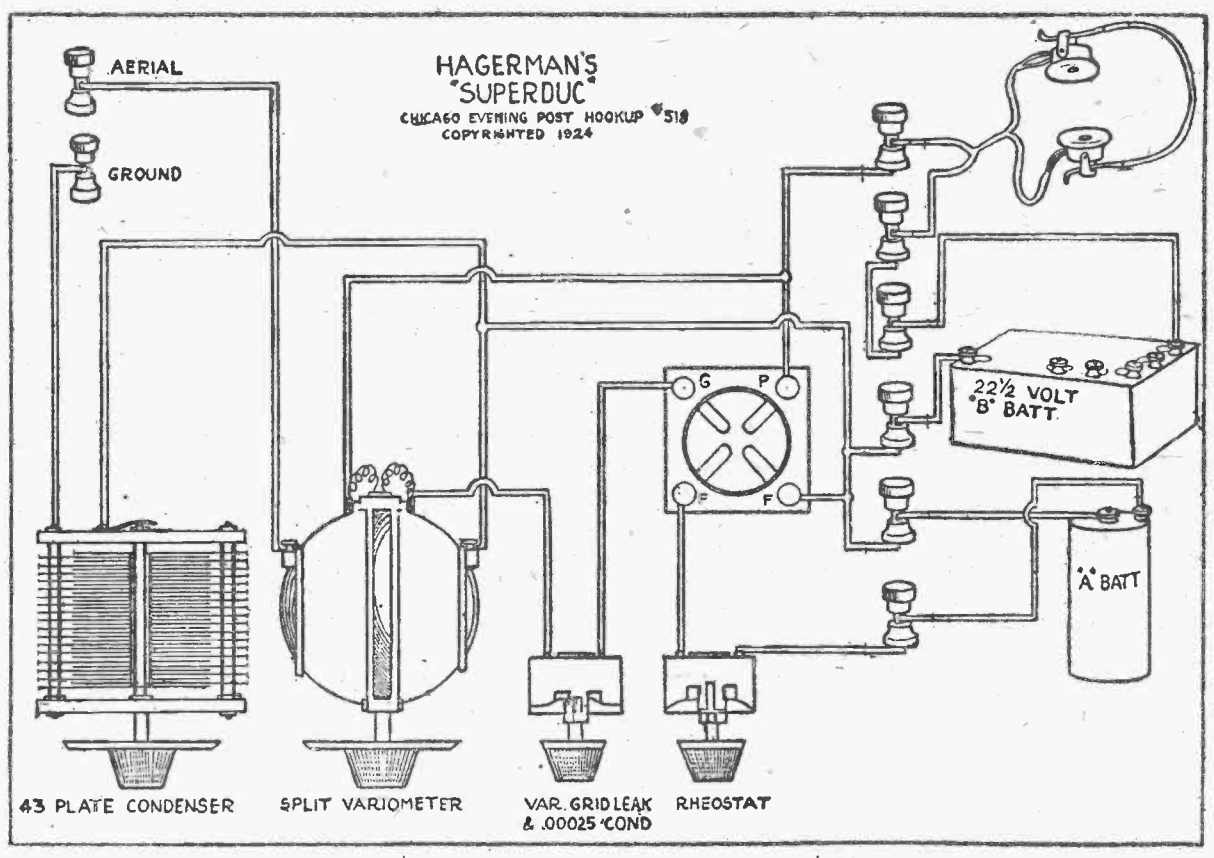
The best way to learn the code is for two ambitious fellows to start out together and work in co-operation.



Radio Traffic Policeman E. F. O'Keefe of the bureau of standards photographed with a special measuring set with which he keeps tab on broadcasting and transmitting stations to observe that they keep within the law. This work at the bureau of standards supplements that of the radio inspection service of the department of commerce.

Here Is the New "Superduc" That Can Be Built for $8 and Acts Like $50

LAST week we promised you something new in a little hook-up which Mr. Hagerman has been working on for some time. He calls it "The Superduc." It gets the name from its inductance relation. Mr. Hagerman doesn't claim absolute originality for the circuit—it being a form of ultra audion with just a little kink in that makes it look different, act different and be different. The original set—mounted on a baseboard, has been delivering the goods the last two or three weeks under all sorts of conditions. It is offered to you as a try-out.—The Editor.

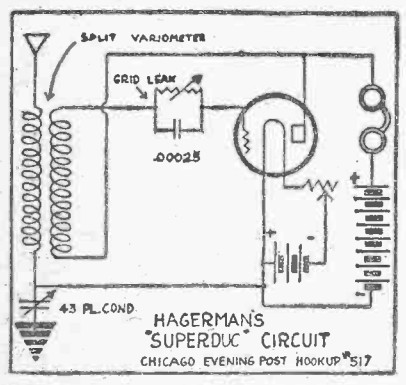


By LEWIS B. HAGERMAN.
(Technical Radio Editor, The Post.)

I PRESENT for the approval of the radiophans "The Superduc" receiver this week. It is of the ultra-audion type, but it has escaped many of the disadvantages possessed by ultra in its best forms, and it has taken unto itself several features of the more pretentious circuits.

Here are the six points about "The Superduc" that make it stand out as a shining example of what can be done with a few parts and only a few minutes of construction effort:

1. It is a long-distance receiver.
2. It is almost like a super in volume.
3. It is almost free of distortion.
4. It has few parts and costs little to build.
5. It requires little effort to construct.
6. It is amiable and free from the



usual eccentricities of the single circuit receiver, and the ultra-audions.

There is one thing about "The Superduc" you are going to like. Most ultras and supers perform wonderfully every once in a while. They are eccentric, however. Tonight you may bring in California with enough volume to fill a room. Tomorrow night and a dozen nights thereafter you very likely won't be able to bring in a local station loud enough for you to distinguish the announcer's name, and that of the station.

It Is Consistent.

I have been operating the little fellow consistently for two weeks. I mean by that, night by night, and have yet to find it to give the slightest evidence of being erratic. Coast to coast stations come in satisfactorily, and there's volume enough with one tube to hear every word distinctly and free of distortion.

Tuesday night, for instance, KHJ (Los Angeles), came in as clear as a bell on one tube, and with amplification could be heard anywhere in the apartment. Some of the five-tube sets can't do as well.

This little set, as you can see at a glance, is extremely simple in construction. It uses parts that can be bought in any radio store, and is not critical as to the brand of parts used. It can be built for from $8 or $30, depending, of course, on the quality of apparatus used.

A funny thing about "The Superduc" is that it seems to work almost under any sort of conditions. For instance, it delivers the goods even when you take the grid connection off the tube entirely. Again, leaving the grid on, but cutting out the plate you will find that she will percolate just about the same.

I haven't tried it with a mazda illuminating lamp yet, but wouldn't be surprised if "The Superduc" would work even on that sort of test.

Resembles Original DeForest.

"The Superduc" circuit is going to fool you a little, perhaps at first glance. You will ask yourself, probably, if it really is an utra-audion, after you have studied the accompanying schematic diagram, and the pictorial hookups. However, if you will go back three or four years and refer to Dr. Lee DeForest's original ultra-audion circuit, you will see a similarity instantly. He, by the way, is the inventer of the ultra, and his circuit is the daddy of them all.

Dr. DeForest used at that time a loose coupler. This was very clumsy and expensive, but had to be used because of the high wave lengths on which code work was carried on. He also differed slightly on a few other inconsequential points, such as battery polarities, but the principle is exactly the same. So if you wish to take a flyer with the original ultra-audion circuit, just hop aboard the "Superduc" and let's go.

LEWIS B. HAGERMAN.

Panel Layout Next Week.

In this week's magazine I am giving you a pictorial diagram and schematic hook-up. From it a good test set can be constructed. Next week we are giving panel layout, cabinet dimensions, photographs and all ordinary construction details. The parts necessary to construct the set are as follows:

One variometer (that can be split).
One forty-three-plate condenser (preferably vernier.
One variable grid leak.
One .00025 grid condenser.
One rheostat.
One socket.
Eight binding posts.
Panel (any convenient size—about 7x14 inches).
Baseboard, wire, screws, etc.

Mount binding posts and instruments on panel in the arrangement shown in the pictorial diagram. Wire, soldering all connections and spacing as near like drawing as possible.

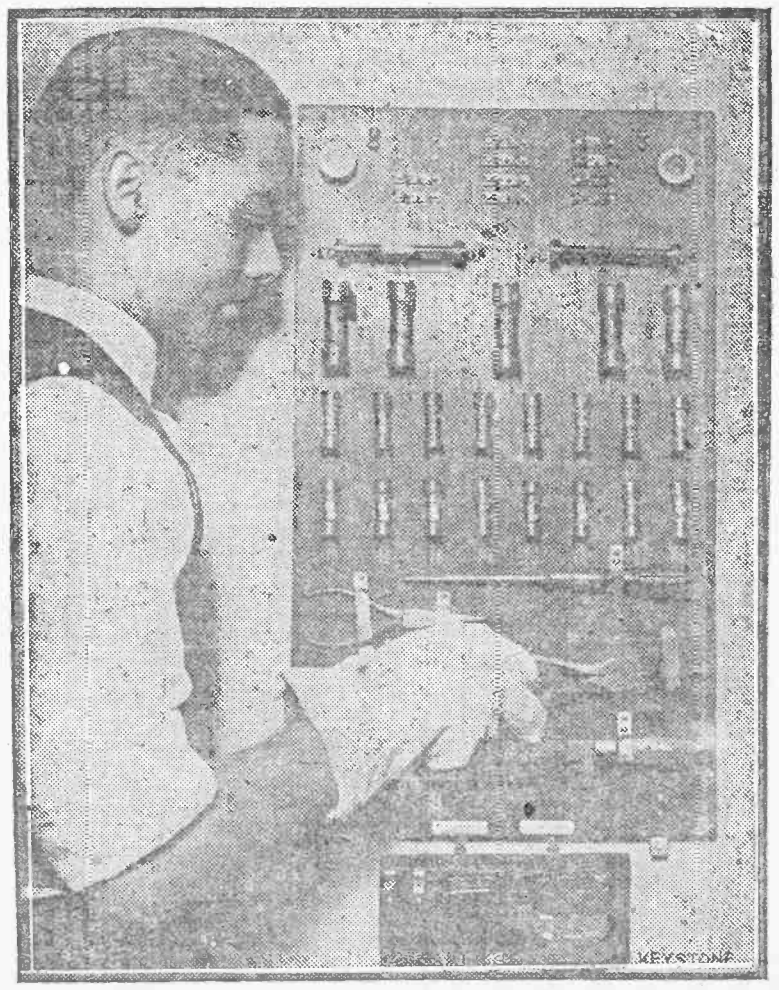
The thing is so simple that there isn't much more to say about it, so I guess I will sign off for this week and be with you next Thursday. In the meantime, if you give "The Superduc" a tryout, I would like to hear from you as to results.

Keeps in Constant Touch with North Pole Explorers

HARTFORD, Conn., Jan. 3.—Recent newspaper accounts prominently mentioning the Aerial League of America, to the effect that a mysterious invisible barrier for months has prevented the reception of radio signals from the arctic expeditions of MacMillan and Amundsen, were vigorously denied here today, as far as the MacMillan expedition is concerned. K. B. Warner, secretary of the American Radio Relay league, the amateur radio telegraphers' organization thru which the MacMillan party keeps in touch with the world, made the denial.

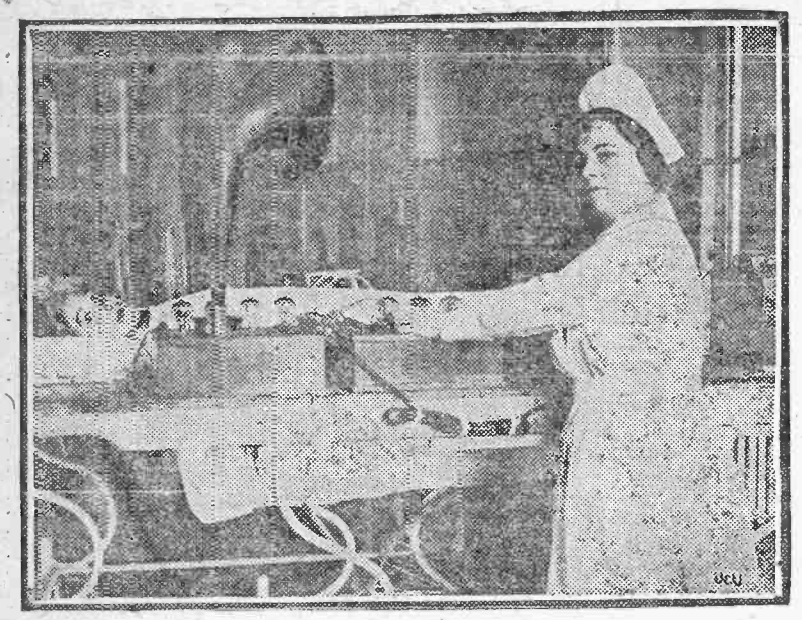
"Our contact with MacMillan is all we could want," Mr. Warner stated. "Hundreds of our members in the United States, Canada and Alaska are regularly hearing the Bowdoin's radio, and dozens of our stations in this country and Canada are in actual communication with her, handling hundreds of messages monthly and regularly receiving news of several thousand words for the press.

"The only time that the party has been cut off since they sailed was between July 29 and Aug. 29, during a period of continuous daylight. We have no knowledge of the radio aspects of the Amundsen expedition, but we have undertaken to keep the MacMillan party in contact with this country, and we are succeeding eminently.



WEAF (New York city) probably has the first radio "first aid" kit in existence. Handily placed, it contains fuses, choke coils, grid leaks, as well as the ever useful pliers, wrenches, etc., and a small buzzer tester. It is a handy article in "shooting" and remedying sudden breaks and is one of the reasons WEAF is always on the job. Photo shows the kit at the Walker street, New York city, station.

Page of Pictures in the Radio News of the Day



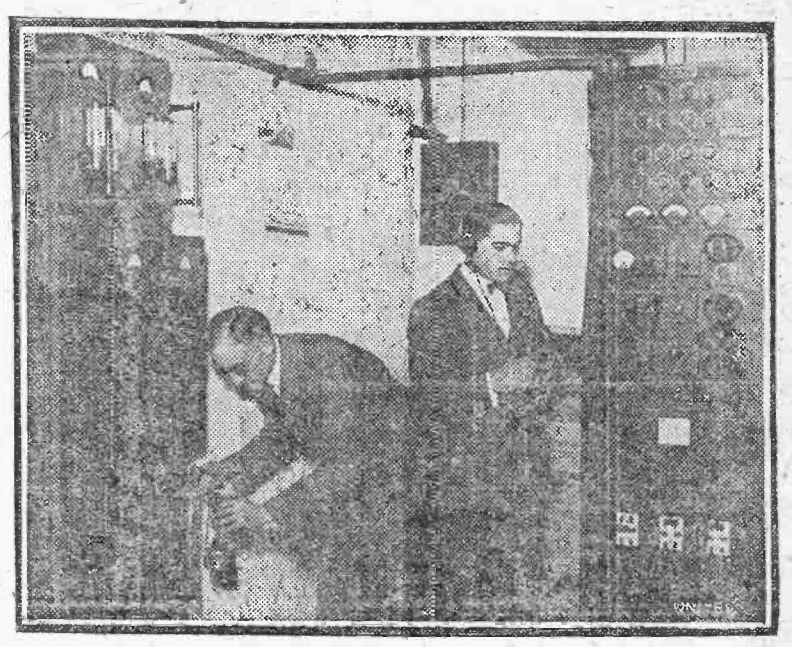
Two kinds of ether are used at Metropolitan hospital, Welfare Island, New York—one as an anaesthetic, the other as an aid to an "aesthetic" treatment, a portable radio set picking up music from the ether waves and using it to help cure patients. In this case the music was used to awaken the patient from the ether sleep after an operation, Nurse Passie Morris operating the set, which is placed on a "stretcher wagon" and trundled from ward to ward.

Prize Awards
For Useful Suggestions

THE POST offers $1 for every accepted and published suggestion made by readers which will enable the home builder to improve his work.

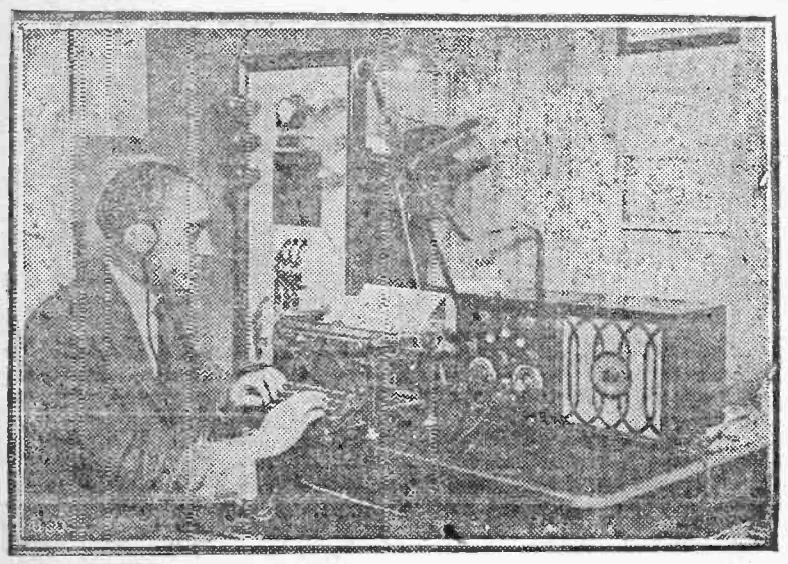
A special prize of $3 each week is made for the best of these suggestions.

Send your entries to Workshop Editor, care Radio Dept., Chicago Evening Post. Inclose pencil sketch if necessary to convey idea.



This radio broadcasting apparatus is located in the capitol of the United States and was used in speeding thru the air President Coolidge's message to the joint session of congress. Coke Flannagan, engineer in charge, and John C. Page, his assistant, carefully inspected the parts, that the millions of listeners-in may not be disappointed.

"HARD OF HEARING" CELEBRATES CHRISTMAS WITH RADIO—Some of the members of the New York League for the Hard of Hearing listening in on the Christmas radio program, which is the one thing they can listen to without having to use devices for the deaf. Photo shows them with their Christmas gift, a new set.



James F. Rau, 2085 East Kingston street, Philadelphia, assistant division manager in charge of the Philadelphia district of the American Radio Relay league, is seen copying a few signals caught by the receiver at his right. The transmitter is shown in the background.

A national campaign to improve dancing is being carried on by radiophone from WOR and twenty other stations. Arthur Murray, who is shown in the photo, will teach, thru the ether, 2,000,000 persons, the correct way to dance, each week—the first dancing lessons ever given by radio. Mr. Murray is director of the National Institute of Social Dancing of New York, London, and Australia.

Dr. Bowden Washington of Cutler-Washington company, who announces new radio receiver.

VALUE OF GRID BIAS.

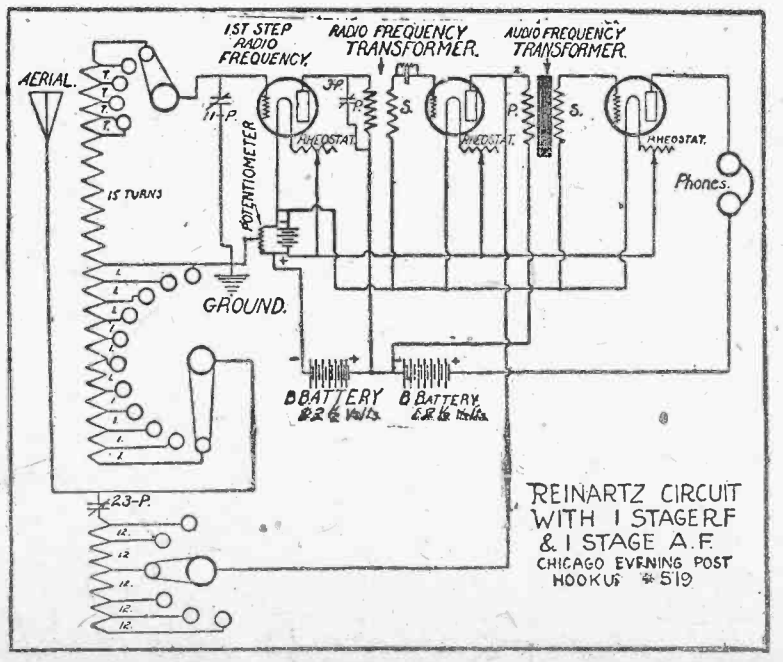
Amplifying tubes working on more than 100 volts require proper grid bias battery. At least, distortion will result if you do not burn out your transformers.

SWITCH VERSUS JACKS.

A simple switch to change from detector to second stage of your amplifier eliminates plugs and jacks.

Lead-In Wire

Lead-in wire should be of No. 14 or better yet No. 10 gauge wire. Large wire is advantageous because of the fact that it presents less resistance to radio-frequency currents than smaller. This is, of course, of minor importance when compared to other parts of a set. But you know how the saying goes, "Trifles make perfection but perfection is no trifle."



Frequent requests for the Reinartz circuit with one stage of radio-frequency and one stage of audio, prompts The Post to print this Schewater diagram.

How to Make an Amplifier Free of Distortion Even in the Third Stage

IN THIS week's article Mr. Freund takes up the distortionless amplification of voice and music and gives a valuable contribution to radio science. Mr. Freund is making a series of special tests in The Chicago Evening Post experimental laboratories on amplification. His articles are specially written for this magazine and are protected by copyright.—The Editor.

By BENJAMIN F. FREUND.

IN THE last article to appear under a series of articles on amplification I described the construction of a push-pull amplifier. The push-pull method is one way of obtaining clear, undistorted reproduction of music or speech past two stages of ordinary audio-frequency amplification.

There also is another method by which power, or a third stage of amplification, may be obtained without introducing distortion.

This method is one that is used frequently in the transmission of voice over long-distance telephone.

Since the development of radio receiving sets to the extent that long-distance reception is a fact there has been a greater demand than ever for a third stage of amplification.

There are many distinctive features of merit with the method which I am going to explain in the latter part of this article.

The first is the absolute overcoming of distortion thruout the full range of frequencies habilitated by voice or music. Distortion has been the main cause for failure in attempts made by many in trying to add a stage of power amplification to the receiving set. Some of these faults have been mentioned in previous articles, but for the benefit of those who failed to read them I will go over those which seem to be the most prominent in failures.

So that all may understand I will explain the requirements of an amplifying transformer. A great deal of the distortion created in most sets is due to this most important instrument.

Voice or music travels in waves just as water does when subject to disturbance. Now, as a different tone or a difference in pitch is created these waves differ in amplitude and in the number of these waves created per second. These waves impressed from speech in an electric circuit range from 200 to 2,000 cycles, or waves, per second. The number of cycles per second is termed frequency.

In music the frequency ranges from 100 to about 5,000 cycles per second.

We find that in human life some people can sing low, others can sing high and others are better adapted for very high notes.

This same condition exists with amplifying transformers. The transformer must not only amplify, but it must be able to amplify all frequencies alike. Different notes vibrate to different frequencies.

It is impracticable to have various transformers, different ones to cover the different parts of the frequency range as is customary with singers. That is the reason that the selection of the transformer is of vital importance.

A well-designed transformer must be flexible and must be able to cover the most-frequented frequencies with equal amplification. It is for this reason that low-ratio transformers produce the least distortion. A low-ratio transformer, if balanced properly in impedance, will give the clearest reproduction. A high-ratio transformer will give forth a trifle more volume, but because this increase in volume is favored to certain frequencies the reproduction is distorted.

A 1 to 1 transformer would give the clearest reproduction, but, of course, would not possess any step-up or amplifying factor.

By experience it has been found that step-up ratios from 3 and 6 to 1 can be used without any noticeable distortion.

The writer has found that manufacturers making transformers with ratios of about 3½ to 1 have instruments best adapted for the average work.

Now that we have dealt with the ratio of different transformers, we will deal with the proper impedance that transformers should have.

A transformer may have a ratio of 3½ or 4 to 1 and yet not amplify properly.

By a ratio of 3½ to 1 it is meant that there are 3½ times the amount of turns on the secondary winding as on the primary.

One particular make which the writer has in mind has about 3,000 turns on the primary and 10,545 turns on the secondary, therefore approximating 3½ to 1 turns step-up ratio.

Now, if we made a transformer having 10 turns on the primary and 35 turns on the secondary, it would probably not amplify at all, tho it had a ratio of 3½ to 1. The reason for its failure to amplify is because it would not have the proper impedance for which it was intended. It is for this reason that the impedance of a transformer should be adhered to.

A manufacturer who properly designs his transformer should design it so that the impedance of the primary winding should approximate that of the plate of the average tubes on the market, and the impedance of the secondary winding should be in the range of that of the grids of the average tubes on the market. Then by checking up his turns the ratio will be had.

It is a known fact with alternating currents that a maximum amount of current will flow when two impedances of the same value are connected together.

It readily can be seen then that if the transformers have primary and secondary windings with an approximate impedance of the tubes with which they are intended to be used a maximum amount of current will flow, thus giving a maximum amount of amplification.

Now, we have another trouble which arises:

When the current flows from the plate circuit thru the primary it magnetizes the iron forming the core. The amount of magnetic flux will depend upon the other constants of the circuit.

Soft iron is used for the core, as it will not retain its magnetism when no current is flowing. It tends to decrease the effect producing the magnetic flux. The unmagnetized iron is the effective iron in the core. If the core is totally magnetized, it has reached the point of saturation. That is, it has reached the highest possible magnetic flux. At this point there is no effective iron, and thus it is acting the same as if no iron core were used.

Generally, a transformer would have to carry so much current to create a saturated condition that the winding would burn out. But it is the approaching of the saturation point that creates distortion.

As the alternating current alternates, first flowing in one direction and then in the other, the current rises and falls, bringing the magnetic field up toward a saturated condition and dropping again by its own amplitude, thus causing distortion due to the core being in a saturated condition one instant and a more effective condition the next.

So, it easily can be seen, that the iron core plays a great part in a good transformer.

A properly designed transformer should not have too much iron within its field, but enough to keep it from reaching a saturated condition.

Some manufactures assemble the core so that an air gap exists within the magnetic circuit. This keeps the core from becoming saturated, but weakens the magnetic field somewhat by allowing a slight magnetic leak. Fig. 2 is an illustration of this type of transformers.

However, the writer has a method which he has used for some time and which relieves this condition whether the transformer has a properly designed core or not.

We all know that the alternating current carries the voice's pulsation and which makes the loud speaker respond to the variations of the voice. The direct current flowing from the "B" battery in the plate circuit, altho essential, tends to increase the magnetic flux and create saturation. If we can by-pass this direct current without going thru the transformer, and pass the alternating current thru the transformer, we will get the full benefit of the voice variation without raising the magnetic flux of the core to such a great extent.

It is a known fact that a condenser will pass alternating current, but will not pass direct current. So, if we insert a condenser of about 1 or 2 mfd. as used in telephone work, we will have sufficient capacity to pass any alternating currents which might be necessary without passing the direct current. See illustration in Fig. 3.

But it is essential to have the direct current flowing from the plate to the filament of the tube, and as the condenser will not allow direct current to pass, we will have to resort to the following means:

If we connect a choke coil with iron core from the plate of the tube to the positive of the "B" battery supply, we will have a means by which the direct current can leak thru. As this choke must be of a value ranging from 25 to 50 henries inductance, this will tend to help the alternating current from also leaking thru, because the large capacity of the condenser used will be an easier path for which the alternating current may flow with little or no loss. See Figure 3.

The Acme Apparatus company makes a choke for amplification which can be had on the market and which will work very well. The writer, however, found that the primary of a Thordarson bell-ringing transformer, which can be bought at a moderate price, worked as well as any for this purpose.

This method of amplification allows only the pure alternating current to pass thru the primary of the transformer or phones, thus not only keeps the direct current from the B batteries

(Continued on Page 10.)

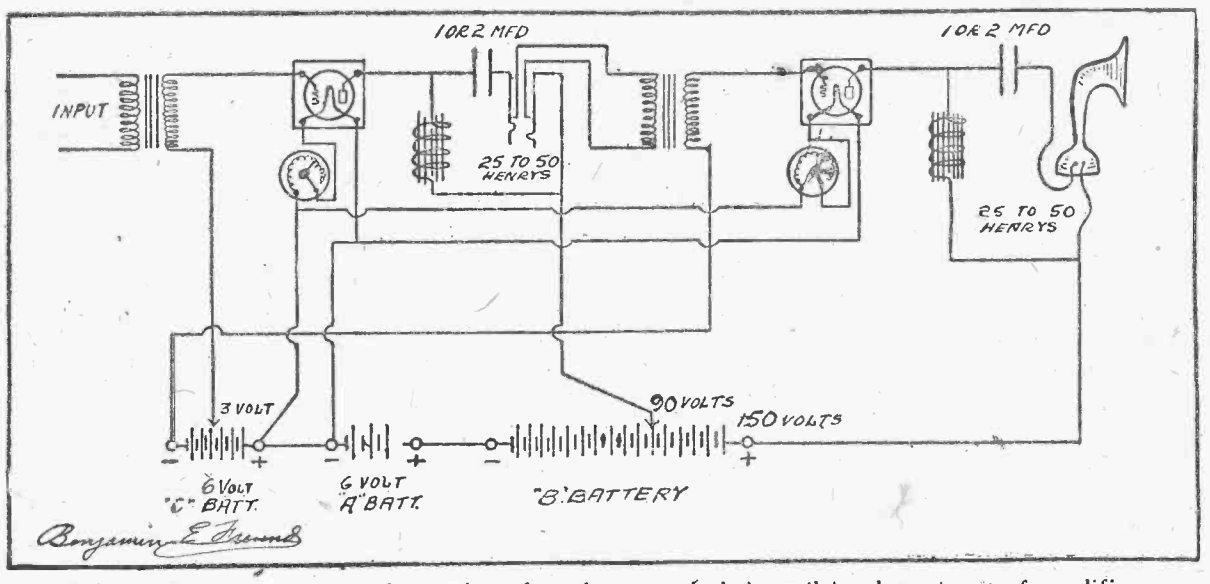


FIG. 3—Illustrating method of inserting of condenser and choke coil in plate circuit of amplifier.

BENJAMIN E. FREUND.

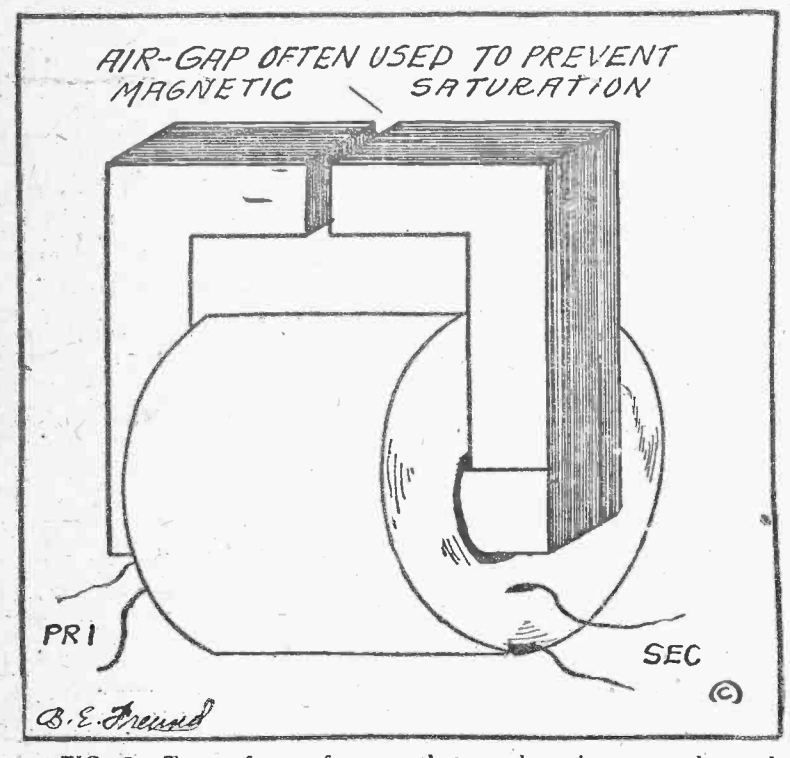


FIG. 2—Type of transformers that employ air gap to keep the core from becoming saturated.

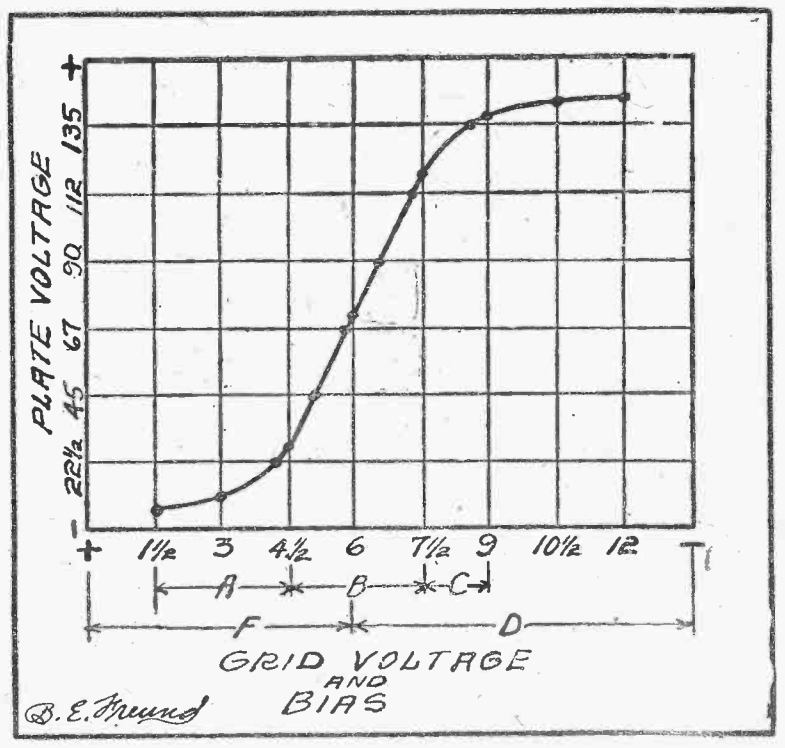


FIG. 1—"A" shows that portion of the amplification curve which gives very little amplification. "B" shows practically a straight line, and it is in this section of the curve that the UV-201A and C-301A will function best. "C" is where distortion sometimes occurs. The section of the curve covered in "F" is the bias which is taken care of by the filament or "A" battery. Section "D" calls for external bias or "C" battery. The following is a list showing at what plate voltages external "C" is necessary: When the plate voltage is 112 volts the grid, or bias, voltage should be one and a half volts. When 135 it should be three volts. When 150 it should be four and a half to six volts. Above that nine volts.

How to Make an Amplifier of Pure Tones

Continued from Page 9.

out but also illuminates and keeps out the B battery noises, which are quite prominent after the battery has been in use a month or so.

By using this method of amplification, it is possible to use high-plate voltage or B battery with a C battery in the grid circuit, and thus obtain the results of a power amplifier without being liable to burning out the phones or transformer as the direct current, which is the defective element, is kept from entering either the phones or primary of the transformer.

This is a means of amplifying in a distortionate manner with an unlimited range of volume and free from saturating the transformer core. It is a method of amplifying which everyone should try. You will be well rewarded for the trivial expense and effort exerted.

Fig. 1 is a chart showing the proper voltage to use for grid bias or C battery with the respective plate voltage or B battery.

Voltages up to 150 can be used on C-301A or UV-201A tubes with excellent results. For greater plate voltage a power tube is recommended, such as the C-302 or UV-202, or still better the VT-2, which will stand as high as 350 volts with a rising comparative increase in amplification.

If the following advice is adhered to there is no reason why your next amplifier cannot be a good one or your present one improved with a very little change.

In next week's article I have something entirely new for the radio experimenter: It is a panel layout that can be assembled and wired into seven different circuits, and when any of the circuits are constructed you would never know but what the panel was made exactly for that particular circuit.

Seven of the most reliable circuits such as the Armstrong three-circuit regenerative receiver, including the "Old Reliable" hook-up of Editor Wells, the Reinartz Cockaday's four-circuit tuner, the extra audion, the Flewelling, the Miloplex and the 150-2,000 meter Universal receiver.

Boy Scouts Test Radio in Signal Work on Field

HARTFORD, Conn., Jan. 3.—Will the Boy Scouts of the United States use portable radio sets in place of semaphore signals?

Without some means of signaling troops of Boy Scouts are as helpless in the field as an army detachment on special service. In order to determine the value of portable receiving and transmitting radio apparatus in connection with scout work Hiram Percy Maxim, president of the American Radio Relay league, and local scout officers conducted a successful experiment recently showing how radio might be used by the scouts in searching for lost persons.

As the test was to be made similar to a real emergency a dummy man was made and hidden in a patch of woods outside the city. The scoutmasters announced to their troops that a demented man had left his home in a neighboring city and attended to the details of organizing a searching party. The scouts assembled at a given point and set up their portable radio apparatus. Their movements were directed entirely from 1AW, which is Mr. Maxim's amateur radio station.

K. B. Warner, secretary of the league, operating 1AW, announced by radio that the missing man had been seen last near a deserted house about a mile from the place where the scouts were situated. He instructed them to dismantle the radio equipment and proceed to the house where they were to search the premises thoroly and report what they had found. This was done speedily and in a short time Warner received a terse message saying that matches and other evidences of recent occupancy had been discovered.

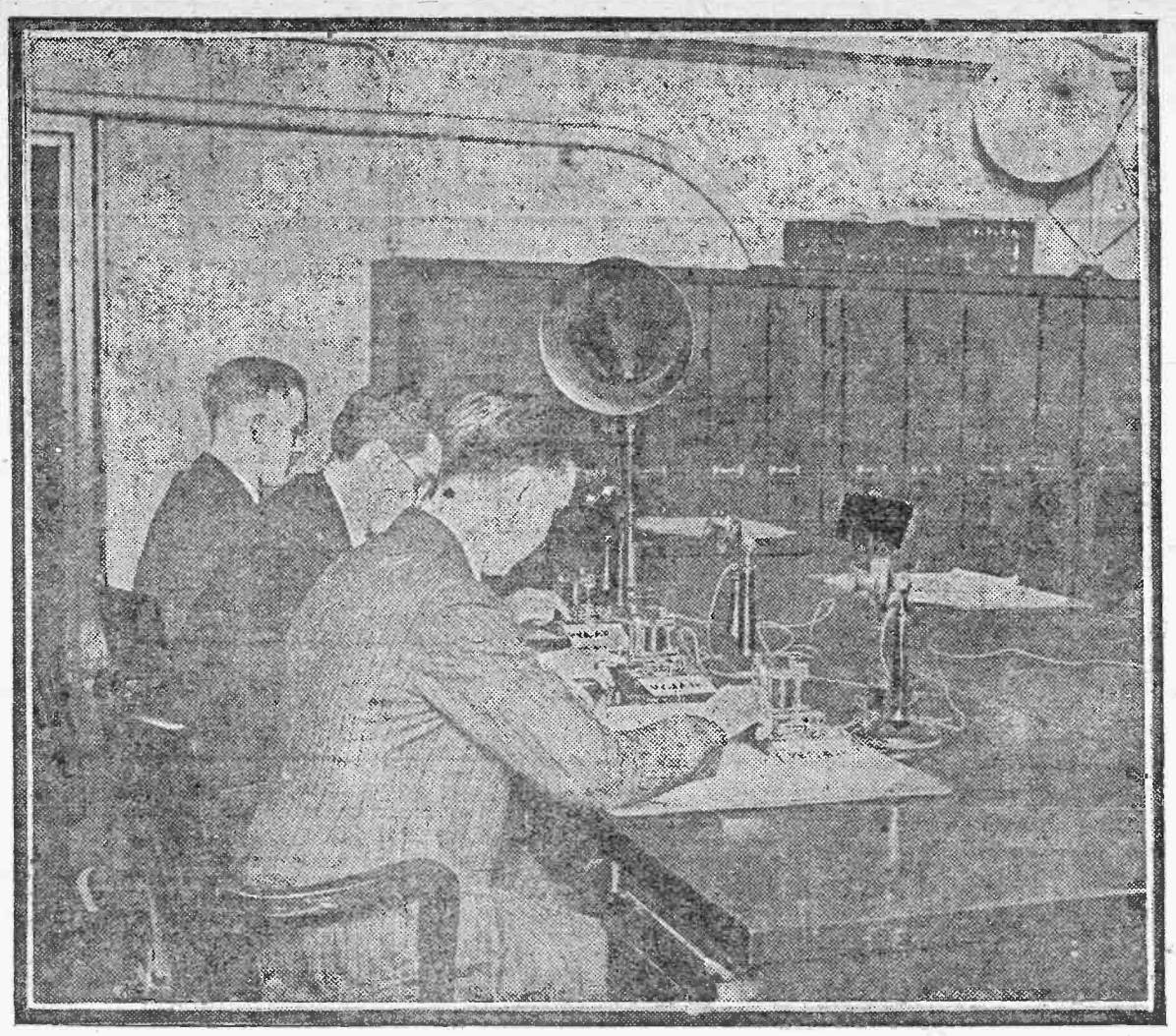
The scouts were then directed to search the woods to the north, where the figure of the dummy was found leaning against a tree. Three shrill blasts of a scout whistle announced the find.

See Radio Educational Factor in Future Science

In the near future radio broadcasting may prove to be the solution for the hard problem of making popular the facts and viewpoints of science. A short interesting scientific talk received at home over the radio set, will attract many listeners who never could have been persuaded to wade thru volumes of scientific books. During the last few months the New York section of the American Chemical society has been broadcasting talks on chemistry once a week over WJZ. A radio lecture on accountancy was received recently in a New York high school. These mark the beginning of what may soon be a great national factor in public education.

Snake Doctoring by Radio

In England recently one of the "uncles" who broadcast talks on snakes (all of the English broadcast talkers seem to be uncles) received next morning a letter from a small boy requesting a diagnosis of a snake, carefully described, which said small boy had captured in the paternal garden. The description showed the snake to be extremely poisonous and a message was broadcast immediately advising the captor to watch his step, or rather to watch the snake.



Most radio phans know it is now quite common to have a number of broadcasting stations in different cities broadcast the same program simultaneously. This is done by having distant stations connected with the station from which the program is originating by long-distance telephone lines. Photograph shows where the wires from stations WCAP at Washington, D. C., and WJAR at Providence, R. I., etc., connect with WEAF'S studio in New York. Note the telegraph and telephone instruments. While the broadcasting is going on these men are in constant touch with the distant stations by both wireless, phone and telegraph, which permits them carefal supervision of the lines.

Seeks to Prove Value of Low Power Outfit

SAN FRANCISCO, Jan. 3.—In order to demonstrate whether the low-power radio code transmitters commonly used by amateurs in the United States and Australia during the recent transpacific tests compare favorably with the high-power, expensive sets when adopted for regular commercial traffic, a special amateur station will be installed on the R. M. S. Tahiti, which will leave Australia about the middle of February, bound for this city.

The arrangements for this unique plan were made upon the advice of Charles Maclurcan, president of the Australasian Radio Relay league, who will supervise the installation on the ship and make the trip from Sydney to San Francisco and back. He will be accompanied by a 16-year-old experimenter, Jack Davis of Vaucluse, who likewise has made a name for himself in Australian radio circles.

Seeks to Prove Theory.

Mr. Maclurcan, whose home is in Strathfield, was prominent in the amateur tests between America and Australia and his station, 2CM, is known thruout the commonwealth. The tremendous distances covered by the low-power transmitters during these tests convinced him that the amateur-type stations were of commercial value.

Immediately after completing his plans for the voyage, the Australian experimenter wrote the American Radio Relay league headquarters at Hartford, Conn., advising them of the project, and the American organization will arrange for his reception here and give their co-operation during the period of the tests.

Duplicates His Own Set.

The equipment to be installed on the ship will be a duplicate of Mr. Maclurcan's own amateur station at Strathfield. A constant watch will be maintained by the operators during the voyage and data obtained faithfully recorded for future reference.

"It occurred to me that all this low-power transmission record work should be turned to some account for the public generally," declared Mr. Maclurcan in an interview with an Australian correspondent. "Many of my friends have been quoted big sums for the installation of wireless sending sets to cover a few hundred miles. This was generally due to the fact that the companies quoting, having no reliable data of the sure ranges of low-power sets had, in self-protection, to contract for excess power."

Experts Believe Martians Possible Broadcasters

Ever since the fable about the radio signals from Mars, the old problem of whether there is life or not on the planet has been of interest to the radiophan. The newest dope about the famed warrior is that it may be hot enough there for life to exist. It has been claimed by star bugs that the Martian atmosphere is so thin that the temperature must be very low like that of space. This, according to Doc Coblenz, one of the aforementioned star bugs, who is also connected with the United States bureau of standards, is the bunk. He claims that he has measured the heat reflected from the surface of Mars. The conclusion is that the temperature is about the same as the earth except that it is very cold at night and just as hot during the day. This confirms the idea that the Martian climate is much the same as a terrestial desert.

Calls Interfering Sets Law Breaking Transmitter

It is estimated from reliable figures that there are 1,500,000 radio-receiving sets in operation in the United States, and today, judging from the number of sales of apparatus daily, it is probable that in two years this number will be doubled.

A moment's reflection on the part of those who now have receivers will produce all sorts of conjectures as to what this will mean to the continued satisfactory reception of broadcasts. Those who operate their receivers in parts of the city where aerials are most numerous cannot avoid thinking about the chap next door or the tenants upstairs operating a receiver that radiates.

There are hundreds of persons who now tune in for their evening concert from their favorite station to find that after becoming all set their reception is muddled by a lot of cat calls and whistles. Those who are inexperienced will wonder, but the initiated will know that the interference comes from a neighbor operating a re-radiating receiver.

What Receivers Radiate?

"What is a radiating receiver and why does it interfere?" was a question recently put to L. C. F. Horle, chief engineer of the Federal Telephone and Telegraph company. In reply Mr. Horle said:

"The worst offenders are directly coupled regenerative receivers which use the antenna electrical characteristics as a part of the tuning system and whose radiation is increased with the strength of the oscillations of the detector tube.

"In this case, the single circuit receiver is one of the worst offenders. In a regenerative receiver, these oscillations can be pushed to a very high amplitude because of the control of the various circuits which regenerative receivers commonly employ. These controls include plate variometers, electromangnetic feed back, together with feed backs in various forms.

"In many cases we find other controls on the tubes which make it so complex that the novice operator finds it difficult to learn the proper means of always knowing how to bring his tubes in and out of oscillation.

"It is readily seen that radio-frequency receivers cannot possibly oscillate with the same violence as regenerative receivers, because they inherently have high losses in their transformer devices which are necessary to flatten out the curve of the reception wave lengths."

How Radiation Can Be Minimized.

It is entirely practical to prefix one or two stages of transformer-coupled radio-frequency amplification to a receiver that offends, thus effectively reducing its radiation to a minimum.

It truthfully can be said that most owners of such radiating sets are wholly unaware of their offense. In many instances where such owners were informed of their unintentional intrusion, a change was immediately made and a remedy affected.

It is entirely within the hands of the users of radio equipment whether or not the growth of broadcasting and, subsequently, the broadening of the programs, is to go ahead uncontrolled by legislation.

A complaint about a particularly vicious interfering receiver whose owner refused to be considerate was answered recently by S. W. Edwards, superviser of radio for the 8th district, headquarters at Detroit, in the following words:

"If a receiver oscillates and sends energy into the ether, the signal so transmitted is capable of causing interference with the reception of signals or radiograms coming from beyond the boundaries of the state in which the oscillating receiver causing the interference is located, and can then be classified as a transmitter and be subject to the regulations covering such stations.

Cites Radio Laws.

"Section 5 of the radio act could be evoked if the operator or owner of a receiving station continued to allow his receiver to oscillate. The interference produced by such a receiver could be classified as malicious and 'upon conviction thereof the owner or operator, or both, shall be punishable by a fine of not to exceed $500 or imprisonment for not to exceed one year, or both.' Section 1 provides a fine of $500 and confiscation of all apparatus unlawfully used if the transmitter is not licensed. Receiving apparatus which oscillates and sends a signal into the ether may be classified as a transmitter.

"With reference to the licensing of receiving sets which oscillate and send out a carrier wave, I have to advise that sections 1, 2 and 3 of the radio act of Aug. 13, 1912, cover the situation."

In replying to the rumor that the government is going to prohibit the use of regenerative sets, the foregoing paragraphs answer the question and leave the matter uncertain. The whole case rests in the hands of the user and leaves one asking the question: "Am I doing my share?"

New Lug on Condensers Aids Radio Home Builder

A proper soldering connection for a fixed condenser has been the desire of all manufacturers of radio sets as well as amateurs who build their own.

It is, of course, comparatively easy to solder one connection to each terminal of every good mica condenser, but the task of making four, three, or even two, clean connections to a fixed condenser always has resulted in a very messy job.

With an evident realization of the importance to clear-toned radio reception, of affording the best possible soldered connections and neatly soldered joints, the Charles Freshman company of New York city has made a radical improvement in the design of all capacities of their tested noiseless mica condensers, which should prove a boon to manufacturers and radio enthusiasts who build and tinker with their own outfits.

A lug of special construction is riveted by means of an eyelet to each terminal of the mica condenser. The lug is so designed that three or more different wires may be soldered to it, giving exceptionally good contact and allowing right-angle bends. The lug is equipped with three grooves, permitting the wires to be laid properly, and held in place while being soldered.

Another most important advantage is that in wiring a set the connection can be made temporary without soldering. All that is necessary is to lay the wires in the lugs, which are so constructed that they can be made to hold the wires without soldering by merely bending over the sides of the grooves to form a contact with the wire. In this way the circuit can be tested and varied so as to give the most efficient result. When this is attained the connections are then soldered.

Two-Circuit Set Best, B. Dudley Tells Amateurs

Many radiophans are constructing their own receivers, some which work well and some which are tolerated merely because the builder has not the necessary funds to make a new one, says Beverly Dudley, member of the American Radio Relay league.

For the construction of a receiver which is to work entirely satisfactorily a thoro knowledge of radio principles is essential, but one may get on well with a few pointers and his own common sense.

The essentials of a good receiver are: (1) Sensitivity, (2) selectivity, (3) ease of control and (4) moderate cost. To combine all of these features is not as simple a matter as it may seem.

First of all, a receiver must be sensitive. This means the use of vacuum tubes and radio-frequency amplification or regeneration. For a single-tube set, regeneration is quite desirable, almost necessary application. There are numerous regenerative circuits to choose from, but for short-wave reception a circuit in which regeneration takes place by use of a tickler is most satisfactory. Regeneration as secured by means of the absorbtion method offers some advantages.

Two-Circuit Tuner.

For selectivity, a two-circuit tuner seems to be the only one worthy of consideration. Tests made last winter showed a single-circuit tuner to bring in the stations a trifle louder, but the tuning was so broad that local and loud broadcasts could not be eliminated. Even a few amateurs who work on 200 meters were heard on this tuner, when tuned for the broadcasts. It is of no use to get loud signals if you cannot pick out the desired stations to the exclusion of the rest.

The main objection a radiophan has to a two-circuit tuner is the additional control. Tuners may be made in such a way as to afford the simplicity of the single circuit tuner with the selectivity of the loose coupled tuner, by making the primary of the circuit apericodic. That is to say, that the primary is not tuned at all. This untuned primary consists of from one to five turns of wire wound over the secondary coil, or coupled to it. These turns may be tapped or not. The Reinartz tuner uses a tapped but untuned primary. This is a very satisfactory method of coupling the primary and secondary circuits.

Ease of Control.

Ease of control is very essential, especially to the radio amateur, in his traffic work. One cannot tune a receiver all evening merely to hear the bedtime stories from Radioville, two miles away. Don't have seventeen tuning controls on your receiver; three is plenty. A receiver may be—tho they usually are not—selective with but one tuning control. Don't, however, sacrifice efficiency for ease of control.

As to the cost. Buy inexpensive parts if necessary, but not cheap parts. There's a difference. The cost of many receivers could be kept down by taking off a lot of the trimmings. A receiver doesn't need voltmeters or bezels mounted on its panel.

Be sure to purchase a good variable condenser. The one with the least parts is all right. Upon merely examining a condenser one cannot tell its electrical efficiency. A variable condenser should be mechanically good. Hard rubber is much better for insulation on a condenser than porous, absorbent fiber.

Get good mica insulted fixed condensers if you value the quality of the signals you desire from your set. See that the fixed condensers are well made and firmly pressed tight. A fixed condenser whose capacity varies is worse than nothing.

Radio Is a Public Utility

Is radio here to stay or is it just a passing craze? That is the question one hears on every side at the present moment, writes Jack Binns, radio editor of the New York Tribune.

Before passing final judgment on the question let us analyze the situation carefully. In the first place, radio is not an overnight production of mushroom growth. It is only the public interest that is new.

The present apparatus of standard worth is the result of twenty-four years' persistent research and experience. It has been produced by slow, steady and oftentimes painful progress, and it has withstood the test of time purely on merit.

In my opinion, radio broadcasting is a public utility. As such it is not only here to stay, but it will form one of the most important necessities of daily life. It will not supplant any of our existing forms of entertainment, but will supplement them in a manner undreamed of two years ago.

Rapid communication is a most important element in cementing a people and building up a country. Radio is ideal, and the most efficient and cheapest method yet devised.

Counterpoise Aerial

An improvement of reception of from 200 to 500 per cent is often obtained by using a counterpoise aerial instead of the customary ground. This is also of advantage when bothered by motor generator and similar noises. There is nothing special about a counterpoise in the way of construction, it being simply another aerial. The best place to erect it is several feel below the receiving antenna, running in the same direction.

RATIO OF AUDIO TRANSFORMERS.

The best amplifying sets use a five-to-one transformer in the first stage and three-to-one transformer in the second stage. Ten to one is too much in the first stage. Distortion results.

Wiring, Construction Details of "Old Reliable" Three-Circuit Regenerative Set

THE wiring plan of the 11 by 30 panel designed for "The Old Reliable" hook-up is given this week. Next week a photograph of the completed set in its cabinet will be shown. Next week also will be printed wiring instructions and panel layout for the 7 by 30 "Old Reliable" which was illustrated last week.

By IVERSON C. WELLS.
Radio Editor Chicago Evening Post.

MANY seemed to be perplexed by the odd size of the panel layout and the cabinet required for the "Old Reliable" hook-up of the Armstrong three-circuit regenerative receiver which has been described in these columns.

It is an odd size, but since it was designed as a de luxe set and for the home where little or no experimenting is done and the receiver was intended as a permanent fixture, this size should not be objectionable. The cabinet will adjust itself to almost any library or small table. That was one of the reasons why the odd size was provided for.

However, those who prefer to have a standard cabinet, which can be procured at almost any of the radio stores, will be given panel layout and construction details of the receiver that was illustrated last week. This will appear in next week's issue of this magazine. It is an 8x30x7 cabinet.

Now for the de luxe set: It is assumed, of course, that you have your various parts and the panels cut and drilled in accordance with the layout and instructions printed two weeks ago. These illustrations are reprinted today for your convenience.

Notes on Drilling.

If you have not drilled your panels now is the time to do so. By examination of the panel layouts you will note that the holes for the rheostats, the series parallel switch and the variocoupler were not indicated. This is because it was left to the choice of the builder to select these instruments and different instruments require different holes.

In selecting your rheostats I want to impress upon the builder that a good detector filament control absolutely is necessary for the "Old Reliable." There are several good rheostats on the market which have a vernier arrangement. Be sure to buy the best you can get for the detector tube. It does not make so much difference about the rheostats for the amplifying tubes. They are not critical.

In boring the holes on the shelf panel you must provide for the rheostats. These will be mounted, of course, on the front or main panel.

Two holes for each rheostat will have to be bored on the shelf panel. These are the holes thru which the wires from the rheostats are fed.

There is another suggestion I wish to make in your drilling. You will note on the main panel layout that reference is made to mounting the two Thordarson transformers upside down and beneath the shelf panel. This is done to give closer grid leads.

However, there is an error in the drawing. These holes are too far front to permit the transformers clearing the other instruments underneath. If you mount them as intended in the design be sure to drill these holes a little farther back toward the rear of the shelf panel—just enough to permit the transformers clearing the other instruments that are underneath on the main panel.

May Mount on Top.

Should you prefer to mount the transformers on top of the shelf panel the holes as they are now indicated will answer. Mind you, however, these holes are for this particular type of transformer. If you use any of the good makes drill your holes accordingly.

Four holes must be drilled for the double circuit jack on the shelf panel. These should be placed just above where the jack is to be mounted on your front panel. Thru them the leads from this jack are brought up above. Two holes must also be drilled for the single circuit jack in the same way.

Four holes, half an inch apart, are drilled on the shelf panel for the series parallel switch, locating these wherever you place the switch on the front panel. If you are using a battery switch drill two holes for this on the shelf panel underneath the switch which is to be located on the front panel.

If you have drilled all your holes properly the next step is to mount the instruments on both panels. The main or front panel carries the tuning instruments—the two 43-plate condensers, the variocoupler and the variometer. It also carries the series parallel switch, the inductance switch, the filament control jacks and the three rheostats.

Mounting the Instruments.

Beginning with the right-hand side of the panel, viewing it from the rear, mount the plain 43-plate condenser in its position. The variocoupler comes next. Then the 43-plate vernier condenser and finally, at the extreme left, the variometer. Refer to Figure 1, showing the panel design. You will note these instruments all are at the bottom of the main panel. The panel, however, in this illustration is a front view.

At the top, beginning at the right, the primary series parallel switch is mounted. Next to it is the detector filament control and to its left the two amplifying tube rheostats. Between the detector and first amplifier rheostats is the primary inductance switch.

Now, for the shelf panel mountings. On this panel are the detector and amplifier tube sockets, the two transformers and the grid leak and grid condenser.

If you are following this de luxe hook-up in its entirety, you will note that provisions are made for concealing most of the wiring underneath the shelf panel. This is done largely for the purpose of allowing short leads, especially in the grid circuit. It also makes a much neater job.

Unscrew the connecting bolts from the three sockets. Replace these with one-inch bolts. These bolts must be placed thru the shelf panel in a reverse direction, since the contacts are to be underneath. Place a solder lug on each bolt before inserting in panel underneath. Then fasten the sockets into place, using the bolt nuts that usually are on the bottom of the sockets at the top. Underneath the shelf panel you now should have twelve bolts with solder lugs, each one a live connection as well as a panel mounting bolt.

The Transformers Are Inverted.

The transformers are mounted on top of the panel, but are inverted. This will throw the connectors underneath. This may be followed if you desire, but do not overlook the caution about the holes. These holes must be bored at least an inch farther back so the transformers will clear the other instruments. I prefer mounting the transformers underneath. It gives you a clear panel on top, with only the tubes and sockets showing.

If the instruments are mounted underneath the bolts will come up thru the panel shelf. Four solder lugs should be fastened into place and the nuts bolted down. This will leave four live connections protruding on the top of the shelf from each transformer, these same connections acting as mounting bolts as well.

If the transformers are mounted on top of the shelf panel, next to the sockets and using the specified holes in the panel layout, place the transformers in the inverted position. The soldering lugs then would go underneath the panel with grid connection of the transformers as near to the grid connections on the tube sockets as is possible.

The grid leak and its grid condenser should be located on the shelf panel as close to the grid post of the socket as is possible. If a variable leak is used, and I advise you to get one, mount it underneath the panel and let the indicator knob stick up thru the panel and turn it from the top side.

Provisions are made for all the battery connections as well as the aerial and ground connections to be placed on the rear of the shelf panel. Binding posts may be used, but the phone tip jacks cost but a little more and certainly are more convenient. The aerial is at the extreme right of the shelf panel, looking at the panel from the rear. The ground post or tip comes next to it. Then follow the battery posts or tip jacks.

Notes on Wiring.

Now comes the wiring plan. It is a wise plan to do as much of the wiring on the two panels as is possible before they are put into place. Make your wire leads with the idea that they are to be pushed up thru the various holes provided for them and leave enough spare wire on the open ends to enable you to complete proper connections when the panels are in place.

Use No. 14 bus bar wire. There is no necessity to use spaghetti tubing on the wire, unless it is in the battery leads. Contrary to popular idea insulation of this nature does not improve the quality of the radio-frequency circuit—those wires that lead up to the detector. Radio currents travel with a "skin effect," that is, on the outer surface of the wire.

Since stone walls and brick buildings do not stop radio waves it is not likely that a little bit of tubing is going to stop them either. Just keep your wires from running parallel and cross them at right angles.

—is desirable. Should a screw driver or a pair of pliers or even another wire be dropped cross one of the leads, with the tubes in their sockets, you are apt to throw the "B" battery voltage onto the filaments. That would prove disastrous. Insulate these wires for that reason and none other.

Begin With the Filaments.

Start with th filament leads. Wire up the filament lead f om the tube sockets that go into the "A" minus battery post and the "B" battery minus post. These two posts, you understand, are wired together, a small strip of copper being placed across the two posts underneath the shelf. A piece of bus bar wire will answer, of course, but not so neat.

If your rheostat holes have been drilled properly on the shelf panel you will see now why I have emphasized the necessity of having them in the right location. Run a wire from the minus A tube socket connection to these rheostat holes. Leave enough spare wire to give you plenty of connecting room later.

Now run a wire from the grid connection on the detector tube to the grid leak and its condenser. One end of the grid leak is left open to be connected later to the instruments underneath. Keep this wire short. The shorter you make it the better you ahe going to build "Old Reliable."

The first transformer grid lead runs to grid connection on the second tube of the first amplifier tube. The second grid lead runs to the grid connection of the third or last tube.

As to the "C" Battery Leads.

The filament connections on the two transformers are connected together and this common terminal goes to "C" minus binding post in the rear of the shelf panel. The "C" plus binding post goes to the "A" minus and the "B" minus binding posts.

The "C" battery connections are not shown in the accompanying diagram, and should be used when using voltage over 90 on plates of amplifying tubes. If used make connections as follows: Variable "C" battery 4½ to 7 volts, minus side connection to "F" on first transformer. Plus to "A" minus—"B" minus filament lead. The same connections should be used with the second transformer, a separate "C" battery being employed. As you increase plate voltage, "C" battery voltage should be raised.

The plate connection of the first transformer is left open for variometer connection underneath the panel later. The "B" plus on the first transformer goes to the "B" plus on the 22½-volt binding post. The plate connection on the second transformer goes into the third connecting terminal from the bottom of the double circuit jack. The "B" plus on the second transformer goes to the second terminal from the bottom of the same jack. The plate of the second tube goes to the top connecting terminal of the same jack and the "B" plus 90-volt binding post should have a lead to the bottom connecting terminal on this same jack.

That is about the simplest way I can explain the intricate jack wiring. If you follow the suggestions carefully you should have no trouble. Some of the advertised brands of jacks placed in labeled cartons carry wiring instructions. Try to get one of that type.

The Other Jack's Wiring.

The plate connection of the third tube goes to top connecting terminal of the single circuit jack. The bottom terminal of this same single circuit jack is wired to the "B" plus 90-volt battery connection on the other or double circuit jack.

It is not possible to give you wiring instructions on the series parallel switch as so much depends upon the type you use. Most switches of the better type have wiring instructions printed. Buy that kind.

Now for the fixed condenser across the phones or the transformers where the two stages of audio are used. This may be either .001 or .002 capacity. One end is connected directly to the "P" post on the first transformer. The other goes to the "B" battery plus binding post.

This completes the shelf panel wir-

Continued on Page 13.

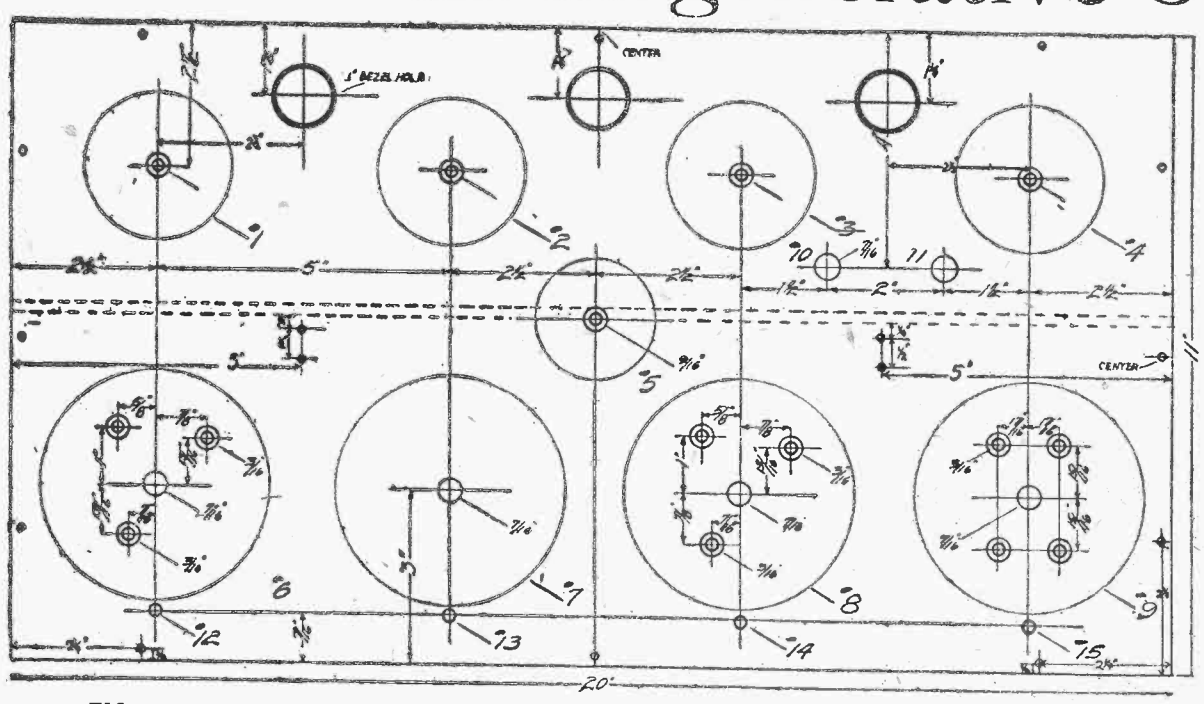


FIG. 1—Panel layout for "Old Reliable" Armstrong three-circuit regenerative receiver. Dial No. 1—Upper left corner, primary series parallel switch. Dial No. 2—Carter's detector filament control rheostat. Dial No. 3—Carter's first-stage amplifier-control rheostat. Dial No. 4—Carter's second-stage amplifier-control rheostat. Dial No. 5—Primary inductance switch. Dial No. 6—Primary condensers. Dial No. 7—Coupler. Dial No. 8—Secondary condenser. Dial No. 9—Plate variometer. No. 10—Phone jack. No. 11—Loud speaker jack. No. 12, 13, 14 and 15—Verniers.

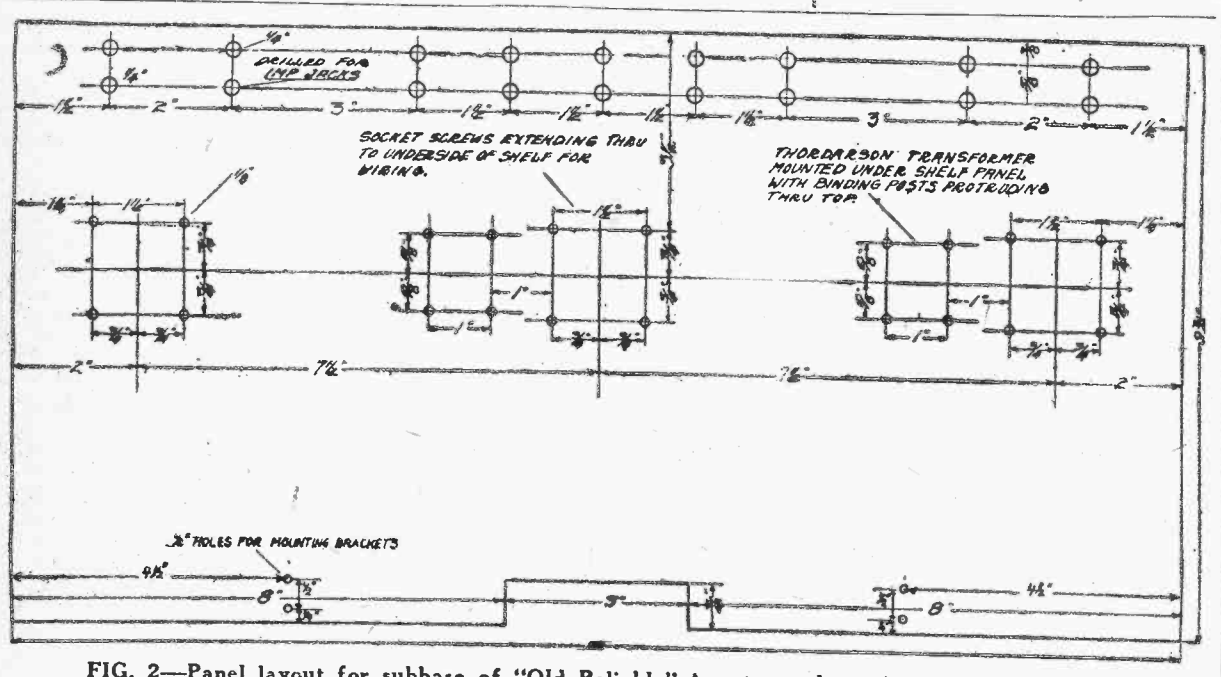
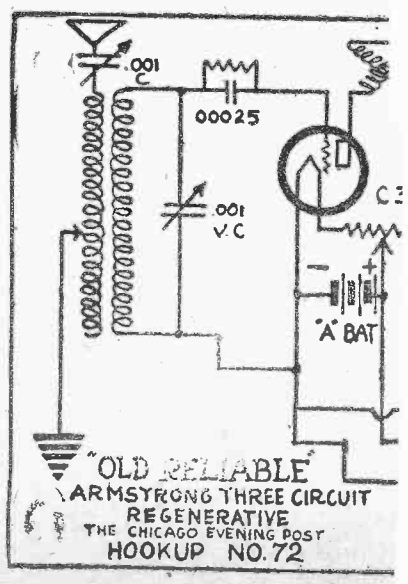


FIG. 2—Panel layout for subbase of "Old Reliable" Armstrong three-circuit. The holes shown here are for Thordarson transformers. If other makes are used, holes must be drilled accordingly.



Questions You Ask and Answers We Give

TUNED RADIO-FREQUENCY.

584—CHICAGO: I have a two-stage amplifier using 201A tubes which I constructed myself, and I would like to have you mail me a good hook-up for a one-stage R. F. and detector. Would you advise tuned or transformer coupled? I have an hand the following parts which I wish to use, altho I will purchase any parts necessary: One WE215A tube and one C300 tube. One 11-plate condenser, one 180 variocoupler, rheostats, sockets, etc.

Below is hook-up you request. This can be made regenerative by adding variometer in plate circuit as shown by dotted lines.

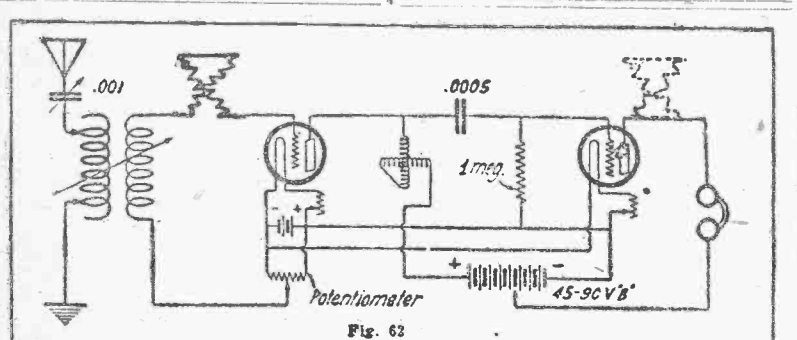


Fig. 62

TUNED RADIO FREQUENCY CIRCUIT
THE CHICAGO EVENING POST HOOK UP #504

CONDENSER FOR CRYSTAL.

610—Chicago: Can a 23-plate variable condenser be used in place of a 43-plate, as in Mr. Hagerman's long-distance crystal set in the Radio Magazine of Nov. 28?

In the Hagerman long-distance crystal set a 23-plate condenser can be used, but it is not advised, as with it the set will not tune to 700 meters, which is very necessary when you wish to receive stations like KYW.

REGENERATIVE CRYSTAL?

606—CHICAGO: In The Chicago Evening Post's Radio Magazine of the 13th I noticed an article, entitled "How to Tune Single-Circuit Sets to Avoid Interfering with Your Neighbor." In the second column of this article it was stated that too much regeneration will cause the signal to be "mushy" or the voice to be distorted. I have a two-slide tuning coil outfit. Occasionally, I receive WDAP so "mushy" that it is impossible to distinguish the voice or whatever happens to be on the air at the moment. As I do not know too much about radio, I would appreciate your answer very much. My set comprises but a two-slide tuning coil and a crystal detector.

In the article you refer to the set mentioned was a one-tube set. Regeneration cannot be obtained on a crystal set, so your trouble does not lie there. A fresh crystal might help you or a 43-plate variable condenser in the ground lead.

PUSH PULL AND R. F.

605—CHICAGO: I have a three-tube regenerative outfit using W.D.-11 tubes. Can the push-pull amplifier shown in Thursday's Radio Magazine be added, it also using W.D.-11 tubes? Inclosed find hook-up of my set. Can I add radio frequency amplification?

Here are answers to your questions: (1) Push-pull amplification can be used on the circuit mailed. (2) Radio-frequency can be added, but is not advised.

591—CHICAGO: Can you tell me why I am unable to tune in KYW on my Jones & Co. Symphony 4-stage receiver? I get WJAZ and WDAP good. Also get Havana, Cuba, and other stations good on loud speaker. The antenna is 120 feet long, including lead-in, and most of it is thirty feet above the ground. I will thank you for any suggestions. Would also like for you to suggest a way to eliminate the interference of an electric ringer used in our local telephone exchange. It can be heard at all times, and when my phone rings, it comes in thru the receiving set.

You are unable to tune in KYW on your set because the primary inductance of your receiver will not tune to 600 meters. A method of increasing this would be to put a 75-turn coil in series with the aerial. To eliminate interference from an exterior source, such as the bell-ringer you mention, would suggest trying Post Wave Trap as per diagram mailed.

NEEDS BIAS BATTERY.

557—CHICAGO: I have an Aeriola Sr. Westinghouse set and a two-step amplifier. The amplifier I made myself. There is a continnous buzzing in the second and third tubes which I cannot tune out. What could cause this? I have gone over the connections and they seem to be O. K. There is also a whistle in the third tube, which does not disappear until I put my finger on the second or third jack. Why is this?

To give you the information you request it is necessary to have a diagram of set as you are using it. You might try inserting from 3 to 6 volts of "C" battery in the leads from "G" of transformer to "G" on socket, negative to socket and positive to transformer.

AERIAL CONSTRUCTION.

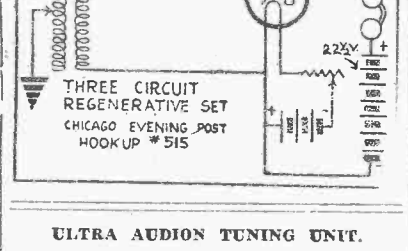
550—CHICAGO: If entirely consistent, I would appreciate it very much if you would answer a few questions: (1) I live in a two-flat building on the west side and the party on the first floor has an aerial on the roof running the length of the building—north and south. I desire to construct an aerial on the outside and I wondered if I constructed one running north and south on the other side of the building if we would cause each other any interference. Could I use his aerial?. (2) Am attaching hereto rough sketch of an aerial which I thought might serve the purpose, and I figured on stringing same in this manner across the back porch up under the roof. Would this be satisfactory and would it be less liable to interference? (3) If neither of the above would work to my advantage, what would you suggest in the way of an aerial? Please submit sketch. (4) I am figuring on constructing the crystal radio set that was published in your Radio News a couple of weekse ago, i. e., the one that the builder said he operated a loud speaker on. What kind of a crystal is shown on this photo? Is there a better one made? Would you suggest the substitution of the better one? (5) What kind of wire is best suited for an aerial to be used on this or any other set? (6) What kind of wire should be used for the lead into the house for this or any other set? (7) It is my understanding that the heavier the wire for the lead in and the ground, the better. Is this true? (8) What loud speaker could best be used on this crystal set? (9) Would the victrola attachment made by Atwater Kent work on this crystal set? It sells for $12.

Here are answers to your questions: (1) Two aerials on the same roof would not cause any objectionable interference, unless they were connected to regenerative tube sets. We do not advise two sets on an aerial. (2) Aerial as per sketch would be unsatisfactory. It must be one straight wire as long as possible, 6 to 8 feet above all obstacles on top of the roof. (3) Sketch requested has been mailed. (4) Crystal used was an R.W. We do not advise substitution, but any good crystal that is not fixed will work. (5) No. 14, seven-strand copper wire is universally used for antennas. (6) No. 14, or larger, rubber-covered wire is required by the fire underwriters to be used as lead-in. (7) Heavier wire, say up to No. 8, has less resistance than smaller wire, therefore is of advantage to a set. (8) Any good loud speaker may be used. (9) The attachment you mention in many cases is better than a horn.

THREE CIRCUIT HOOK-UP.

519—CHICAGO: Would you kindly send me two variometer and one variocoupler hook-up?

Below is hook-up you request.



ULTRA AUDION TUNING UNIT.

536—CHICAGO: Have ultra audion demon two-stage amplifier, using W.D. 12 tube. Would variocoupler give better results than demon coil which I am using. Please suggest what variocoupler would be best for my set.

We do not advise a variocoupler for your set. Would suggest a variometer in place of tapped coil. Any standard make will suffice.

SUPERDYNE DATA.

624—WAUKEGAN: Could you inform me as to where I could get a blue print or diagram of the four-tube Superdyne, also the correct parts to use in this hook-up?

All the diagrams and information available on the Superdyne set was given in our Dec. 27th issue of the Radio Magazine. Kindly refer to it.

POSITION OF GRID LEAK.

625—CHICAGO: In your issue of Dec. 20, on page 10, you give a panel layout of the Old Reliable Armstrong set, which I intend to build, and which seems complete in every detail with the exception that on Dec. 27, on page 7, in showing the apparatus to be used, you include a variable grid leak of .00025 capacity. In checking this up with the panel layout published Dec. 20 there seems to be no place on the panel board for this grid leak, and I don't want to commence the set without being sure of the proper distribution on the panel. I would very much appreciate your advising me in this particular, also advising me if you have a full size blue print of the layout and wiring as shown in the issue of Dec. 20, page 10.

The variable grid leak in the Old Reliable set is mounted on the bakelite sub-base post of the detector tube. We have not at present the blue prints you request.

FREE SERVICE

QUESTIONS asked on any subject pertaining to radio will be answered in this department in either the daily edition or the Radio Magazine published each Thursday. No charges are made for this service.

Due to the immense volume of letters being received by the Question and Answer department, the following restrictions must be made:

All letters must be plainly written in ink and preferably typewritten, and only on one side of the paper.

Drawings, hook-ups, etc., must be on a separate sheet from question and clearly drawn, showing values of parts.

Do not ask for panel layouts, construction details, etc., for a set unless they have appeared in the columns of this magazine. Self-addressed and stamped envelope must be inclosed. Address all your letters to Radio Questions and Answers Department, The Chicago Evening Post, 12-14 South Market Street, Chicago.

REINARTZ HOOK-UP.

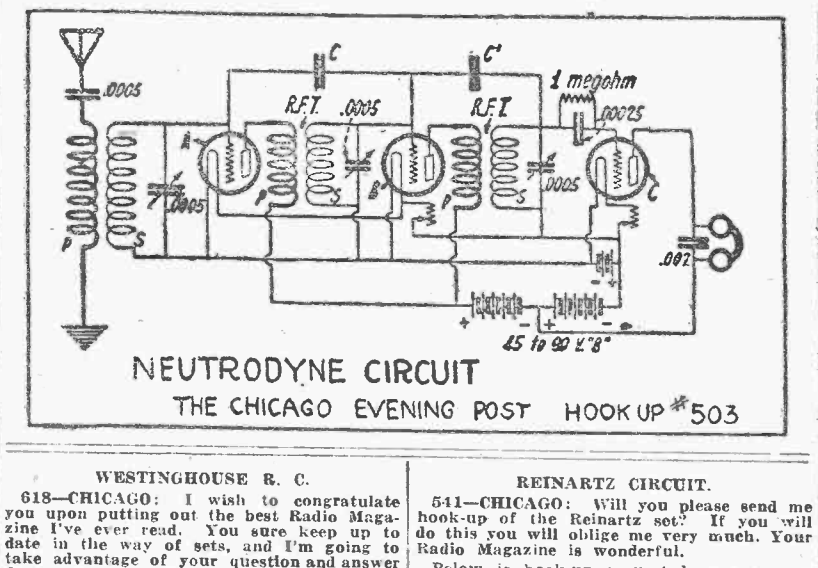
542—CHICAGO: I received your paper last week and was very pleased with it. Will you kindly send me the latest Reinartz hook-up.

The hook-up you request was given in answer to question No. 541.

NEUTRODYNE HOOK-UP.

525—CHICAGO: I enjoy your Radio Magazine immensely. Will you kindly send hook-up for three and four tube Neutrodyn sets. Also instructions for making Neutroformers.

Below is given hook-up you request. To make this a four-tube merely add one stage of A. F. amplification. Information on the construction of neutroformers was given in the Dec. 20 Radio Magazine.



NEUTRODYNE CIRCUIT
THE CHICAGO EVENING POST HOOK UP #503

WESTINGHOUSE R. C.

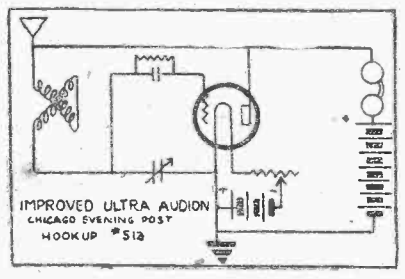
618—CHICAGO: I wish to congratulate you upon putting out the best Radio Magazine I've ever read. You sure keep up to date in the way of sets, and I'm going to take advantage of your question and answer department. I have a type R. C. Westinghouse and a 5-5 Thorophone. I'm using a UV200 detecter and two UV201 A's as amps. I notice that the R. C. was taken off the market, and I am puzzled, and wonder if you could enlighten me as to the reason. I get the entire United States, with the exception of west coast stations, clearly over the loud speaker. Is this all that can be expected? Would Western Electric tubes improve the set? If so, what kind? I have constructed a number of sets, including the Fleweling and Reinartz, just for fun, but Miner's Superdyne seems a world beater, and I wait anxiously for next Thursday.

The Westinghouse R. C. set that you mention was taken off the market because of some commercial reason by the Westinghouse people. Just what it is, we cannot tell you. The results you are obtaining are all that could be expected. The Western Electric tube would give more volume; 216 A's are very good

GOOD WD11 HOOK-UP.

521—CHICAGO: Please send me a very good hook-up using a WD11 tube. I enjoy your paper very much.

Below is hook-up you request



WORNOUT TUBES?

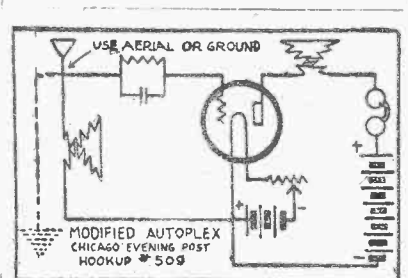
623—CHICAGO: I have a regenerative receiver, which I used on an average of two and one-half hours per night for the last nine months. It has lost considerable volume and I cannot get distant stations. I would like to know if my three tubes (UV201A) are worn out. Would new tubes bring in better and louder signals?

Vacuum tubes very seldom wear out. Your trouble more than likely lies in your batteries, or possibly your phones are demagnatized.

INDOOR AERIAL HOOK-UP.

544—CHICAGO: Kindly send me hook-up for a one-tube set with extreme selectivity. I am forced to use loop or indoor aerial and intend to use UV201A tube or one similar and the very least of parts. I intend to use the best of parts as I know from experience that inferior parts do not pay.

Hook-up requested is given below. Use wire around moulding or Ducon light socket plug for an aerial.



AUTOPLEX WAVE LENGTH.

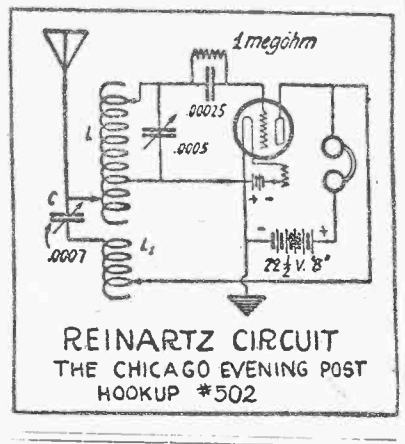
518—CHICAGO: My autoplex outfit made as per your magazine some time ago, with the few changes made as per my sketch, brought in WSAI, KDKA, WGY, WCAL, WTAS, WHAD, WOS and others thru the local stations. I use an Antanella plug in conjunction with my aerial in order to get stations above 460 meters. Do you suppose a different pair of variometers would bring in the longer wave stations? I use a pair of wood variometers, 70 turn stator, 70 turn rotor. The vernier rheostat helps very much in the clearness of the tone.

To raise the wave length of your set, place a 75 turn coil in series with the grid and plate leads of your tube, as per diagram mailed.

REINARTZ CIRCUIT.

541—CHICAGO: Will you please send me hook-up of the Reinartz set? If you will do this you will oblige me very much. Your Radio Magazine is wonderful.

Below is hook-up requested. ....



REINARTZ CIRCUIT
THE CHICAGO EVENING POST
HOOKUP #502

COUNTERPOISE AERIAL.

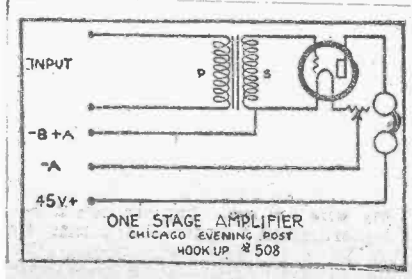
619—CHICAGO: Just want to let you know I think your Radio Magazine has anything in the country beat and gives the best dope. I am interested in a counterpoise. Please give full details for construction, i. e., is it put up like one antenna with insulation at both ends and then grounded, or is it insulated only at one end, and then connected to ground post on set? I understand it is to be just about one foot above the ground, but should it run the same way as the antenna—that is the only way I could run it. My antenna is forty feet high, two wires about two feet apart, seventy-five feet long, forty feet lead-in, No. 10 copper wire. Must counterpoise be same amount of wire as in antenna? I have placed a fixed condenser on the secondary of my second audio transformer and notice a wonderful improvement in the tone, but would like some way to vary it. Would a Bradley leak take care of it? These people advocate its use. If so, should a fixed be used with it?

A counterpoise aerial is constructed exactly as your receiving aerial. It can be placed at any convenient height. Its length is determined by experimentation. When a counterpoise is used on a set, it takes the place of the ground, or, in other words, the set has two aerials on it. In your letter you state you have a fixed condenser across the secondary of your second transformer. Do you mean a fixed condenser or a fixed leak? If you mean a leak, the one you mention would be O. K. A fixed leak should not be used in conjunction with it.

A. F. ON CRYSTAL.

621—CHICAGO: I am inclosing a hook-up of a crystal set. I would like to know if I could add one step of amplification to the said set, and would I then be able to receive Chicago stations loud enough to hear it in the same room as set is in on a Baldwin phone? I have a V. T. one-tube, and would like to use it. Please inclose hook-up of the amplification circuit and tell me if I should use, and what ohms rheostat should I use?

The average crystal set with a one-stage amplifier is generally loud enough to be heard over two or three rooms on a loud speaker. Hook-up is given below; also a 5-1 ratio A. F. transformer and a 6-ohm rheostat.



RADIO-FREQUENCY TROUBLE.

628—CHICAGO: As I am a constan reader of your wonderful magazine, I tak it upon myself to ask a few question Below is a diagram of my present se What is wrong? It is a poor receive Will this inductance below give me mor volume than the variometer? The tw stages give no volume at all. Is the dia gram incorrect?

We are very sorry we are unable to chec your set from diagram mailed, but if yo will rewire your radio-frequency and de tector, as shown in answer to question No 541, we can assure you of very good re sults.

BODY CAPACITY.

620—CHICAGO: I am a new Post reade chiefly because of its splendid radio depart ment, and wish to take advantage of you very kind assistance. I have a single one tube set and am using spider-web coils an a twenty-three-plate condenser, with a WD1 tube. I have no trouble in tuning in th outside stations, but when I take my han away from the condenser there are whistle and cannot hear unless I keep my hand ove the condenser. I would like to know if ther is anything I can do to eliminate this. have a sixty-foot single wire aerial, an would like to know if I could do better wit a 100-foot aerial. If I added a variometer would it help to get more distance and vol ume?

Body capacity can be eliminated on a se by shielding the back of the panel with ti foil and connecting it to the ground. I your trouble seems to concentrate on th variable condenser, be sure the rotor goe to the ground. A 100-foot aerial woul improve your results considerably. Yo neglected to inclose hook-up of your se therefore we are unable to answer your las question.

Radio Varies Monotony of Shuts-ins in Maine Wood

If it were not for the radio receivin set, which links them unfailingly wit the outside world, a little communit in the northwest corner of Orr's islan Maine, would be facing a monotonou winter.

Mrs. Dennis L. Wilson, in a lette just received by WGY, the broadcast ing station of the General Electri company at Schenectady, N. Y., give a suggestion of how radio broadcastin in general, and the programs sent ou by WGY in particular, have assure them of a far different winter seaso from that which they were obliged t go thru in the "old days."

"We live," she writes, "on the north west end of Orr's island, just two fam ilies by ourselves, with only five peo ple in all. There is sometimes a wee in which we don't see a soul and i which we cannot get to our neares neighbors, so you see what a comfor radio will be for us.

"I have been very ill, and so m family has all been in the house wit me, and my mother-in-law, who is 7 years old, does not get to church ver often. She is quite deaf, but she go almost all the service last Sunda night, and she said it did her a lo of good. It came in here as clear a a bell.

"We have only a small radio outfi one tube, with three dry cell batterie and two head sets. We have bee hearing your concerts night afte night, and we are having a feast o music and lectures. We look forwar all day to the evening. I never hear so much in the way of good things a I hear over the radio—things to uplif one and new thoughts. I do surel appreciate what all our radio station are doing for us; my winter will be s much shorter and happier than thos of previous years."

Uruguay Shows Interest in Radio Broadcastin

MONTEVIDEO, Jan. 3.—Keen in terest in radio is developing in Uru guay. Amateur radio enthusiasm go a retarted start in Uruguay as in A gentina and even up to the preser very little has been done.

There are only five houses dealin in radio apparatus in Montevideo, tw of whom only just have begun t handle radio goods to any extent. On of these concerns intends to erect small broadcasting station, since th only station now broadcasting in Mon tevido gives concerts very irregularly making it necessary for the Urugua an radiophans to depend very largel upon Buenos Aires.

The other house actively dealing i radio apparatus has just hired a Be gian electrical engineer, who has bee trained in radio in the United State to take charge of a new radio depar ment, and the manager feels that h house is going to make a big succes of radio apparatus. Both of thes concerns intend to sell American set only.

JARRING PHONE RECEIVERS.

Sudden jars, caused by dropping th instruments on the floor, weaken tele phone receivers. The permanent mag nets are effected.

How to Wire Old Reliable Receiving Set

Continued From Page 11.

ing for the time. Lay it aside and take up the front or main panel.

The primary taps on the coupler are wired up to the inductance switch, leaving one end of coil open to go later to series parallel switch. The switch arm on the inductance switch goes to ground binding post at the rear and also into series parallel switch.

The secondary of the coupler is now wired to connect the rotor of the 43-plate vernier variable condenser and into "A" plus and "B" minus filament line. The other connection on the secondary of the coupler goes to the rotor of the secondary condenser, which is the third instrument from the left end of panel, looking at the panel from the rear, and to the open connection of the grid leak and the grid condenser.

The rotor connection of the primary condenser, the first instrument on the right of the main panel looking at it from the rear, is carried to the antenna binding post or tip jack. The stator, as well as the rotor of the primary condenser, goes into the series parallel switch.

One connection from the variometer goes to the plate connection on the detector tube and the other to the "P" post on the first transformer. That completes the wiring.

Up to this time the panels were not in position and the wiring had to be left open until the panels are mounted. The panels can be mounted and all open ends connected up. The set is ready to place in the cabinet and for the battery connections. It should "percolate" right off the bat. If you have done your work carefully and correctly it will.

The cabinet is 11x20 inches and 10 inches deep. I doubt if you can find one of this size on the market. Any cabinet maker can make you one if you are not handy with the tools.

For those who prefer to buy a standard cabinet I will publish next week panel layouts for an "Old Reliable" 8x30 and 7 inches deep. It is the set illustrated last week. Also a photograph of the "Old Reliable" which was described here today is to be printed next week.

How to Eliminate Body Capacity in Receiver Set

Body capacity may be easily avoided by one of two methods of shielding. One method would be to place a copper sheet on the back of the panel, between the panel and the instruments. The sheet should be grounded.

The better way, would be to place the part (the shafts) of the condensers and variable tuning instruments which face the front of the panel or project thru the panel into the knob at ground potential, or at ground potential as far as the radio-frequency currents are concerned.

How to Make Hoops for Permanent Cage Aerial

In making the hoops for supporting the wires of a cage antenna it will be found that No. 00 hard-drawn copper wire will be suitable. Bend a piece of this wire into the proper-sized circle and solder the two ends together (flush) with hard solder. Then you can mark off the proper spacings for the wires by notching with a file. The antenna wires should be wrapped around each hoop with a single turn and soldered firmly in place with the same hard solder. If this is done the cage will be absolutely permanent.

Grease Battery Posts

Keep the terminals of the storage battery coated with a thin coat of vaseline and always be sure that no green, gray or yellow substance is allowed to collect on them. This will corrode the clips or the copper wire which connects the battery with the set and may often cause noises in the set.

Exploding Rectifiers

If you have a rectifier for your storage "B" battery be careful when you pull out the aluminium rod for examination. When you replace it you likely are to cause a spark. If this occurs an explosion will follow and your battery will be wrecked.

Check Up on Your Core

If you build a transformer from data that is reliable, and it heats up, or draws too much on no load, check up first on your core material. Soft iron, commonly called stove-pipe iron, must be worked at much lower flux density than silicon steel.

THE LOWLY CRYSTAL.

Supers, heterodynes and umptyteen tube sets may bring in 2,000 miles, but don't be too cocky when discussing crystals." In the "good old days" similar ranges were possible, even with spark transmitters and crystal receivers.

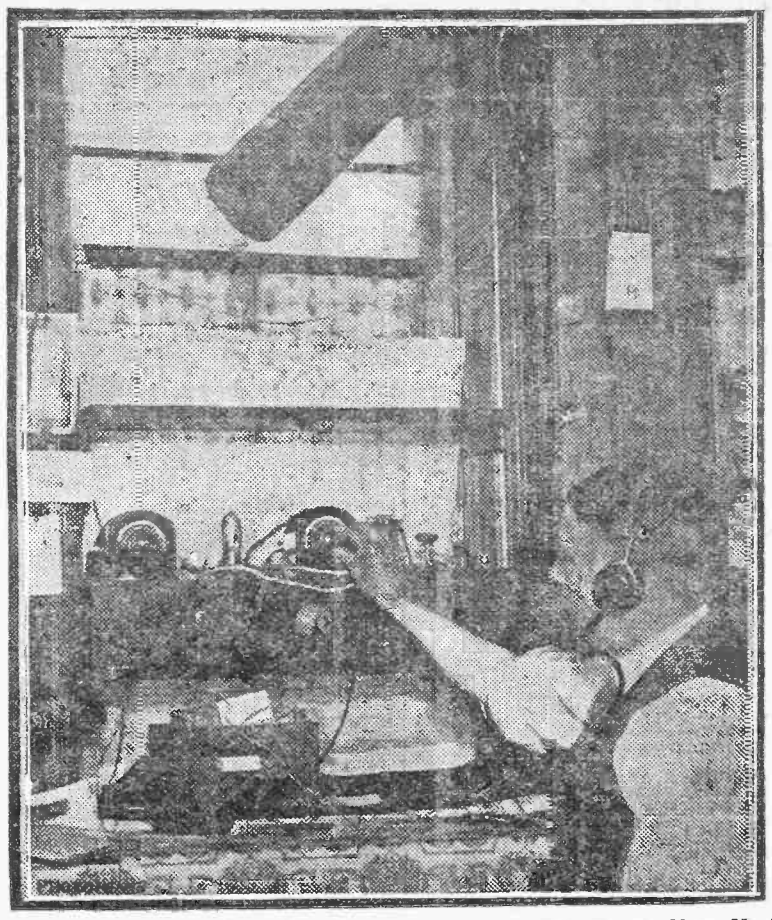


Photo shows Edward Kelly of 228 East 36th street, New York city, who has solved the tenement radio problem by doing away with an aerial. By simply putting a bunch of wires in a cardboard box and sticking it on a shelf, under the bed or any other part of the house, Mr. Kelly says he has succeeded in bringing in a large number of DX stations as loud as the local ones. Photo shows him listening in on his radio set, which is a single circuit outfit with dry cells. The long round box at the top, the bottom of which shows near the window, is his substitute for an aerial.

Reflex Expert Tells How to Locate Troubles in Circuit

By WILLIAM J. SCHNELL.

(Radio Engineering Staff, Electrical Research Laboratories.

WHILE reflex circuits are easy to construct and even easier to operate, some fans always have trouble with most any kind of a set. For this reason the laboratories have worked out some "trouble-shooting" rules for those who have difficulties with reflex sets:

When satisfactory results are not obtained with Erla Duo-Reflex circuits the difficulty arises, ninety-nine times of a hundred, from neglect properly to hook up the apparatus, or from loose and faulty connections. Tubes, of course, are not all perfect, and batteries sometimes fail to deliver their rated voltage. With continued service, periodic replacement of tubes as well as recharging or replacement of batteries becomes necessary.

In the event of trouble, therefore, first check all the wiring and connections, and make sure that both tubes and batteries are in good condition.

Trouble-Shooting Rules.

As an aid in diagnosing trouble, enabling the application of prompt corrective measures at its source, the following suggestions have been prepared:

FAILURE OF TUBE TO LIGHT—This may be due to one of the following five reasons:

1. Tube is burned out. Test by connecting the two filament terminals of the tube socket to the terminals of the "A" battery by means of insulated wires, taking care that the base ends of the wires themselves do not come together.

2. Tube is not making contact with socket springs. Bend up socket springs until firm, positive connection is made.

3. Rheostat is defective. Test by connecting the rheostat terminals together with a short piece of wire. If this causes the tube to light, the rheostat is defective and should be replaced.

4. "A" battery is not connected. Test by connecting a voltmeter to the "A" battery binding posts of the apparatus. If the dial of the voltmeter fails to move, look for a break in the connecting wires, for a faulty connection, or for a defect in the battery itself.

5. Presence of an opening in the filament circuit wiring. Check all wiring for open or loose connections.

Antenna Circuit Fails.

ANTENNA CIRCUIT DOES NOT TUNE—This may be due to one of the following three causes:

1. If turning the coarse tap switch of the variocoupler does not effect the tuning, the trouble is due to one of the following: (a) The primary winding of the variocoupler is open. (b) The aerial or ground connections are not properly made. (c) There is an open connection in the aerial or ground circuits.

2. If revolving the rotor of the variocoupler does not affect the signal, there is an open connection in the primary circuit, either in the variocoupler, the aerial, or the ground.

3. If placing the finger or a short length of wire on the binding posts of either the aerial or the ground improves the signal strength, there is an open connection either in the ground or aerial or else the antenna is not long enough.

Open Condenser Circuits.

SECONDARY CONDENSER DOES NOT TUNE—This may be due to one of the three following reasons:

1. Rotor of the variocoupler is open.

2. An imperfect connection exists between the variocoupler and condenser or between the grid and grid-return filament leads.

3. The condenser is open or short-circuited.

RADIO-FREQUENCY CONDENSER DOES NOT TUNE—This may be due to one of the following two reasons:

Either the connections to the condenser or radio-frequency reflex transformer are imperfect, or the condenser itself is open or short-circuited.

THIRD TUBE DOES NOT INCREASE SIGNAL STRENGTH—This may be due to one of the following reasons:

Test by plugging the phones into the first and second jacks alternately, with the tubes lit. If a click is heard in both instances, the trouble is due to the following: (a) Contacts of first jack are defective. (b) Audio-transformer is defective. (c) Grid contact on last tube socket is imperfect. If no click is heard: (a) Plate contact of tube is faulty. (b) Second jack does not make contact or is short circuited. (c) "B" battery connection is not properly made.

If changing the third tube to the second socket and transferring the plug to the first jack gives no signal, it is evident that the tube is defective.

"B" Battery Shorts.

CLICK IN PHONES WITH TUBES NOT BURNING—This may be due to one of the following reasons:

With the tubes turned out, no click should be heard when the phones are plugged in on any circuit. Should a click be audible upon plugging into the one or two tube receivers or the first jack of the three-tube receiver, the "B" battery is short-circuited directly across the phones, as the result either of a faulty .002 by-pass condenser or improper wiring.

If a click is heard when plugging into the second jack of the three-tube receiver, there is a mistake in wiring.

NOISES IN THE PHONES—This may be due to one of the following causes:

If crackling sounds in the phones are affected by tuning, and disappear upon disconnecting the aerial and ground, they are caused by atmospheric electrical disturbance. If they persist after disconnecting the aerial and ground, they are due to the following: (a) Leakage in apparatus resulting from imperfect contacts or defective insulation, (b) defective "A" or "B" batteries.

With the tubes not burning, if a crackling sound is heard when the phones are plugged into any jack, the trouble is caused by a short-circuited or leaky .002 by-pass conductor. Remedy by replacing.

Howl Tests Transformers.

AUDIO-TRANSFORMER DOES NOT "REFLEX"—This may be due to one of several causes:

Disconnect the aerial and ground, and test by opening the circuit of the crystal rectifier. when a howl should be heard in the phones, disappearing when the circuit is again closed. If no howl is heard, try reversing the connection of the primary of the audio-transformer that is connected with the rectifier. If this does not produce a howl, the transformer does not "reflex" and should be replaced with a new audio-transformer.

CARRIER WAVE WHISTLE—This results from oscillating tubes. If not eliminated by increasing the coupling, there is either an intercoupling between apparatus that can be remedied by rearranging the various parts, or else the crystal rectifier is not functioning properly. If a rectifier other than the Erla fixed crystal rectifier is used, try readjusting the catwhisker. If this fails, replace with an Erla rectifier.

Where Distortion Is Born.

DISTORTED SIGNALS—This may be due to one of the following reasons:

1. The set is improperly tuned. Correct thru closer coupling, i. e., reducing the angle between the rotor and stator of the variocoupler.

2. Crystal rectifier is defective, usually as a result of loose or grainy structure of crystal employed. Replace with Erla crystal rectifier.

3. Transformers do not synchronize, received and reflexed currents having the same phase characteristics. Replace with Erla synchronizing radio and audio transformers.

After the receiving apparatus has been assembled and carefully checked for proper wiring and arrangement, it should be hooked to the aerial and ground system, in accordance with the "A" and "G" markings on the diagrams that accompany the instrument. Next the batteries can be assembled and connected.

First, the "B" battery, consisting of small, high voltage units, is connected together in series so as to obtain the sum of the voltages of its component units. This is accomplished by connecting the highest voltage positive (plus) tap of one battery to the negative (minus) tap of the next, and continuing this process until all the batteries are thus joined together.

When finished, a positive tap will be left open at one end of the group and a negative tap at the other. These taps are then connected to the two "B" battery terminals of the set, in accordance with the positive "B" (plus) and negative "B" (minus) markings.

How to Operate Batteries.

Next, the "A" or filament lighting battery is made ready. If dry cells are used, they should be wired in series by connecting the outer (zinc or negative) terminal of one to the center (carbon or positive) terminal of the next, continuing this process until all the cells have been linked together, leaving a positive terminal at one end of the chain and a negative terminal at the other.

If the battery is of storage type, the individual cells will be found already strapped together, with the two end terminals marked positive (plus) and negative (minus).

After the "A" battery has been carefully checked, to guard against mistakes in wiring or loose connections, the positive and negative terminals should be attached to the corresponding plus and minus terminals on the set.

Since it is extremely important that the negative and positive connections of both batteries be correct, every precaution in making these connections should be observed.

Testing Out Circuit.

After the batteries are hooked up, insert the tubes into their sockets, with the rheostats turned off, making sure that the socket springs press firmly against the tub contact points.

Now plug in the headphones thru the jack provided, and give the rheostat controls slightly more than half a turn. A slight crackling sound (static) in the phones should accompany this movement. Continue to advance the rheostat controls until further movement causes no increase in the crackling sound.

Up to this point, instructions for setting up and operating Erla Duo-Reflex circuits apply equally to all types. When it comes to tuning, however, individual methods must be pursued, because of the different characteristics of the various circuits involved. Consequently, separate tuning directions are provided for each.

Hint on Tuning

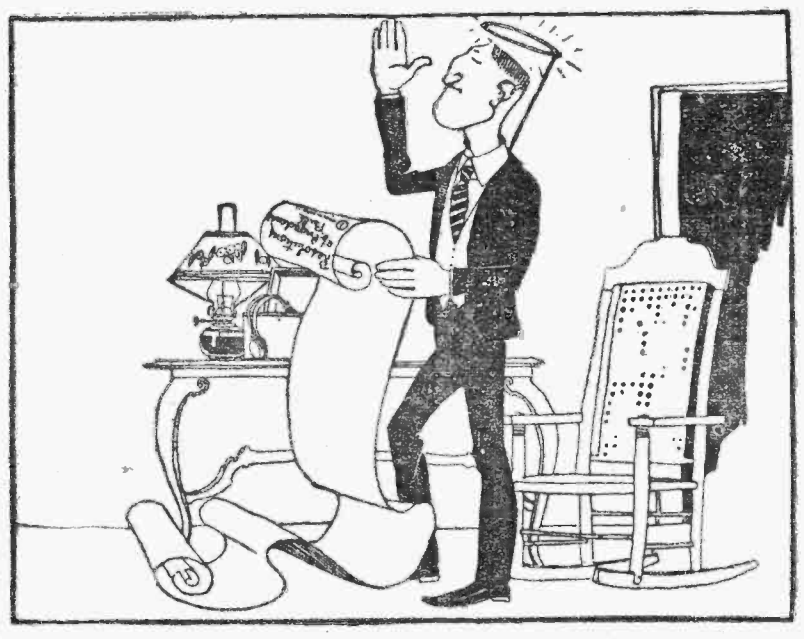
In tuning a receiver don't overlook the fact that you are dealing with a delicately adjusted instrument. Some phans twirl a dial viciously. They skip a dozen stations in so doing. Proceed carefully, deliberately, and you will build up a DX record.

FUSES SAVE TUBES.

Fuses placed in the filament battery circuit protect your tubes. They cost a few cents. Tubes cost dollars. Better blow a fuse than a tube.

Broadcast Bill's Radiolays

By WILLIAM E. DOUGLASS



I'VE thought the matter over an' I've come to the conclusion that a New Year's day ain't perfect 'less you make a resolution. So to make it even better, I will take my pen in hand an' I'll make a half a dozen then you'll know right where I stand. Here's number one: Resolved, that I won't smoke er chew this year. I reckon I'll chew spearmint till the cravings disappear, but shucks, I swore off smokin' once way back in 1910. I didn't smoke for months an' months an' didn't mind it then. Fer number two: Resolved, that I won't gamble any more; I've lost a lot of money playin' checkers at the store. When Si an' Chuck an' Jim an' me play poker I'm the goat. My IOU's are all paid up. That's one good thing you'll note. I guess I'll cut out scoldin' an' I'll call that number three—no arguments this year at all between my wife an' me. That there's a dern big order but I s'pose at any rate, like in the league of nations, we'll discuss an' arbitrate. Well, now, let's see for number four: Hereby let it be known that for the year ensuing I'll let politics alone. Last year I run fer mayor but I didn't have a show an' now they're talkin' congress, but it's absolutely "No." I've heard it said that "worry kills," an' so fer number five I'll make the resolution that I won't, an' stay alive. It makes young men grow old too soon an' lines their brows with care an' causes silver threads to streak what once wuz auburn hair. For number six: Be it resolved, this here's my one best bet, no matter what may be my lot, I'll keep my wireless set. Tho trials an' tribulations co rregate about my door an' tho my creditors may take the carpet from my floor, there'll be no chance to separate my wireless set from me, fer safely by my side it stays thru all eternity.

Alphabetical List of U. S. Radio Stations

ABERDEEN, Wash.—KNT.
ABILENE, Texas—WQAQ.
AGRICULTURAL COLLEGE, N. D.—WPAK.
AKRON, Ohio—WOE.
ALBANY, N. Y.—WNJ.
ALEXANDRIA, La.—KFFY.
ALLENTOWN, Pa.—WCBA.
ALLENTOWN, Pa.—WSAN.
ALTADENA, Cal.—KGO.
AMARILLO, Texas—WDG.
AMARILLO, Texas—WQAC.
AMARILLO, Texas—WBAU.
AMES, Iowa—WOI.
AMSTERDAM, N. Y.—WPAS.
ANDERSON, Ind.—WABC.
ANN ARBOR, Mich.—WQAJ.
ANTHONY, Kas.—WBL.
ARDMORE, Okla.—WOAA.
ARLINGTON, Ore.—KFGL.
ASHEVILLE, N. C.—WFAJ.
ATLANTA, Ga.—WGM.
ATLANTA, Ga.—WSB.
ATLANTIC CITY, N. J.—WHAR.
ATWOOD, Kas.—WEAD.
AUBURN, Ala.—WMAV.
AUSTIN, Texas—WCM.
AUSTIN, Texas—WNAS.

BAKER, Ore.—KFDA.
BAKERSFIELD, Cal.—KDZB.
BALTIMORE, Md.—WCAO.
BALTIMORE, Md.—WEAR.
BALTIMORE, Md.—WKC.
BALTIMORE, Md.—WNAY.
BANGOR, Me.—WABI.
BANGOR, Me.—WPAY.
BATON ROUGE, La.—KFGC.
BAUDETTE, Minn.—KFGY.
BAY CITY, Mich.—WTP.
BEAUMONT, Texas—WMAM.
BELLINGHAM, Wash.—KDZR.
BELLOWS FALLS, Vt.—WLAK.
BELOIT, Kas.—WPAR.
BELOIT, Wis.—WKAW.
BELVIDERE, Ill.—WOAG.
BERKELEY, Cal.—KQI.
BERKELEY, Cal.—KRE.
BERRIEN SPRINGS, Mich.—KFGZ.
BILLINGS, Mont.—KFCH.
BINGHAMTON, N. Y.—WIAV.
BIRMINGHAM, Ala.—WSY.
BOISE, Idaho—KFAU.
BOISE, Idaho—KFDD.
BOISE, Idaho—WFFB.
BOONE, Iowa—KFGQ.
BOSTON, Mass.—WNAC.
BOULDER, Colo.—KFAJ.
BOWLING GREEN, Ky.—WNAB.
BOZEMAN, Mont.—KFDO.
BRIDGEPORT, Conn.—WKAX.
BROOKINGS. S. D.—KFDY.
BROOKVILLE, Ind.—WSAL.
BUFFALO, N. Y.—WGR.
BURLINGTON, Iowa— WIAS.
BURLINGTON, Iowa—WLAT.
BURLINGTON, Vt.—WCAX.
BUTLER, Mo.—WNAR.
BUTTE, Mont.—KFAP.

CAMDEN, N. J.—WBP.
CAMERON, Mo.—WFAQ.
CANTON, N. Y.—WCAD.
CANTON, Ohio—WWB.
CAPE GIRARDEAU, Mo.—WSAB.
CARTHAGE, Ill.—WCAZ.
CASPER, Wyo.—KFDF.
CAZENOVIA, N. Y.—WMAC.
CEDAR RAPIDS, Iowa—WJAM.
CEDAR RAPIDS, Iowa—WKAA.
CENTERVILLE, Iowa—WDAX.
CHARLESTON, S. C.—WNAQ.
CHARLESTON, S. C.—WOAH.
CHARLESTON, W. Va.—WPAZ.
CHARLOTTE, N. C.—WBT.
CHENEY, Kas.—KFGP.
CHICAGO, Ill.—KYW.
CHICAGO, Ill.—WAAF.
CHICAGO, Ill.—WBU.
CHICAGO, Ill.—WDAP.
CHICAGO, Ill.—WJAZ.
CHICAGO, Ill.—WLAG.
CHICAGO, Ill.—WMAQ.
CHICAGO, Ill.—WPAD.
CHICAGO, Ill.—WSAH.
CHICKASHA, Okla.—KFGD.

CINCINNATI, Ohio—WAAD.
CINCINNATI, Ohio—WHAG.
CINCINNATI, Ohio—WIZ.
CINCINNATI, Ohio—WLW.
CINCINNATI, Ohio—WMH.
CINCINNATI, Ohio—WSAI.
CLARKSBURG, W. Va.—WHAK.
CLEARFIELD, Pa.—WPI.
CLEMSON COLLEGE. S. C.—WSAC.
CLEVELAND, Ohio—KDPM.
CLEVELAND, Ohio—WHK.
CLEVELAND, Ohio—WJAX.
COLLEGE PARK, Ga.—WDAJ.
COLLEGE STATION, Texas—WTAW.
COLORADO SPRINGS, Colo.—KFCK.
COLORADO SPRINGS, Colo.—KFFQ.
COLUMBIA, Mo.—WAAN.
COLUMBUS, Ohio—WBAV.
COLUMBUS, Ohio—WCAH.
COLUMBUS, Ohio—WEAO.
COLUMBUS, Ohio—WMAN.
COLUMBUS, Ohio—WPAL.
CORVALLIS, Ore.—KFDJ.
COUNCIL BLUFFS, Iowa—WPAF.
CRANSTON, R. I.—WKAP.

DALLAS, Texas (portable)—KFFZ.
DALLAS, Texas—WDAO.
DALLAS, Texas—WFAA.
DALLAS, Texas—WRR.
DARTMOUTH, Mass.—WMAF.
DARTMOUTH, Mass.—WSAQ.
DAVENPORT, Iowa—WHAI.
DAVENPORT, Iowa—WOC.
DAVID CITY, Neb.—WKAR.
DAYTON, Ohio—WABD.
DAYTON, Ohio—WJAJ.
DEARBORN, Mich.—WWI.
DECATUR, Ill.—WBAO.
DECATUR, Ill.—WHAP.
DENVER, Colo.—KDZQ.
DENVER, Colo.—KFAF.
DENVER, Colo.—KFDL.
DENVER, Colo.—KFEL.
DENVER, Colo.—KFEP.
DENVER, Colo.—KFIC.
DENVER, Colo.—KFLE.
DENVER, Colo.—KLZ.
DES MOINES, Iowa—KFDE.
DES MOINES, Iowa—WGF.
DETROIT, Mich.—WCX.
DETROIT, Mich.—WWJ.
DETROIT, Mich.—KOP.
DOUGLAS, Wyo.—KFEV.
DUBUQUE, Iowa.—WQAK.
DULUTH, Minn.—WJAP.
DULUTH, Minn.—WMAT.

EAST LANSING, Mich.—WKAR.
EASTON, Pa.—WMAP.
EAST PITTSBURG, Pa.—KDKA.
EAST PROVIDENCE, R. I.—WKAD.
EDGEWOOD, R. I.—WEAG.
ELGIN, Ill. (Near)—WTAS.
EL MONTE, Cal.—KUY.
EL PASO, Texas—WDAH.
EL PASO, Texas—WPAT.
EMPORIA, Kan.—WAAZ.
ERIE, Pa.—WOAV.
EUGENE, Ore.—KFAT.
EVANSVILLE, Ind.—WNAM.
EVERETT, Wash.—KFBL.

FAIRBANKS, Alaska—WLAY.
FALL RIVER, Mass.—WSAR.
FALL RIVER, Mass.—WTAB.
FARGO, N. D.—WDAY.
FAYETTEVILLE, Ark.—KFDV.
FLINT, Mich.—WEAA.
FORT DODGE, Iowa—KFKR.
FORT DODGE, Iowa—WEAB.
FORT MONROE, Va.—WNAW.
FORT SMITH, Ark.—WGAR.
FORT WORTH, Texas—WBAP.
FRANKFORT, Ky.—WOAK.
FREMONT, Neb.—WOAE.
FRESNO, Cal.—KMJ.
FROSTBURG, Md.—WPAQ.

GAINESVILLE, Ga.—WKAY.
GALVESTON, Texas—WHAB.
GALVESTON, Texas—WIAC.
GLADBROOK, Iowa—KFIK.
GLOUCESTER CITY, N. J.—WRAX.
GRAND FORKS, N. D.—WOAB.
GRAND ISLAND, Neb.—KFJA.

GRANVILLE, Ohio—WJD.
GREAT FALLS, Mont.—KDYS.
GREELEY, Colo.—KFJD.
GREELEY, Colo.—KFKA.
GREENCASTLE, Ind.—WLAX.
GREENSBORO, N. C.—WQAZ.
GREENVILLE, Ohio—WCBB.
GREENVILLE, S. C.—WQAV.
GRIDLEY, Cal.—KFU.
GROVE CITY. Pa.—WSAJ.
GUNNISON, Colo.—KFHA.

HAMILTON, Ohio—WBAU.
HAMILTON, Ohio—WRK.
HARRISBURG, Pa.—WABB.
HARTFORD, Conn.—WDAK.
HASTINGS, Neb.—WQAY.
HAVRE, Mont.—KFBB.
HILLSBORO, Ore.—KFFO.
HOLLYWOOD, Cal.—KFAR.
HONOLULU, Hawaii—KDYX.
HONOLULU, Hawaii—KGU.
HONOLULU, Hawaii—KYQ.
HOOD RIVER, Ore.—KFHB.
HOOD RIVER, Ore.—KQP.
HOULTON, Maine—WLAN.
HOUSTON, Texas—KFCV.
HOUSTON, Texas—WCAK.
HOUSTON, Texas—WEAY.
HOUSTON, Texas—WEV.
HOUSTON, Texas—WRAA.
HUNTINGTON, Ind.—WHAY.
HUTCHINSON, Kan.—KFHX.
HUTCHINSON, Minn.—WFAN.

INDEPENDENCE, Mo.—KFIX.
IOLA, Kan.—KFID.
IOWA CITY, Iowa—WHAA.
ITHACA, N. Y.—WEAI.

JACKSONVILLE, Fla.—WABG.
JACKSONVILLE, Fla.—WDAL.
JEFFERSON CITY, Mo.—WOS.
JOHNSTOWN, Pa.—WTAC.
JOPLIN, Mo.—WHAH.
JUNEAU, Alaska—KFIU.

KALAMAZOO, Mich.—WLAQ.
KALAMAZOO, Mich.—WOAP.
KANSAS CITY, Mo.—WDAF.
KANSAS CITY, Mo.—WMAJ.
KANSAS CITY, Mo.—WHB.
KANSAS CITY, Mo.—WOQ.
KEARNEY, Neb.—KFHP.
KELLOGG, Idaaho—KFEY.
KENOSHA, Wis.—WOAR.
KNOXVILLE, Tenn.—WNAV.

LACEY, Wash.—KGY.
LACONIA, N. H.—WKAV.
LA CROSSE, Wis.—WABN.
LAKE FOREST, Ill.—WABA.
LAKESIDE, Colo.—KFKH.
LAMONI, Iowa—KFFV.
LANCASTER, Pa.—WDBC.
LANCASTER, Pa.—WGAL.
LANSING, Mich.—WHAL.
LAPORTE, Ind.—WRAF.
LARAMIE, Wyo.—KFBU.
LAREDO, Texas—WWAX.
LAWRENCEBURG, Tenn.—WOAN.
LE MARS, Iowa—KFCY.
LE MARS, Iowa—WIAU.
LEXINGTON, Ky.—WQAH.
LIHUE, Hawaii—KFHS.
LIMA, Ohio—WOAC.
LINCOLN, Neb.—KFDU.
LINCOLN, Neb.—WFAV.
LINCOLN, Neb.—WJAB.
LINCOLN, Neb.—WKAC.
LINCOLN, Neb.—WMAH.
LINDSBORG, Kan.—WDAD.
LITTLE ROCK, Ark.—WCAV.
LOCKPORT, N. Y.—WMAK.
LONG BEACH, Cal.—KSS.
LOS ANGELES, Cal.—KDZF.
LOS ANGELES, Cal.—KFI.
LOS ANGELES, Cal.—KHJ.
LOS ANGELES, Cal.—KJS.
LOS ANGELES, Cal.—KNR.
LOS ANGELES, Cal.—KNV.
LOS ANGELES, Cal.—KNX.
LOS ANGELES, Cal.—KUS.
LOS ANGELES, Cal.—KWH.
LOS GATOS, Cal.—KFRQ.
LOUISBURG, Kan.—KFIL.
LOUISVILLE, Ky.—WHAS.

LOUISVILLE, Kan.—WLAP.
LOWELL, Mass.—WQAS.

MACON, Ga.—WMAZ.
MADISON, Wis.—WGAY.
MADISON, Wis.—WHA.
MANHATTAN, Kan.—WTG.
MARIETTA, Ohio—WBAW.
MARIETTA, Ohio—WSAA.
MARION, Ind.—WIAQ.
MARION, Kan.—WRAD.
MARSHALL, Mo.—WJAT.
MARSHALLOWN, Iowa—KFJB.
MATTOON, Ill.—WQAL.
MAYVILLE, N. D.—KFHU.
McKEESPORT, Pa.—WIK.
McLEANSBORO, Ill.—WRAS.
MEDFORD, Ore.—KFAY.
MEDFORD HILLSIDE, Mass.—WGI.
MEMPHIS, Tenn.—WMC.
MIAMI, Fla.—WQAM.
MIDDLEPORT, Ohio—WSAK.
MIDDLETOWN, Conn.—WOAS.
MILWAUKEE, Wis.—WAAK.
MILWAUKEE, Wis.—WCAY.
MILWAUKEE, Wis.—WHAD.
MILWAUKEE, Wis.—WIAO.
MINNEAPOLIS, Minn.—KFDZ.
MINNEAPOLIS, Minn.—KFEX.
MINNEAPOLIS, Minn.—WBAD.
MINNEAPOLIS, Minn.—WBAH.
MINNEAPOLIS, Minn.—WCAS.
MINNEAPOLIS, Minn.—WCE.
MINNEAPOLIS, Minn.—WLAG.
MINNEAPOLIS, Minn.—WLB.
MISHAWAKA, Ind.—WOAO.
MOBERLY, Mo.—KFFP.
MOBILE, Ala.—WEAP.
MODESTO, Cal.—KXD.
MONTEREY, Cal.—KLN.
MONTGOMERY, Ala.—WKAN.
MOORESTOWN, N. J.—WBAF.
MOOREHEAD, Minn.—WPAU.
MORGANTOWN, W. Va.—WHD.
MOSCOW, Idaho—KFAN.
MOUNT VERNON, Ill.—WABF.
MUNCIE, Ind.—WJAF.

NEAH BAY, Wash.—KFHH.
NEENAH, Wis.—WIAJ.
NEWARK, N. J.—WAAM.
NEWARK, N. J.—WBS.
NEWARK, N. J.—WOR.
NEWARK, N. J.—WRAZ.
NEWARK, Ohio—WBBA.
NEW BEDFORD, Mass.—WDAU.
NEW HAVEN, Conn.—WPAJ.
NEW LEBANON, Ohio—WPG.
NEW ORLEANS, La.—WAAB.
NEW ORLEANS, La.—WAAC.
NEW ORLEANS, La.—WCAG.
NEW ORLEANS, La.—WGV.
NEW ORLEANS, La.—WIAF.
NEW ORLEANS, La.—WWL.
NEWTON, Iowa—WIAH.
NEW YORK, N. Y.—WBAY.
NEW YORK, N. Y.—WEAF.
NEW YORK, N. Y.—WJX.
NEW YORK, N. Y.—WJY.
NEW YORK, N. Y.—WJZ.
NEW YORK, N. Y.—WLAW.
NEW YORK, N. Y.—WQAO.
NEW YORK, N. Y.—WSAP.
NEW YORK, N. Y.—WWZ.
NORFOLK, Neb.—WJAG.
NORMAN, Okla.—WNAD.
NORTHFIELD, Minn.—WCAL.
NORTH PLAINFIELD, N. J.—WEAM.

OAK, Neb.—KFEQ.
OAKLAND, Cal.—KLS.
OAKLAND, Cal.—KLX.
OAKLAND, Cal.—KZM.
OCEAN CITY, N. J.—WIAD.
OGDEN, Utah—KFCP.
OKLAHOMA CITY, Okla.—WMAK.
OKLAHOMA CITY, Okla.—WKY.
OKMULGEE, Okla.—WPAC.
OMAHA, Neb.—KFCZ.
OMAHA, Neb.—KFFX.
OMAHA, Neb.—WAAW.
OMAHA, Neb.—WIAK.
OMAHA, Neb.—WNAL.
OMAHA, Neb.—WOAW.
ORANGE, Texas—KFGX.
OSKALOOSA, Iowa—KFHL.

PADUCAH, Ky.—WIAR.
PARKESBURG, Pa.—WQAA.
PARSONS, Kan.—WOAJ.
PATERSON, N. J.—WBAN.
PENDLETON, Ore.—KFFE.
PENSACOLA, Fla.—WGAN.
PENSACOLA, Fla.—WLAV.
PEORIA, Ill.—WJAN.
PEORIA, Ill.—WQAX.
PHILADELPHIA, Pa.—WCAU.
PHILADELPHIA, Pa.—WDAR.
PHILADELPHIA, Pa.—WFI.
PHILADELPHIA, Pa.—WGL.
PHILADELPHIA, Pa.—WIP.
PHILADELPHIA, Pa.—WNAT.
PHILADELPHIA, Pa.—WOO.
PHILADELPHIA, Pa.—WWAD.
PHOENIX, Ariz.—KDYW.
PHOENIX, Ariz.—KFAD.
PINE BLUFF, Ark.—WOK.
PITTSBURG, Kan.—KFIV.
PITTSBURG, Pa.—KQV.
PITTSBURG, Pa.—WCAE.
PITTSBURG, Pa.—WJAS.
PLAINVIEW, Texas—WSAT.
PLATTE, S. D.—KFIJ.
PORT ARTHUR, Texas—WFAH.
PORTLAND, Ore.—KDYQ.
PORTLAND, Ore.—KFEC.
PORTLAND, Ore.—KFIF.
PORTLAND, Ore.—KGG.
PORTLAND, Ore.—KGN.
PORTLAND, Ore.—KGW.
PORTSMOUTH, Va.—WOAQ.
POUGHKEEPSIE, N. Y.—WFAF.
PROVIDENCE, R. I.—WEAN.
PROVIDENCE, R. I.—WJAR.
PROVIDENCE, R. I.—WRAH.
PROVIDENCE, R. I.—WSAD.
PROVIDENCE, R. I.—WTAG.
PULLMAN, Wash.—KFAE.

RALEIGH, N. C.—WLAC.
RAPID CITY, S. D.—WCAT.
READING, Pa.—WBBD.
READING, Pa.—WRAW.
REEDLEY, Cal.—KMC.
RENO, Nev.—KDZK.
RICHMOND, Cal.—KFCM.
RICHMOND, Va.—WQAT.
RIDGEWOOD, N. Y.—WHN.
ROCHESTER, N. Y.—WABO.
ROCHESTER, N. Y.—WHAM.
ROCKFORD, Ill.—WIAB.
ROCKPORT, Mo.—WMAD.
ROSWELL, N. M.—KNJ.

SACRAMENTO, Cal.—KFBK.
SAGINAW, Mich.—WABM.
SAGINAW, Mich.—WIAW.
S. CLOUD, Minn.—WFAM.
ST. CROIX FALLS, Wis.—WRAL.
ST. JOSEPH, Mo.—KFHD.
ST. JOSEPH, Mo.—WEAK.
ST. LOUIS, Mo.—KFEZ.
ST. LOUIS, Mo.—KFGJ.
ST. LOUIS, Mo.—KFIB.
ST. LOUIS, Mo.—KSD.
ST. LOUIS, Mo.—WCK.
ST. LOUIS, Mo.—WEB.
ST. LOUIS, Mo.—WEW.
ST. LOUIS, Mo.—WMAY.
ST. LOUIS, Mo.—WRAO.
ST. PAUL, Minn.—WAAH.
ST. PETERSBURG, Fla.—WSAG.
SALEM, Ore.—KFCD.
SALT LAKE CITY, Utah—KDYL.
SALT LAKE CITY, Utah—KZN.
SAN ANTONIO, Cal.—KFCL.
SAN ANTONIO, Texas—WCAR.
SAN ANTONIO, Texas—WOAI.
SAN DIEGO, Cal.—KDPT.
SAN DIEGO, Cal.—KDYM.
SAN DIEGO, Cal.—KFBC.
SAN DIEGO, Cal.—KFFA.
SANDUSKY, Ohio—WABH.
SANDUSKY, Ohio—WQAF.
SAN FRANCISCO, Cal.—KFDB.
SAN FRANCISCO, Cal.—KPO.
SAN FRANCISCO, Cal.—KUO.
SAN JOSE, Cal.—KFAQ.
SAN JOSE, Cal.—KQW.
SAN JOSE, Cal.—KSC.
SAN JUAN, P. R.—WKAQ.
SAN LUIS OBISPO, Cal.—KFBK.
SANTA ANA, Cal.—KFAW.
SANTA BARBARA, Cal.—KFHJ.

Broadcasting Stations and Schedule of Programs

Continued from Page 2.

company, 380 meters.

WHA—Madison, Wis., University of Wisconsin, 360 meters.
WHAA—Iowa City, Iowa, State University of Iowa, 283 meters.
WHAB—Galveston, Texas, Clark W. Thompson, 360 meters.
WHAC—Waterloo, Iowa, Cole Brothers Electric company, 360 meters.
WHAD—Milwaukee, Wis., Marquette university, 280 meters.
WHAG—Cincinnati, Ohio, University of Cincinnati, 222 meters.
WHAH—Joplin, Mo., Hafer Supply company, 360 meters.
WHAI—Davenport, Iowa, Radio Equipment and Manufacturing company, 360 meters.
WHAK—Clarksburg W. Va., Roberts Hardware company, 360 meters.
WHAL—Lansing, Mich., Lansing Capital News, 248 meters.
WHAM—Rochester, N. Y., University of Rochester (Eastman School of Music), 360 meters.
WHAP—Decatur, Ill., Otta & Kuhn, 360 meters.
WHAQ—Washington, D. C., Semmes Motor company, 360 meters.
WHAR—Atlantic City, N. J., Paramount Radio and Electric company (W. H. A. Paulus), 231 meters.
WHAS—Louisville, Ky., Courier-Journal and Louisville Times, 400 meters.
WHAV—Wilmington, Dela., Wilmington Electrical Special company, 360 meters.
WHAZ—Troy, N. Y., Rensselaer Polytechnic Institute, 380 meters.
WHB—Kansas City, Mo., Sweeney School company, 411 meters.
WHD—Morgantown, W. Va., West Virginia University, 360 meters.
WHK—Cleveland, Ohio, Radiovox company (Warren R. Cox), 360 meters.
WHN—Ridgewood, N. Y., George Schubel, 360 meters.
WIAB—Rockford, Ill., Joslyn Automobile company, 252 meters.
WIAC—Galveston, Texas, Galveston Tribune, 360 meters.
WIAD—Ocean City, N. J., Ocean City Yacht club (Howard R. Miller), 254 meters.
WIAF—New Orleans, La., 139 North Alexander street, Gustav A. DeCortin, 234 meters.
WIAH—Newton, Iowa, Continental Radio and Manufacturing company, 258 meters.
WIAI—Springfield, Mo., Heer Stores company, 360 meters.
WIAJ—Neenah, Wis., Fox River Valley Radio Supply company (Quinn Brothers), 224 meters.
WIAK—Omaha, Neb., Journal-Stockman company, 278 meters.
WIAO—Milwaukee, Wis., School of Engineering of Milwaukee, 360 meters.
WIAQ—Marion, Ind., Chronicle Publishing company, 226 meters.
WIAR—Paducah, Ky., Paducah Evening Sun, 360 meters.
WIAS—Burlington, Iowa, Home Electric company, 360 meters.
WIAT—Tarkio, Mo., Leon T. Noel, 360 meters.
WIAU—Le Mars, Iowa, American Trust and Savings bank, 360 meters.
WIK—McKeesport, Pa., K. & L. Electric company (Herbert F. Kelso and Hunter J. Lohman), 360 meters.
WIL—Washington, D. C., Continental Electric Supply company, 360 meters.
WIP—Philadelphia, Pa., Gimbel Brothers, 509 meters.
WJAB—Lincoln, Neb., American Electric company, 360 meters.
WJAD—Waco, Texas, Jackson's Radio Engineering laboratories, 360 meters.
WJAF—Muncie, Ind., Press Publishing company, 360 meters.
WJAG—Norfolk, Neb., Norfolk Daily News (Huse Publishing company), 360 meters.
WJAK—Greentown, Ind., Clifford L. White, 254 meters.
WJAM—Cedar Rapids, Iowa, 302 3d avenue, West, D. M. Perham, 268 meters.
WJAN—Peoria, Ill., Peoria Star, 280 meters.
WJAQ—Topeka, Kan, Capper Publications, 360 meters.
WJAR—Providence, R. I., The Outlet company (J. Samuels and Brother), 360 meters.
WJAS—Pittsburg, Pa., Pittsburg Radio Supply house, 360 meters.
WJAT—Marshall, Mo., Kelly-Vawter Jewelry company, 360 meters.
WJAX—Cleveland, Ohio, Union Trust company, 390 meters.
WJAZ—Chicago, Ill., Chicago Radio laboratory, 448 meters.
WJD—Granville, Ohio, Richahrd H. Howe, 229 meters.
WJH—Washington, D. C., White & Boyer company, 273 meters.
WJX—New York, N. Y., Deforest Radio Telephone and Telegraph company, 360 meters.
WJY—New York, N. Y., R. C. A. 405 meters.
WJZ—New 2York, N. Y., R. C. A., 455 meters.
WKAA—Cedar Rapids, Iowa, 1444 2d avenue, East, H. F. Paar, 268 meters.
WKAD—East Providence, R. I., Charles Loof (Cresent park), 240 meters.
WKAF—Wichita Falls, Texas, W. S. Radio Supply company, 360 meters.
WKAN—Montgomery, Ala., United Battery Service company, 226 meters.
WKAP—Cranston, R. I., Dutee W. Flint, 360 meters.
WKAQ—San Juan, P. R., Radio Corporation of Porto Rico, 360 meters.
WKAR—East Lansing, Mich., Michigan Agriculture college, 280 meters.
WKAS—Springfield, Mo., L. E. Lines Music company, 360 meters.
WKAV—Laconia, N. H., Laconia Radio club, 254 meters.
WKAW—Beloit, Wis., Turner Cycle company, 242 meters.
WKAX—Bridgeport, Conn., 1789 Park avenue, William A. MacFarlane, 231 meters.
WKAY—Gainesville, Ga., Brenau college, 280 meters.
WKC—Baltimore, Md., Joseph M. Zamoiski company, 360 meters.
WKY—Oklahoma, Okla., WKY Radio Shop, 360 meters.
WLAC—Raleigh, N. C., North Carolina State college, 360 meters.
WLAG—Minneapolis, Minn., Cutting and Washington Radio corporation, 417 meters.
WLAH—Syracuse, N. Y., 425 Brownell street, Samuel Woodworth, 234 meters.
WLAJ—Waco, Texas, Waco Electrical Supply company, 360 meters.
WLAK—Bellows Falls, Vt., Vermont Farm Machine corporation, 360 meters.
WLAL—Tulsa, Okla., Naylor Electric company, 360 meters.
WLAN—Houlton, Maine, Putnam Hardware company, 283 meters.
WLAP—Louisville, Ky., 306 West Breckenridge street, W. V. Jordon, 360 meters.
WLAQ—Kalamazoo, Mich., 108 Elm street, Arthur E. Schilling, 360 meters.
WLAT—Burlington, Iowa., Radio and Specialty company, 360 meters.
WLAV—Pensacola, Fla., Electric Shop, 254 meters.
WLAW—New York, N. Y., police department, City of New York, 360 meters.
WLAX—Greencastle, Ind., Putnam Electric company (Greencastle Community Broadcasting station), 231 meters.
WLB—Minneapolis, Minn., University of Minneosta, 360 meters.
WLW—Cincinnati, Ohio, Crosley Manufacturing company, 309 meters.
WMAB—Oklahoma, Okla., Radio Supply compnay, 360 meters.
WMAC—Cazenovia, N. Y., Fernwood street, J. Edw. Page (Olive B. Meredith), 261 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WMAH—Lincoln, Neb., General Supply company, 254 meters.
WMAJ—Kansas City, Mo., Drovers Telegram company, 275 meters.
WMAK—Lockport, N. Y., Norton Labbratories, 360 meters.
WMAL—Trenton, N. J., Trenton Hardware company, 256 meters.
WMAM—Beaumont, Texas, Beaumont Radio Equipment company, 360 meters.
WMAP—Easton, Pa., Utility Battery service, 246 meters.
WMAQ—Chicago, Ill., Chicago Daily News, 448 meters.
WMAV—Auburn, Ala., Alabama Polytechnic institute, 250 meters.
WMAY—St. Louis, Mo., Kingshighway Presbyterian church, 280 meters.
WMAZ—Macon, Ga., Mercer university, 268 meters.
WMC—Memphis, Tenn., "Commercial Appeal" (Commercial Publishing company), 500 meters.
WMH—Cincinnati, Ohio, Precision Equipment company, 248 meters.
WMU—Washington, D. C., Doubleday-Hill Electric company, 261 meters.
WNAC—Boston, Mass., Shepard stores, 278 meters.
WNAD—Norman, Okla, University of Oklahoma, 360 meters.
WNAL—Omaha, Neb., 5019 Capitol avenue, R. J. Rockwell, 242 meters.
WNAM—Evansville, Ind., Ideal Apparatus company, 360 meters.
WNAN—Syracuse, N. Y., Syracuse Radio Telephone company, 286 meters.
WNAP—Springfield, Ohio, Wittenberg college, 231 meters.
WNAQ—Charleston, S. C., Charleston Radio Electric company, 360 meters.
WNAR—Butler, Mo., C. C. Rhodes, 231 meters.
WNAS—Austin, Texas, Texas Radio Corporation and Austin Statesman, 360 meters.
WNAT—Philadelphia, Pa., Lemmig Brothers company (Frederick Lennig), 360 meters.
WNAV—Knoxville, Tenn., Peoples Telephone and Telegraph company, 236 meters.
WNAW—Fort Monroe, Va., Peninsular Radio club (Henry Kunzmann), 360 meters.
WNAX—Yankton, S. D., Dakota Radio Apparatus company, 244 meters.
WNJ—Albany, N. Y., Shotton Radio Manufacturing company, 360 meters.
WOAA—Ardmore, Okla., Dr. Walter Hardy, 360 meters.
WOAC—Lima, Ohio, Maus Radio company, 266 meters.
WOAD—Sigourney, Iowa, Friday Battery and Electric corporation, 360 meters.
WOAE—Fremont, Neb., Midland college, 360 meters.
WOAF—Tyler, Texas, Tyler Commercial college, 360 meters.
WOAG—Belvidere, Ill., Apollo theater (Belvidere Amusement company), 224 meters.
WOAH—Charleston, S. C., Palmetto Radio corporation, 360 meters.
WOAI—San Antonio, Texas, Southern Equipment company, 385 meters.
WOAJ—Parsons, Kan., Ervins Electrical company, 258 meters.
WOAK—Frankfort, Ky., Collins Hardware company, 240 meters.
WOAL—Webster Groves, Mo., 4 Jefferson road, William E. Woods, 229 meters.
WOAN—Lawrenceburg, Tenn., Vaughn Conservatory of Music (James D. Vaughn), 360 meters.
WOAO—Mishawka, Ind., Lyradion Manufacturing company, 360 meters.
WOAP—Kalamazoo, Mich., Kalamazoo college, 240 meters.
WOAQ—Portsmouth, Va., Portsmouth Kiwanis club, 360 meters.
WOAT—Wilmington, Del., 215 Market street, Boyd M. Hamp, 360 meters.
WOAV—Erie, Pa., Pennsylvania National Guard, 2d Battalion, 112th Infantry, 242 meters.
WOAW—Omaha, Neb., Woodmen of the World, 526 meters.
WOAX—Trenton, N. J., 600 Ingham avenue, Franklyn J. Wolff, 240 meters.
WOAZ—Stamford, Texas, Penick Hughes company, 360 meters.
WOC—Davenport, Iowa, Palmer School of Chiropractic, 484 meters.
WOI—Ames, Iowa, Iowa State college, 360 meters.
WOK—Pine Bluff, Ark., Pine Bluff company, 360 meters.
WOO—Philadelphia, Pa., 13th and Market streets, John Wanamaker, 509 meters.
WOQ—Kansas City, Mo., Western Radio company, 360 meters.
WOR—Newark, N. J., L. Bamberger & Co., 405 meters.
WOS—Jefferson City, Mo., Missouri State Marketing bureau, 441 meters.
WPAB—State College, Pa., Pennsylvania State college, 360 meters.
WPAC—Okmulgee, Okla., Donaldson Radio company, 360 meters.
WPAD—Chicago, Ill., W. A. Wieboldt & Co., 360 meters.
WPAH—Waupaca, Wis., Wisconsin department of markets, 360 meters.
WPAJ—New Haven, Conn., Doolittle Radio corporation, 268 meters.
WPAK—Agricultural College, N. D., North Dakota Agricultural college, 360 meters.
WPAL—Columbus, Ohio, Superior Radio and Telegraph Equipment company, 286 meters.
WPAM—Topeka, Kan., Auerbach & Guettel, 360 meters.
WPAP—Winchester, Ky., 222 Lexington avenue, Theodore D. Phillips, 360 meters.
WPAQ—Frostburg, Md., General Sales and Engineering company, 360 meters.
WPAR—Beloit, Kan., Ward Battery and Radio company, 360 meters.
WPAT—El Paso, Texas, St. Patrick's cathedral, 360 meters.
WPAU—Moorhead, Minn., Concordia college, 360 meters.
WPAZ—Charleston, W. Va., Dr. John R. Koch, 273 meters.
WPG—New Lebannon, Ohio, Nushawg Poultry farm, 234 meters.
WQAA—Parkersburg, Pa., Horace A. Beale, Jr., 360 meters.
WQAB—Springfield, Mo., Southwest Missouri State Teachers' college, 236 meters.
WQAC—Amarillo, Texas, 108 East 8th street, E. B. Gish, 360 meters.
WQAD—Waterbury, Conn., Whitall Electric company, 242 meters.
WQAE—Springfield, Vt., Moore Radio News station (Edmund B. Moore), 275 meters.
WQAF—Sandusky, Ohio, Sandusky Register, 240 meters.
WQAH—Lexington, Ky., Brock-Anderson Electrical Engineering company, 254 meters.
WQAL—Mattoon, Ill., Coles County Telephone and Telegraph company, 258 meters.
WQAM—Miami, Fla., Electrical Equipment company, 360 meters.
WQAN—Scranton, Pa., Scranton Times, 280 meters.
WQAO—New York, N. Y., Calvary Baptist church, 360 meters.
WQAQ—Abilene, Texas, West Texas Radio company, 360 meters.
WQAS—Lowell, Mass., Prince-Walter company, 266 meters.
WQAV—Greenville, S. C., Huntington and Guerry (Inc.), 258 meters.
WQAW—Washington, D. C., Catholic university, 236 meters.
WQAX—Peoria, Ill., Radio Euipment company, 360 meters.
WQAZ—Greensboro, N. C., Greensboro Daily News, 360 meters.
WRAA—Houston, Texas, Rice institute, 360 meters.
WRAD—Marion, Kan., Taylor Radio shop (G. L. Taylor), 360 meters.
WRAF—Laporte, Ind., The Radio club (Inc.), 224 meters.
WRAH—Providence, R. I., Stanley N. Read, 231 meters.
WRAL—St. Croix Falls, Wis., Northern States Power company, 248 meters.
WRAN—Waterloo, Iowa, Black Hawk Electrical company, 236 meters.
WRAO—St. Louis, Mo., Radio Service company, 360 meters.
WRAP—Winter Park, Fla., Winter Park Electrical Construction company, 360 meters.
WRAU—Amarillo, Texas, Amarillo Daily News, 360 meters.
WRAV—Yellow Springs, Ohio, Antioch college, 360 meters.
WRAW—Reading, Pa., Avenue Radio shop (Horace D. Good), 238 meters.
WRAX—Gloucester City, N. J., Flaxon's garage, 268 meters.
WRAY—Scranton, Pa., Radio Sales corporation, 280 meters.
WRAZ—Newark, N. J., Radio Shop of Newark (Herman Lubinsky), 233 meters.
WRC—Washington, D. C., Radio Corporation of America.
WRK—Hamilton, Ohio, Doron Bros. Electric company, 360 meters.
WRL—Schenectady, N. Y., Union college, 360 meters.
WRM—Urbana, Ill., University of Illinois, 360 meters.
WRR—Dallas, Texas, City of Dallas (police and fire signal department), 360 meters.
WRW—Tarrytown, N. Y., Tarrytown Radio Research laboratory, 273 meters.
WSAB—Cape Girardeau, Mo., Southeast Missouri State Teachers' college, 360 meters.
WSAC—Clemson College, S. C., Clemson Agricultural college, 360 meters.
WSAD—Providence, R. I., J. A. Foster company, 261 meters.
WSAG—St. Petersburg, Fla., City of St. Petersburg (Loren V. Davis), 244 meters.
WSAH—Chicago, Ill., 4801 Woodlawn avenue, A. J. Leonard, Jr., 248 meters.
WSAI—Cincinnati, Ohio, United States Playing Cards company, 309 meters.
WSAJ—Grove City, Pa., Grove City college, 360 meters.
ESAK—Middleport, Ohio, Foster Egner (Daily News, Pomeroy, Ohio), 258 meters.
WSAL—Brookville, Ind., Franklin Electric company, 246 meters.
WSAN—Allentown, Pa., Allentown Radio club, 229 meters.
WSAP—New York, N. Y., Seventh Day Adventist church, 360 meters.
WSAR—Fall River, Mass., Doughty & Welch Electrical company, 254 meters.
WSAT—Plainview, Texas, Donohoo-Ware Hardware company, 268 meters.
WSAU—Chesham, N. H., Camp Marienfeld, 229 meters.
WSAW—Canandaigua, N. Y., Curtice and McElwee, 275 meters.
WSAX—Chicago, Ill., Chicago Radio laboratory, 268 meters.
WSAY—Port Chester, N. Y., Port Chester Chamber of Commerce, 233 meters.
WSB—Atlanta, Ga., Atlanta Journal, 429 meters.
WSL—Utica, N. Y., J. and M. Electrical company, 273 meters.
WSY—Birmingham, Ala., Alabama Power company, 360 meters.
WTAB—Fall River, Mass., Fall River Daily Herald Publishing company, 248 meters.
WTAC—Johnstown, Pa., Penn Traffic company, 360 meters.
WTAD—Carthage, Ill., First Presbyterian church, 229 meters.
WTAF—New Orleans, La., Louis J. Galle, 242 meters.
WTAH—Belvidere, Il., Carmen Ferro, 236 meters.
WTAG—Providence, R. I., Kern Music company, 258 meters.
WTAJ—Portland, Me., The Radio shop, 236 meters.
WTAL—Toledo, Ohio, Toledo Radio and Electric company, wave length unrecorded.
WTAM—Cleveland, Ohio, Willard Storage Battery company, 390 meters.
WTAN—Mattoon, Ill., Orndorff Radio shop, 240 meters.
WTAP—Cambridge, Ill., Cambridge Radio and Electric company, 242 meters.
WTAQ—Osseo, Wis., S. H. Van Gordon and Son, 226 meters.
WTAR—Norfolk, Va., Reliance Electric company, 226 meters.

Continued on Page 15.

They are doing all sorts of things to get publicity. Here is Miss Doris Gilbert, whose press agent fitted art with a borrowed radio receiving set and who placed in her hands an umbrella-aerial, which is supposed to be good, doubtless, for rainy day reception.

Variable Grid Leak Takes Out Amplifier Distortion

Distorted amplification of the output of a one-tube radio receiver, encountered by many home builders, can be overcome to a great extent with the proper construction of an amplifier and with the addition of a few pieces of apparatus, radiophans have learned after experimentation, says Charles E. Butterfield, a Chicago expert.

The first step in this improvement, it was explained, is the shunting across the secondary terminals of each audio-frequency transformer of a high resistance such as a variable grid leak, having a value of from one-half to five megohms. This resistance is adjusted to the best point of reception, and much of the noise in the amplifier can be cleared up.

Another improvement can be brought about by the insertion of small flashlight cells, called a "C" battery, in the grid return circuit of each amplifier tube, the voltage of these cells being determined thru experimentation. The voltage, however, will run from three to nine volts, depending on the type of tube and the "B" battery voltage. Use of a "C" battery, it has been found, results in a saving in the "B" battery consumption. The negative terminal of the battery goes to the grid of the tube.

Variable Grid Leak Helps "Flew."

Certain receiving circuits, such as the Flewelling and similar types, when amplified, will give better results by the shunting of a variable grid leak of one-half to five megohms across the primary terminals of the first audio transformer. This resistance should be adjusted to the best reception. Further improvement is sometimes noted with the use of a fixed condenser of .001 microfarads in parallel with the grid leak.

One radiophan has reported that he had improved the volume of his Flewelling amplifier with the addition of a second grid leak .001 fixed condenser in parallel with the first leak and condenser, with an audio-frequency choke coil in one of the leads between the two sets of condensers and leads. This second grid leak, he stated, acted as a vernier adjustment to the one closer to the transformer.

How to Build Choke Coil.

The size of the choke coil and its iron core could only be determined by experimentation, the phan added, but he said that about thirty turns of wire on a cardboard tube one and one-half inches long and one inch or so in circumference with a soft iron core large enough to fit inside, probably would be found satisfactory. This "filter," he explained, was used in addition to the "C" batteries and the secondary grid leaks. He added that sometimes it was necessary to shunt a small fixed condenser across the choke coil.

The phan also laid stress on the fact that in the construction of a satisfactory amplifier, efforts should be made to have all connecting wires as short and as far apart as possible to prevent any feed-back action which will result in distortion.

BROADCASTING STATIONS AND SCHEDULE OF PROGRAMS

Continued from Page 14.

WTAS—Elgin, Ill., (near) R. F. D. 6, Box 75, Charles E. Erbstein, 275 meters.
WTAT—Boston, Mass., Edison Electric Illuminating company, portable, 244 meters.
WTAU—Tecumseh, Neb., Ruegg Battery and Electric company, 360 meters.
WTAW—College Station, Texas, Agricultural and Mechanical college of Texas, 280 meters.
WTAX—Streator, Ill., Williams Hardware company, 231 meters.
WTAY—Oak Park, Ill., Iodar-Oak Leaves Broadcasting station, 226 meters.
WTAZ—Lambertville, N. J., Thomas J. McGuire, 283 meters.
WTG—Manhattan, Kans., Kansas State Agricultural college, 485 meters.
WWAB—Trenton, N. J., Hoenig, Swern & Co. 226 meters.
WWAC—Waco, Texas, Sanger Brothers, 360 meters.
WWAD—Philadelphia, Pa., Wright & Wright, (Inc.), 360 meters.
WWAX—Laredo, Texas, Wormser Brothers, 360 meters.
WWB—Canton, Ohio, Daily News Printing company, 268 meters.
WWI—Dearborn, Mich., Ford Motor company, 273 meters.
WWJ—Detroit, Mich., Detroit News (Evening News association), 517 meters.
WWL—New Orleans, La., Loyola university, 280 meters.
WWZ—New York, N. Y., John Wanamaker, 360 meters.
WZAZ—Pomeroy, Ohio, Chase Electric, 258 meters.

Makes Two-Way Contact with Jap Across Seas

TACOMA, Wash., Jan. 3.—An unknown American radio operator situated in Tokyo, Japan, recently sent a radio message to his mother at Cambridge, Ill., thru the amateur radio station 7HG, in this city, operated by Charles York, marking the first two-way short-wave communication across the Pacific ocean.

With only a fleeting contact, barely allowing time for the message to come thru, York had considerable difficulty in distinguishing the foreign operator's call, JUPU.

While the signals of amateur transmitters in the United States have been reported by ship operators in remote sections of the Pacific, and as distant as the island of Ceylon in the Indian ocean, this incident is the first in which an amateur has worked both directions across the 4,760-mile stretch of ocean. The message was delivered via the American Radio Relay league traffic system.

The contact hardly had been made and the message copied when communication was interrupted by heavy interference. It was about 1 a. m. when York heard a station with pure CW calling on 200 meters and signing with the unfamiliar Japanese call. For a brief interval signals were good at both stations.

The station operated by York is situated on one of the highest hills in the surrounding country. He has done a great deal of long-distance work, his best previous two-way record being to communicate with Canadian amateur station 1AC situated in Nova Scotia. He had also worked 6CEU in Hawaii and amateurs in every radio district in the United States with the exception of those in the second and fourth.

York's antenna is supported by a 65-foot pole at the free end and a 40-foot pole at the lead in end. It is a six-wire flat top 50 feet long with a counterpoise directly underneath. The transmitter uses the Hartley circuit with two Telefunken D. R. P. tubes.

Offers Prize to Amateurs Who Reach MacMillan

E. F. McDonald Jr., president of the National Association of Broadcasters, has announced that the Chicago Radio laboratory will offer a Zenith receiving set with two stages of audio amplification, which is a duplicate of the one used by the MacMillan Arctic expedition, to the first radio amateur in Cook county, Illinois, to hold two-way communication with the radio operator on MacMillan's schooner, the Bowdoin.

A somewhat similar receiver set, likewise offered by the Chicago Radio laboratory, was won recently by Jack Barnsley of Prince Rupert, British Columbia, who was for a time the only amateur link between MacMillan and the United States.

Microphonic Noises

Many sets, particularly those employing dry cell tubes as detectors, are bothered by a loud ringing noise at the slightest jar, such as laying the hand on the cabinet or walking across the floor. This almost can be entirely eliminated by mounting the tube sockets on a piece of sponge rubber. A very suitable material for this purpose that is easily obtainable is a piece of 10-cent rubber sponge that can be bought in any drug or 10-cent store. Another method of doing this that is a little more difficult is to suspend the sockets in the air on heavy rubber bands between two supports. When doing this use flexible wire on the socket leads.

The Chicago Evening Post Radio Magazine

RADIO EXCHANGE

5c a Word

Radio Classified Advertisements will be inserted in this section at 5c per word per insertion. Minimum 10 words. Two initials count as one word. No display type, cuts or borders allowed.

If box number is desired, allow two extra words. Box answers will be mailed to advertisers free of charge. Address The Chicago Evening Post, Radio Department, 12 South Market-st.

Here is a medium of exchange for Radiophans. You may wish to buy or sell parts or sets. In your spare time you can do battery charging, repair, construction, instruction. You may wish to open a radio store—or you may have a location that would be ideal for a radio store. An expert radio man may be seeking a position—or you may be seeking such a man for your store, or construction plant. Advertise in this page. Get the radiophan's attention.

SETS FOR SALE.

5-TUBE NEUTRODYNE Fada Parts; less cabinet and tubes, $42.50; or tubes, "B" Batteries and 13-plate storage battery, $87.50. Come and hear it. Also four variometers and a few condensers. SCHMIDT, 1355 Cleveland-av. 2d floor, rear.

BARGAIN!—Erla One-Tube Reflex; operates loud speaker on local and DX. Phone Drexel 5568.

5-TUBE NEUTRODYNE—In glass-top, mahogany cabinet; made to your order, installed. Private party. Tel. Kenwood 0750.

SETS AND PARTS.

BARGAINS in Radio Sets and Parts. SMITH'S CURIO SHOP, 3968 Drexel-blvd.

RADIO SERVICE.

AERIAL CONSTRUCTION and repair work done at minimum charge. Phone Hyde Park 0072. MR. SCHULZ.

SETS WIRED and repaired; aerials erected. W. H. REICHARD, 1433 East 65th-pl. Phone Fairfax 0289.

PARTNER WANTED.

PARTNER WANTED—With capital, to open Radio Store in live Michigan city. Real gold mine spot. For interview, address D-210, Chicago Evening Post.

POST RADIO CLASSIFIED ADS. BRING RESULTS.

Letter Box

MARK OF CONFIDENCE.

RADIO EDITOR: I believe the radiophans have more confidence in your Radio Magazine section than in all the other Chicago newspapers combined. I was in one of the big retail stores last Thursday afternoon and for two hours watched the buyers. More than 40 per cent of the customers that came under my observation either had a Chicago Evening Post Radio Magazine section in their hand or referred to it when buying parts. This same dealer told me he sold 450 assemblies of a certain hook-up you had printed within four days after your magazine was published.

I do not wonder. You certainly are publishing just the kind of radio magazine we phans have wanted. I am an admirer, particularly, of your simple way of treating a technical subject. It is the first time I could understand radio.

To show my appreciation of your wonderful service, every time I ask for an article in a dealer's store I say, "The Chicago Evening Post says this is the correct thing to do," and I insist on getting it just that way.

If all radiophans who want to see you keep up this good work only will realize that they must help you become popular with the dealer in the same ratio as you are with us phans, this will give us a radio insurance policy for the future.—R. D. THIELME, Chicago.

LOCAL AIR JAMMERS.

RADIO EDITOR: I want to agree with you in your attitude on the local interference situation. There are two sides to all questions—just as you say.

One hears almost a universal criticism of a certain station for the way it "hogs the air."

No one can get anywhere by destructive criticism.

I do admire The Chicago Evening Post Radio Magazine section for its level-headed, businesslike, conservative policy.

The owners of the local stations are trying to please us. They are spending a lot of money in that effort. They should be encouraged—not discouraged. They want to do the right thing. Roasting and knocking is unfair.

You have said that there is an easy way out of the whole mess. You are right. We don't have to call mass meetings, ask Mayor Dever to butt in where he doesn't belong or seek the aid of the city council or of a council committee.

If the stations know what we want they will strain every point to give it to us. That's sure.

They probably know now that the phans want an unscrambled schedule. If they don't, then it is up to us to make known this general sentiment.—T. C. BOYLE, Elmhurst, Ill.

WANTS INSIDE AERIAL DATA.

RADIO EDITOR—After reading your advance articles on "The Superdue" and "Old Reliable Junior" in The Post of Dec. 27, I gave one big sigh of relief and shook the neighborhood with my cheers for The Post and its Radio Section.

My case is perhaps typical of an army of potential radiophans. I have a crystal set and am just a roomer in an apartment building. I have a desire to junk my crystal set, except the phones, spend about $25 to $30 more and build an efficient, selective one-tube set that will enable me to get something else besides WJAZ announcing "Laddie Boy" (Why don't they sing something else?) or Ted Peritol's "Coach."

And this to be on an indoor aerial which my landlady kindly permits me to run down the hallway and into my room. I see that the Prowler has noticed the lack of dope on indoor aerials and I hope that The Post will favor us with one of its real articles on this subject at an early date.

So, with the present day and its labyrinth of hook-ups thru which the amateur must plod (and which one shall he choose?), I welcome the news that The Post is to come out with a real one-tube hook-up, for so far I have found the Radio Section filled with red meat radio information. Let us have the dope as soon as you can, Mr. Prowler. With best New Year's wishes for The Post.—R. P. DECKER, 4607 Malden street, Chicago.

AS TO SCRAMBLED PROGRAMS.

RADIO EDITOR—Congratulations on your article in this week's Radio Magazine on the subject of interference. You have stated the situation very clearly and very much to the point.

Before going further, I wish to state that, with the set I am operating, three miles from a big station on the North side, I believe I could tune them out if I were under their wires, but there must be tens of thousands, if not hundreds of thousands, who possess receiving apparatus who receive three of the six Chicago and vicinity stations at one time.

You and I are in a small percentage, which is in about the same relative position to the big majority of listeners that the amateurs are to the entire listening-in public. The amateurs are co-operating nicely and in the end they will, I believe, be greatly benefited by their co-operation.

It is my idea that the broadcasting stations, as a result of some such conference and co-operation as you suggest, would relieve the present chaos, and would keep in favor with the public for a longer time because of the elimination of parallel broadcasting which tempts listeners to hop to and fro and as a result miss out on many worth-while features which broadcasting stations put on at considerable expense.—E. B. WILSON, president, The American Bureau of Inspection and Tests, Chicago.

WELL, HERE'S A SUGGESTION.

RADIO EDITOR—Just a word of protest against limiting our choice of programs. This is a large city, with tastes as diverse as the million men who live in it.

I advocate the licensing of two more stations, one to alternate with WDAP and one with KYW, having the same wave as those stations. On special occasions (as opera) the stations having same wave length should co-operate if the special occasion runs into their time (WJAZ should co-operate to that extent). But as for pulling down the progress of radio to suit those who will not learn how to buy and operate their sets, NO!—WILLIAM LINN ALLEN, 2351 Cleveland avenue, Chicago.

Duke of Sutherland Talks Thru WJZ Tonight

NEW YORK, Jan. 3.—This evening at 9 o'clock radio listeners will have the opportunity of hearing station WJZ broadcast a brief talk by George Granville Sutherland-Levenson-Brower, fifth Duke of Sutherland, on the eve of his departure after a visit to this country in his official capacity of under secretary of air in Great Britain.

The duke has been investigating American aviation methods and practices, and has devoted practically every moment of his brief stay here to his official duties, and in consequence his radio message will constitute his only public speech here.

Range of Sets

Some one asks how to determine the range of a radio receive set. Here is a good formula: As a premise take the distance the owner claims. Let this represent X. Extract the cube root and divide the answer by one-half what you believe is true, and what you get in your phones is what the set will do under favorable conditions.

IMA GOSHGUY, Chicago.

Radio Is a Major Factor in the World March of Events

(From Chicago Evening Post)
November 28, 1923.

RADIO MAKING A NEW WORLD

The extraordinary response which a discerning public has made to THE POST'S Radio Magazine is not only a gratifying evidence of appreciation for newspaper enterprise, it is a remarkable demonstration of the grip which aerial communication has taken upon the popular interest.

No invention of modern times has brought to the great mass of the people the many-sided opportunities presented by radio. It is a unique development destined to contribute vastly more to the thought and progress of our age than is superficially obvious.

The delights of listening-in would be alone sufficient to justify it as a diversion. It would be a hopelessly dull imagination which could not find thrill in the possibility of establishing within the seclusion of a home an instrument, occupying less room than a sewing machine, which literally brings the world about one's ears. The man with books upon his shelves keeps touch with the living past; the man with a radio receiving set is in touch with the throbbing present. For him there is no distance. New York is as near as the loop; San Francisco as close as Edgewater Beach. He can hear the calls of ships all the way from the Mediterranean to the Caribbean. The lecture in Boston, the concert in Atlanta, the recital in Los Angeles are within his audience for the mere turning of a milled head on a dial. If business, rather than entertainment or instruction, be his momentary interest, the trade of all the great marts can be brought within his hearing as readily. The pulse of the fleeting hour, whether it beats to the clamor of the traffickers on the floor of the exchange, or to the tempo of the conductor's baton in symphony and opera, can be felt by the man who sits in the stillness of his room, be it on the Lake Shore drive, on South Halsted street or in Ten Sleep, Wyo. Radio has put an end to isolation.

Telegraph, telephone, phonograph, automobile and aeroplane—all these marvelously extended human possibilities; but what barriers still remained radio has broken down. Nothing has brought within the reach of so many so varied and far-sweeping a realm for adventure as opens to the magic of wireless.

Radio is thoroly democratic. It has joys for mass and class, for the youngster and the oldster, for the serious mind and the lover of frivolity. The ether is neither critical nor selective. It will carry jazz as readily as Brahms, or the open and close quotations as tolerantly as a lecture on art. You can go to the opera or to church; you can listen to Dr. Shannon or Voliva.

But a unique wonder of radio, as we see it, lies in the fact that the public has been in on its development as on the development of no other great invention. What discovery of the past has invited so curious and experimental an interest as this on the part of the multitude? The telegraph has remained in the hands of specialists; the telephone belongs to the public utility; the phonograph is sold to us ready built in its mahogany cabinet; the automobile and aeroplane are the products of great factories, but every man can be his own discoverer, inventor, artificer in radio. There is no end to the possible hook-ups, to the combinations of condensers, fixed and variable, variometers, variocouplers, crystals, tubes and all the rest of the marvels which make a radio shop window the most fascinating display in the world. Here is the real fun and one of the great values of radio. Who can say what may be the impetus forward which will come from the countless thousands of boys thruout America who are studying the theory of etheric communication and working it out, by trial and error, on their reception sets? They may add no new thing to radio, but they will add much to their own capacity for constructive thought—for thought in the terms and in the sphere of that new world which science is unfolding to our amazed understanding.

THE POST believes that in encouraging the active, curious, experimental interest in radio it is doing more than appealing to whim or fad; it believes it is stimulating those brain cells which more and more must be the world's dependence for the solving of many of its problems. The political mind needs the aid of the scientific mind. Democracy did much to develop the former; radio is doing more, perhaps, to develop the latter.

Without Radio, today, you are practically shut in from the world. Your home is in darkness. Contemporary history is broadcast over your head and leaves you behind.

With Radio you keep step with the day—you remain in the present, instead of slipping into the misty past. You stay in the race.

Resting in your easy chair, in the evening, after the usual day's grind, you can reach out to all sections of the country—near or far—and be entertained, advised of facts, informed in news.

All you need is a good Radio receiving set—and The Post.

The Chicago Evening Post Has Taken the Lead in Radio

Your Radio Magazine is very good. Keep it up.
CARL GREDIN, JR.,
2214 Ainslie Street, Chicago.

I like your Magazine, in fact, haven't enjoyed anything like it quite so much since the days when I used to revel in Dan Beard's American Boys Handy Book. Please continue to be specific, as many of us appreciate detail and like to know the exact number of turns in a coil and the position of every part.
FRANK F. SIPP,
3656 Pine Grove Ave., Chicago.

You most assuredly are entitled to congratulations on your Radio Section. I doubt very much that any newspaper can boast of a more interesting section. Coupled with the fact that I have been a reader of The Post for a good many years, I now enjoy it all the more.
FRED A TODD,
820 Oakwood Blvd., Chicago.

I get many helps from your Section.
J. CURTISS STOCK,
606 Oneida Street, Joliet, Ill.

Just a few words of praise for the Radio Magazine. I look forward to every Thursday and believe the Radio Magazine is equal to any magazine worth ten times the price.
EDWARD A. STONER,
527 N. Spalding Ave., Chicago.

I have just seen a copy of your wonderful Radio Magazine, and would be pleased to have you send me a subscription blank for your valued paper
MENDELL SCHNEIDER,
112 Weld Street, Rochester, N. Y.

Picked up a copy of your Radio Magazine, December 8th, on train and am very well pleased with same, and expect to be a regular reader of your paper in the future.
JOHN I. RAPP,
303 Weston Ave., Valparaiso, Ind.

I have built your wave trap—in your issue of Nov. 28th—and must say it is a beauty. It shuts 'em dead as a doornail and is a whiz. May your Radio Section be as good a year from now as it is at present.
FRED HOUGHTBY,
654 Roscoe, Chicago.

I have not seen a Radio Magazine that could compare with yours. Keep it up.
CHARLES F. KROULIK,
2714 S. Kedvale Ave., Chicago.

I wish to tell you how much I appreciate your Radio Department. It is very complete and rounds out your splendid paper.
ROSCOE L. STOUT,
7423 Coles Ave., Chicago.

I have enjoyed the Post Magazine very much, and I find it very good and interesting. Wishing you success with the magazine.
F. H. HILL,
944-954 Washington Blvd., Chicago.

Several of your Radio Magazine Supplements have been forwarded to us and I wish to take this opportunity to express my thorough satisfaction with this Section. Please accept my congratulations upon bringing out such a good publication. It is my opinion that this is one of the best current magazines dealing with the subject that is now published. Many of my friends to whom I have shown it have the same opinion as I. In order to keep my file up to date, would kindly request that you forward me the issue of Nov. 22, as I am short this one. Enclosed find stamps to cover mailing.
A. E. WILLIAMS, Research Engineer,
Board of Education, Cleveland, Ohio.

Your Radio Magazine is GREAT. Keep it up.
ANTHONY SIRUS,
3830 Parnell Ave., Chicago.

I wish to congratulate you on your Radio Magazine. It sure is a dandy and worth more than the weekly magazine selling at 10c.
J. W. BEAZEKAMP,
2139 Armitage Ave., Chicago.

You sure have THE Radio Magazine of Chicago.
JOHN A. MONTGOMERY,
5255 N. Bernard St., Chicago.

I want to congratulate you on your wonderful Radio Section every evening, and especially the one on Thursday.
DAVID COUSTAN,
9437 Champlain Ave., Chicago.

Assuring you that I enjoy the Radio Department of The Post.
LYLE L. HAZEL,
Coal City, Illinois.

I think your Radio Magazine fills a want for an intelligent, reliable source of information.
E. B. NELSON,
372 Herrick Road, Riverside, Ill.

I'll say you've got some Radio Section in your paper, and appreciate it very much.
PHILIP BERTEMES, JR.,
10744 Drew St., Chicago.

We appreciate the up-to-date Radio Magazine that The Chicago Evening Post is now conducting.
JOHN S. REID, JR.,
7441 Yates Ave., Chicago.

Your Radio Section is great, especially the Thursday issue. I do not seek information at this time, but just a word of praise for your splendid magazine. I enclose a few stamps and wish you would kindly send a copy of next Thursday's magazine as a sample to the two following named parties who, after reading your paper, will undoubtedly subscribe.
H. R. ARNOLD,
4608 Malden St., Chicago.

By luck I got one of The Chicago Evening Post Radio Magazines and I think it is as good as I have seen yet. Inclosed you will find postage. Please send me editions of November 15th, 22d, 28th, as I am a Radiophan and would like to see the same. Also let me know the subscription fee of same yearly, and oblige.
SAMUEL FERGUSON,
2216 Bedford Ave., Pittsburgh, Pa.

Your paper surely is the berries. Your Thursday issue saves me from buying two papers.
JAMES INGHAM,
2423 Irving Park Blvd., Chicago.

I have been a reader of The Chicago Evening Post for some time. Before you started to publish the Radio Magazine I had to buy another to get good reading of Radio, but since you publish the magazine I only have to get one paper, and that is The Post.
CHARLES GILLMAN,
515 Denvir Ave., Chicago.

Just to let you know that the wave trap printed in your Radio Section is a "Bear." I am referring to the trap with 43 plate condenser and two coils. Your Radio Section sure is some help to the Radiophan.
HOWARD W. LEARN,
2126 Giddings St., Chicago.

Read THE POST Every Night for RADIO News

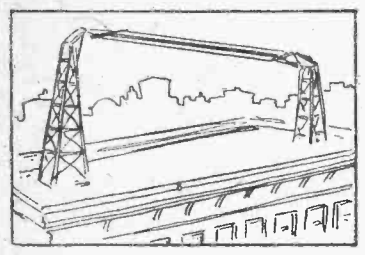
Real news and plenty of it—more than you will find in any other Chicago newspaper—all up-to-the-minute, correct, dependable. Of course, you never want to forget the big magazine on Thursday—there's nothing better anywhere in this country. If you have a Radio friend tell him about this big 16-page magazine—he will thank you because he never will miss a copy of it after he sees how valuable it is to him in information that he would not be without at any price. If your Radio friends and relatives reside in the country, or in some distant city, send them a copy of the magazine and call their attention to the yearly subscription price—or, send us their name and address and we will mail them a sample copy FREE. Think of it—52 issues of The Post with the RADIO MAGAZINE by mail, every Thursday, for only $1.35!

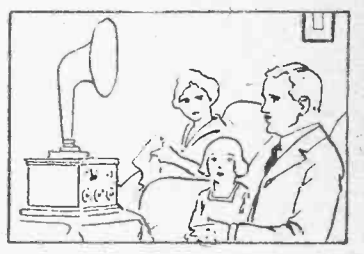
The Chicago Evening Post with the RADIO MAGAZINE Every Thursday for a year

BY MAIL—FOR ONLY $1.35

THE CHICAGO EVENING POST

RADIO MAGAZINE





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BROADCASTING

HOME RADIO

RADIO SETS

HOOK-UPS

AMATEUR RECEPTION

HOME-WORKSHOP

RADIO SCIENCE-

RADIO PROGRAMS

LOCAL NEWS

U.S.RADIO NEWS

FOREIGN RADIO NEWS

HOME LABORATORY

AMATEUR TRANSMISSION

RADIO STATIONS

INVENTIONS

D.X.RECORDS

RADIO PRACTICE-

COMMERCIAL

NEW EQUIPMENT

MANUFACTURERS NEWS

DEALERS NEWS

JOBBER NEWS

MISS EDITH KENDALL, violinist and a student at the Bush Conservatory of Music, is to play this evening before the microphone at KYW station. It is her first time over radio. She is heralded as an artist of rare ability.

IN THIS ISSUE

Broadcasting Stations and Schedules

Central, or Chicago time, is shown on all stations. If necessary to ascertain local time on any station deduct two hours from time shown for Pacific coast stations, one hour from time shown for the Rocky mountain stations and add one hour to those stations using eastern time. Hawaiian island time is four hours and a half slower than Chicago time. In the list the call number of the station is first given, followed by the location, the owner's name, wave length used and broadcasting schedule in order named. THE POST is making a thoro canvass of all stations in order that this directory may be complete and accurate. Changes are so frequent in stations and schedules that no list can be satisfactory which is not corrected frequently. Corrections and additions to this list will be made from week to week. Stations are urged to co-operate by sending information of changes in schedule to Radio Editor, The Chicago Evening Post.

CFAC—Calgary Herald, Calgary, Canada; 430 meters; Fred Carleton, director and operator; silent Monday, Wednesday and Thursday; Tuesday, day, 1 to 1:30, night, 7:45 to 7:55; Friday, day, 1 to 1:30, night, 7:45 to 8:45 and 11 to 12.

CKAC—La Presse, Montreal, Canada; 430 meters; J. M. Carter, announcer and director; day, 4, music; 4:30, weather and stock reports; special Tuesday, Thursday and Saturday, night, 7, kiddies stories in French and English; 7:30 to 10 lectures in French and English, music; Sunday, day, 4, sacred music.

CKOC—Wentworth Radio Supply company, Hamilton, Ont.; 410 meters H. Slach, operator; silent nights, Tuesday, Thursday; Saturday, night, 7:30 to 9; special Sunday night church exercises, 7 to 8.

KDKA—East Pittsburg, Westinghouse Electric and Manufacturing company, 326 meters.

KDPM—Cleveland, Ohio, Westinghouse Electric and Manufacturing company, 270 meters.

KDPT—San Diego, Calif., Southern Electrical company, 244 meters.

KDYL—Salt Lake City, Utah, Telegram Publishing company, 244 meters.

KDYM—San Diego, Calif., Savoy theater, 252 meters.

KDYQ—Oregon Institute of Technology, Portland, Ore., 360 meters; program director, L. E. Simson.

KDYQ—Portland, Ore., Oregon Institute of Technology, 360 meters.

KDYS—Great Falls, Mont., The Tribune, 360 meters.

KDYW—Phoenix, Ariz., Smith Hughes & Co., 360 meters.

KDYX—Honolulu, Hawaii, Star Bulletin, 360 meters.

KDZB—Bakersfield, Calif., 1402 20th street, Frank E. Seifert, 240 meters.

KDZE—Seattle, Wash., The Rhodes company, 455 meters.

KDZF—Los Angeles, Calif., Automobile Club of Southern California, 278 meters.

KDZI—Wenatchee, Wash., Electric Supply company, 360 meters.

KDZK—Reno, Nev., Nevada Machinery and Electric company, 360 meters.

KDZQ—Denver, Colo., Nichols Academy of Music, 360 meters.

KDZR—Bellingham, Publishing company, Bellingham, Wash., 261 meters; 50 watts; operator and announcer, A. M. Brown; silent Thursday; night, 9 to 10, local talent, phonograph music.

KDZT—Seattle, Wash., Seattle Radio association, 360 meters.

KFAD—Phoenix, Ariz., McArthur Bros. Mercantile company, 360 meters.

KFAE—Pullman, Wash., State College of Washington, 360 meters, director, H. V. Carpenter; program manager, A. J. Kralowse; silent Tuesday, Thursday, Saturday, Sunday, night, 9:30 to 11; educational lectures.

KFAF—Western Radio corporation, Denver, Colo., 360 meters. Silent nights, Sunday and Wednesday. Nights, 9 to 10.

KFAJ—Boulder, Colo., University of Colorado, 360 meters.

KFAN—Moscow, Idaho, The Electric shop, 360 meters.

KFAP—Butte, Mont., Standard Publishing company, 360 meters.

KFAR—Hollywood, Calif., Studio Lighting Service company (O. K. Olsen), 280 meters.

KFAU—Boise, Idaho, Independent School District of Boise City, Boise High school, 270 meters.

KFAV—Venice, Calif., Abbot Kinney company, 224 meters.

KFAW—Santa Ana, Calif., The Radio Den (W. B. Ashford and H. T. White), 280 meters.

KFAY—Medford, Ore., Virgin's Radio service, 283 meters.

KFBB—Havre, Mont., F. A. Buttrey & Co., 360 meters.

KFBC—San Diego, Calif., W. K. Azbill, 278 meters.

KFBE—San Luis Obispo, Calif., Reuben H. Horn, 360 meters.

KFBG—Tacoma, Wash., First Presbyterian church, 360 meters.

KFBK—Sacramento, Calif., Kimball-Upson company, 283 meters.

KFBL—Everett, Wash., Leese Bros., 224 meters.

KFBS—Trinidad, Colo., Trinidad Gas and Electric Supply company and the Chronicle News, 360 meters.

KFBU—Laramie, Wyo., The Cathedral (Bishop N. S. Thomas), 283 meters.

KFCB—Phoenix, Ariz., Nielson Radio Supply company, 238 meters.

KFCD—Salem, Ore., Salem Electric company, 360 meters.

KFCF—Walla Walla, Wash., 707 Baker building, Frank A. Moore, 360 meters.

KFCH—Billings, Mont., Electric Service station (Inc.), 360 meters.

KFCK—Colorado Springs, Colo., Colorado Springs Radio company, 258 meters.

KFCL—San Antonio, Calif., Los Angeles Union Stock yards, 360 meters.

KFCM—Richmond, Calif., Richmond Radio shop (Frank T. Doeing), 360 meters.

KFCP—Ogden, Utah, 2421 Jefferson avenue, Ralph W. Flygare, 360 meters.

KFCY—Houston, Texas, Fred Mahaffey, Jr., 360 meters.

KFCY—Le Mars, Iowa, Western Union college, 252 meters.

KFCZ—Omaha, Neb., Omaha Central High school, 258 meters.

KFDA—Baker, Ore., Adler's Music store, 360 meters.

KFDD—Boise, Idaho, St. Michael's cathedral, 252 meters.

KFDH—Tuscon, Ariz., University of Arizona, 360 meters.

KFDJ—Corvallis, Ore., Oregon Agricultural college, 360 meters.

KFDL—Denver, Colo., Knight-Campbell Music company, 360 meters, 50 watts.

KFDO—Bozeman, Mont., 420 West Koch street, H. Everett Cutting, 248 meters.

KFDP—Des Moines, Iowa, Hawkeye Radio and Supply company, 278 meters.

KFDR—York, Neb., Bullock's Hardware and Sporting Goods (Robert G. Bullock), 360 meters.

KFDU—Lincoln, Neb., Nebraska Radio Electric company, 240 meters.

KFDV—Fayetteville, Ark., Gilbrech & Stinson, 360 meters.

KFDX—Shreveport, La., First Baptist church, 360 meters.

KFDY—Brookings, S. D., South Dakota State College of Agriculture and Mechanic Arts, 360 meters.

KFDZ—Minneapolis, Minn., 2510 South Thomas avenue, Harry O. Iverson, 360 meters.

KFEC—Portland, Ore., Meier & Frank company, 360 meters.

KFEJ—Tacoma, Wash., 1724 South Jay street, Guy Greason, 360 meters.

KFEL—Denver, Colo., Winner Radio corporation, 360 meters.

KFEP—Denver, Colo., Radio Equipment company (Joseph L. Turre), 240 meters.

KFEQ—Oak, Neb., J. L. Scroggin, 360 meters.

KFER—Fort Dodge, Iowa, Auto Electric Service company, 231 meters.

KFEV—Douglas, Wyo., Radio Electric Shop, 263 meters.

KFEX—Minneapolis, Minn., Augsburg Seminary, 261 meters.

KFEY—Kellogg, Idaho, Bunker Hill and Sullivan Mining and Concentrating company, 360 meters.

KFEZ—St. Louis, Mo., American Society of Mechanical Engineers (F. H. Schubert), 360 meters.

KFFB—Boise, Idaho, Jenkins Furniture company, 240 meters.

KFFE—Pendleton, Ore., Eastern Oregon Radio company, 360 meters.

KFFO—Hillsboro, Ore., Dr. E. S. Smith, 229 meters.

KFFT—Moberly, Mo., First Baptist church, 275 meters.

KFFQ—Colorado Springs, Colo., Marksheffel Motor company, 360 meters.

KFFR—Sparks, Nev., Nevada State Journal (Jim Kirk), 226 meters.

KFFV—Lamoni, Iowa, Graceland college, 360 meters.

KFFX—Omaha, Neb., McGraw company, 278 meters.

KFFY—Alexandria, La., Pincus & Murphy, 275 meters.

KFFZ—Dallas, Texas (portable), Al. G. Barnes Amusement company, 226 meters.

KFGC—Baton Rouge, La., Louisiana State university, 254 meters.

KFGD—Chickasha, Okla., Chickasha Radio and Electric company, 248 meters.

KFGH—Standard University, Cal., Leland Stanford university, 360 meters.

KFGJ—St. Louis, Mo., Missouri National guard 138th infantry, 266 meters.

KFGL—Arlington, Ore., Arlington garage, 234 meters.

KFGP—Cheney, Kan., Cheney Radio company, 239 meters.

KFGQ—Boone, Iowa, Crary Hardware company, 226 meters.

KFGV—Utica, Neb., Heidbreder Radio Supply company, 224 meters.

KFGX—Orange, Texas, First Presbyterian church, 250 meters.

KFGZ—Berrien Springs, Mich., Emmanuel Missionary college, 268 meters.

KFHA—Gunnison, Colo., Colorado State Normal school, 252 meters.

KFHB—Hood River, Ore., Rialto theater (P. L. Beardwell), 280 meters.

KFHD—St. Joseph, Mo., Utz Electric Shop company, 226 meters.

KFJH—Selma, Cal., The Sugar Bowl (H. R. Shaw), 273 meters.

KFJI—Astoria, Ore., Liberty theater (E. E. Marsh), 252 meters.

KFJJ—Carrollton, Mo., Carrollton Radio shop, 236 meters.

KFJK—Bristow, Okla., Delano Radio and Electric company, 233 meters.

KFJI—Ottumwa, Iowa, Hardsacg Manufacturing company, 242 meters.

KFJM—Grand Forks, N. D., University of North Dakota, 229 meters.

KFJQ—Grand Forks, N. D., Electric Construction company (portable), 252 meters.

KFJR—Stevensville, Mont., Ashley C. Dixon and Son, 258 meters.

KFJV—Dexter, Iowa, Thomas H. Warren, 224 meters.

KFJW—Towanda, Kan., Le Grand Radio company, 222½ meters.

KFJX—Cedar Falls, Iowa, State Teachers' college, 229 meters.

KFJY—Fort Dodge, Iowa, Tunwall Radio company, 246 meters.

KFJZ—Fort Worth, Texas, Texas National Guard, 112th Cavalry, 254 meters.

KFKA—Greeley, Colo., Colorado State Teachers college, 248 meters.

KFKB—Milford, Kan., Brinkley-Jones Hospital association, 286 meters.

KFKF—Lakeside, Colo., Denver Park and Amusement company, 248 meters.

KFKQ—Conway, Ark., Conway Radio laboratories, 224 meters.

KFKV—Butte, Mont., F. F. Gray, 283 meters.

KFKX—Hastings, Neb., Westinghouse Electric and Manufacturing company, 286 meters.

KFKZ—Colorado Springs, Colo., Nassour Bros. Radio company, 234 meters.

KFLA—Butte, Mont., Abner R. Wilson, 283 meters.

evenings, 9, news bulletins; 9:30, weather; 10, studio programs, lectures, entertainment.

KLZ—Denver, Colo., Reynolds Radio company, 360 meters.

KMJ—Fresno, Calif., San Joaquin Light and Power corporation, 273 meters, 50 watts; R. C. Denny, operator and director; Wayne Freund, announcer; Tuesday, Friday and Sunday night, 10 to 11.

KMO—Tacoma, Wash., Love Electric company, 360 meters.

KNJ—Roswell, New Mexico, Roswell Public Service company, 250 meters.

KNT—Aberdeen, Wash., Grays Harbor Radio company (Walter Hemrich), 263 meters.

KNV—Los Angeles, Cal., Radio Supply company, 360 meters.

KNX—Los Angeles, Cal., Electric Lighting Supply company, 360 meters.

KOB—State College, New Mexico, New Mexico College of Agriculture and Mechanic Arts, 360 meters. Daily, time signals, weather, news, crop reports; Monday, Wednesday, Friday night, 8:30 to 9:30, concerts.

KOP—Detroit Police department, Detroit, Mich., 286 meters; daily except Sunday; 1 p. m., to 6:30 p. m.

KPO—San Francisco, Cal., Hale Brothers 423 meters; silent Friday; Sunday night, 10:30 to 12, concert; Monday, 10 to 11, organ, 11 to 12, dance music; Tuesday, Wednesday, Thursday nights, 10 to 11, studio program, 11 to 12, dance music; Saturday night, 10 to 2 a. m., dance music.

KQI—Berkeley, Cal., University of California, 360 meters.

KQP—Hood River, Ore., Apple City Radio club, 360 meters.

KQV—Pittsburg, Pa., Doubleday-Hill Electric company, 360 meters.

KQW—San Jose, Cal., Berkeley Daily Gazette, 278 meters.

WAAM—Newark, N. J., I. R. Nelson company, 263 meters.

WAAN—Columbia, Mo., University of Missouri, 254 meters.

WAAW—Omaha, Neb., Omaha Grain Exchange, 360 meters, 500 watts; Daily except Sunday, 9:45, 10:45, 11:45, 12:45, 1:15 and 8, world markets; final report Saturday at 12:45 p. m.

WAAZ—Emporia, Kan., Hollister-Miller Motor company, 360 meters.

WAAF—Harrisburg, Pa., Dr. John E. Lawrence, 266 meters.

WABC—Anderson, Ind., Fulwider-Grimes Battery company, 229 meters.

WABD—Dayton, Ohio, Parker high school, 283 meters.

WABE—Washington, D. C., Young Men's Christian association, 283 meters.

WABF—Mount Vernon, Ill., Mount Vernon Register-News company, 234 meters.

WABG—Jacksonville, Fla., Arnold Edwards Piano company, 248 meters.

WABH—Sandusky, Ohio, Lake Shore Tire company, 240 meters.

WABI—Bangor, Me., Bangor Railway and Electric company, 240 meters.

WABA—Lake Forest, Ill., Lake Forest college, 266 meters.

WABJ—South Bend, Ind., The Radio Laboratories, 240 meters.

WABK—Worcester, Mass., First Baptist church, 252 meters.

WABL—Storrs, Conn., Connecticut Agricultural college, 283 meters.

WABM—Saginaw, Mich., F. E. Doherty Automotive and Radio Supply company, 254 meters.

WABN—La Crosse, Wis., Waldo C. Grover, 234 meters.

WABO—Rochester, N. Y., Lake Avenue Baptist church, 252 meters.

WBAA—West Lafayette, Ind., Purdue university, 360 meters.

WBAD—Minneapolis, Minn., Sterling Electric company, 360 meters.

WBAH—Minneapolis, Minn., The Dayton company, 360 meters.

WBAN—Paterson, N. J., Wireless Phone corporation, 244 meters.

WBAO—Decatur, Ill., James Millikin university, 360 meters.

WBAP—Fort Worth, Texas, Wortham-Carter Publishing company (Star-Telegram), 476 meters, 750 watts; Silent Saturday and Sunday nights. Operator, E. S. Olds; supervisor, H. W. Hough; announcer, "The Hired Hand." Daily program, 11 a. m., markets, aviation, weather; 12 noon, 1, 2, 4 p. m., markets and information; 5 p. m., financial news; 8:30 to 11:45 p. m., concert.

WBAV—Columbus, Ohio, Einer and Huphins company, 390 meters, 500 watts, Director, R. S. Bohannan; program director Miss Helen Mears; announcer, H. E. Day. Daily except Sunday, 12:30 to 1, markets and news. Monday evening, 8 to 10, music.

WBAW—Marietta, Ohio, Marietta college, 246 meters.

WBAX—Wilkesbarre, Pa., 66 Gildersleeve street, John H. Stenger, Jr., 360 meters.

WBAY—New York, N. Y., Western Electric company, 492 meters.

WBBA—Newark, Ohio, Newark Radio Laboratories, 240 meters.

WBBC—Sterling, Ill., Sterling Radio Equipment company, 229 meters.

WBBD—Reading, Pa., Barbey Battery Service, 234 meters.

WBL—Anthony, Kan., T. & H. Radio company, 261 meters.

WBS—Newark, N. J., D. W. May, Inc., 360 meters.

WBT—Charlotte, N. C., Southern Radio corporation, 360 meters.

WBU—Chicago, Ill., City of Chicago, 286 meters.

WBZ—Springfield, Mass., Westinghouse Electric and Manufacturing company, 337 meters.

WCAD—Canton, N. Y., St. Lawrence university, 280 meters.

WCAE—Pittsburg, Pa., Kaufmann & Baer company, 462 meters; daily, 11:30, weather; 2:30, news; 3:30, stocks; 5:30, dinner music; 6:30, children's stories; 7:30, music; Sunday, 2 p. m., people's radio church service, Rev. Dr. George W. Shelton; 6:30, music.

WCAG—New Orleans, La., 2813 Calhoun street, Clyde R. Randall, 268 meters.

WCAR—Columbus, Ohio, Entrekin Electric company, 286 meters.

WCAJ—University Place, Neb., Nebraska Wesleyan university, 360 meters; station director and announcer, J. C. Jensen; daily, 10:30 a. m., weather; Tuesday, 6 p. m., children's stories; Thursday, 8 p. m., lectures and music.

WCAK—Houston, Texas, 2504 Bagby street, Alfred P. Daniel, 360 meters.

WCAL—Northfield, Minn., St. Olaf college, 360 meters.

WCAM—Villanova, Pa., Villanova college, 360 meters.

WCAO—Baltimore, Md., Sanders & Stayman company, 360 meters; daily, 10:55, time signals; 11 a. m., weather; 11:05, music; Monday and Wednesday, 7 p. m., music.

WCAP—Washington, D. C., Chesapeake & Potomac Telephone company, 469 meters.

WCAR—San Antonio, Texas, Alamo Radio Electric company, 360 meters.

WCAS—Minneapolis, Minn., William Hood Dunwoodie Industrial institute, 246 meters; director, M. R. Bass; operator and announcer, F. P. Upton; Monday, 7 to 7:30 p. m., music; Tuesday, 8:15 to 9:30 p. m., music and educational programs (9:30 to 10:45 on alternate weeks); Wednesday, 6:30 to 7, music and technical lectures; Thursday, 7 to 7:30 p. m., notes on radio and code practice.

WCAT—Rapid City, S. D., South Dakota State School of Mines, 240 meters.

WCAU—Philadelphia, Pa., Durham & Co., 286 meters.

WCAV—Little Rock, Ark., J. C. Dice Electric company, 360 meters.

WCAX—Burlington, Vt., University of Belmont, 360 meters.

WCAY—Milwaukee, Wis., Kesselman O'Driscoll company, 261 meters.

WCAZ—Carthage, Ill., Carthage college, 246 meters.

WCBA—Allentown, Pa., 1015 Allen street, Charles W. Heimbach, 280 meters.

WCBB—Greenville, Ohio, K. & K. Radio Supply company (Charles H. Katzenberger), 240 meters.

WSBD—Zion, Ill., Wilbur G. Voliva, 345 meters.

WCE—Minneapolis, Minn., Findley Electric company, 360 meters.

WCK—St. Louis, Mo., Stix, Baer & Fuller Dry Goods company, 360 meters.

WCM—Austin, Texas, University of Texas, 360 meters.

WCX—Detroit, Mich., Detroit Free Press, 517 meters.

WDAD—Lindsborg, Kans., Central Kansas Radio Supply company (Wm. L. Harrison), 360 meters.

WDAE—Tampa, Fla., Tampa Daily Times, 360 meters.

WDAF—Kansas City, Mo., Kansas City Star, 411 meters.

WDAG—Amarillo, Texas, J. Lauranee Martin, 360 meters; J. L. Martin, director and operator; broadcast, Tuesday and Thursday at 8 p. m.

WDAH—El Paso, Texas, Trinity Methodist church (South), 268 meters; station director, A. C. Arnold; announcer, John Burke; Sunday, 8:30 a. m., and 12 midnight; Thursday, 8:30 p. m., concert.

WDAI—Syracuse, N. Y., Hughes Radio corporation, 246 meters.

THE CHICAGO EVENING POST
TABLOID RADIO SCHEDULES

These stations are those most commonly tuned in evenings by the Chicago broadcast listeners. The time given is central standard. Pacific coast time is two hours earlier than that shown here. Mountain time is one hour earlier, and eastern time one hour later. Evening program schedules only are given. This list was compiled by The Chicago Evening Post Radio Department and is protected by copyright.

STATION	Miles	Met	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Chicago—									
KYW, Comm. Edison Bldg.		536		6:30- 9:30	6:30-12:00	6:30- 9:30	6:30- 9:30	6:30-12 m.	6:30- 9:30
WAAF, Union Stock Yards		286	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00		
WMAQ, Hotel La Salle		536		7:00- 9:55	7:00- 9:55	7:00- 9:55	7:00- 9:55	8:00-10:00	
WDAP, Drake Hotel		360		7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	9:15-10:30
WJAZ, Edgewater Beach Hotel		448		10:00-12:30	10:00-12:30	10:00-12:30	10:00-12:30	10:00- 2:00	6:00- 9:00
Suburban—									
WCRD, Zion, Ill.	39	345	8:00- 9:00				8:00- 9:00		
WIAB, Rockford, Ill.	77	252			8:00- 9:00				
WRM, Urbana, Ill.	120	360			8:50- 9:30				
WTAS, Elgin, Ill.	37	275			7:30-10:00				
Eastern—									
KDKA, East Pittsburg	430	326	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WBZ, Springfield, Mass.	802	337	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	
WEAF, New York City	733	495	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00
WGI, Medford Hillside, Mass.	875	360	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	7:30- 9:00
WHAZ, Troy, N. Y.	748	380	8:00- 9:30						
WGY, Schenectady, N. Y.	698	280	6:45-11:30	6:45- 9:00	6:45- 9:00	6:45- 9:00	6:45-11:30	6:45- 9:00	
WGR, Buffalo	472	319	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	
WHN, New York City	912	360	1:15-11:00	1:15-11:00	1:15-11:00	1:15-11:00	1:15-11:00	1:15-11:00	
WJY, New York City	733	405							2:30- 6:00
WJZ, New York City	733	455	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	
WOO, Philadelphia	677	509	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	
WRC, Washington, D. C.	612	469	8:00-10:00		8:00-10:00		8:00-10:00		
Midwest—									
WCX, Detroit	245	517	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00		
WJAX, Cleveland	323	390		7:30- 9:30		8:00-10:30			
WLAG, Minneapolis	358	417	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	
WLW, Cincinnati	262	309	8:00-10:00	10:00-12:00	8:00-10:00	10:00-12:00			
WOC, Davenport	105	481	7:00-11:00		7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WTAM, Cleveland	323	300	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30
WWJ, Detroit	245	517	8:30-10:00	8:30-10:00	8:30-10:00	8:30-12 m.	8:30-10:00		
Southern—									
KSD, St. Louis	270	546	8:00-11:00	8:00-11:00	8:00-11:00		8:00-11:00	8:00-11:00	
WBAP, Fort Worth, Texas	855	476	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00		
WDAF, Kansas City, Mo.	430	411	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	
WFAA, Dallas, Texas	853	476	6:45- 9:30	6:45- 9:30	6:45- 9:30	6:45- 7:30	6:45- 9:30	6:45- 9:30	9:30-11:00
WGV, New Orleans	858	350	7:00- 8:00		7:00- 8:00			7:00- 8:00	
WHAS, Louisville	271	400			7:30- 9:00				4:00- 5:00
WHB, Kansas City, Mo.	430	411		7:00- 9:00		7:00- 9:00	7:00- 9:00		8:00-10:00
WMC, Memphis	480	500		11:00-12:00			11:00-12:00	8:00-10:00	8:00-10:00
WOAI, San Antonio, Texas	1,080	385		9:30-10:30				9:30-10:30	
WOS, Jefferson City, Mo.	337	441	8:00- 9:30		8:00- 9:30		8:00- 9:30		
WSB, Atlanta, Ga.	605	428	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	7:30- 9:00
Pacific Coast—									
KFDB, San Francisco	1,910	509	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30
KGW, Portland, Ore.	1,895	492	1:00-1 a.m.	10:00-11:00	10:00-11:00	10:00-11:00	1:00-2 a.m.	10:00-11:00	9:00-10:00
KHJ, Los Angeles	1,795	395	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	10:00-12:00
KPO, San Francisco	1,910	423	6:30-12 m.	6:30-12 m.	7:30-12:00	6:30-12 m.		6:30-12 m.	10:30-12 m.

KFHF—Shreveport, La., Central Christian church, 266 meters.

KFHH—Neah Bay, Wis., Ambrose A. McCue, 282 meters.

KFHJ—Santa Barbara, Cal., Fallon & Co., 360 meters. Manager, S. Haskings. Evening—8 to 8:40 p. m., news bulletins, bed-time story; 11 to 12, music.

KFBQ—Los Gatos, Cal., Curtis Brothers Hardware store, 242 meters.

KHR—Seattle, Wash., Star Electric and Radio company, 270 meters.

KFHS—Lihue, Hawaii, Clifford J. Dow, 275 meters.

KFHU—Mayville, N. D., M. G. Steren, 261 meters.

KFHX—Hutchinson, Kan., 407 East 1st street, Robert W. Nelson, 220 meters.

KFI—Los Angeles, Cal., Earle C. Anthony (Inc.), 469 meters.

KFIB—St. Louis, Mo., 5666 Vernon avenue, Franklin W. Jenkins, 244 meters.

KFID—Iola, Kan., Ross Arbuckle's garage, 246 meters.

KFIF—Portland, Ore., Benson Polytechnic institute, 360 meters.

KFIK—Gladbrook, Iowa, Gladbrook Electric company, 234 meters.

KFIL—Louisburg, Kan., Windisch Electric Farm Equipment company, 234 meters.

KFIO—Spokane, Wash., North Central high school, 252 meters.

KFIQ—Yakima, Wash., Yakima Valley Radio Broadcasting association, 224 meters.

KFIU—Juneau, Alaska, Alaska Electric Light and Power company, 226 meters.

KFIV—Pittsburg, Kan., 706 East 10th street, V. H. Broyles, 240 meters.

KFIX — Independence, Mo., Reorganized Church of Jesus Christ of Latter Day Saints, 240 meters.

KFIY—Seattle, Wash., Brott laboratories, 236 meters.

KFIZ—Fond du Lac, Wis., Daily Commonwealth, 237 meters.

KFJA—Grand Island, Neb., Central Power company, 244 meters.

KFJB—Marshalltown, Iowa, Marshalltown Electrical company, 248 meters.

KFJC—Seattle, Wash., Post Intelligencer, 233 meters.

KFJB—Greeley, Colo., Weld County Printing and Publishing company, 236 meters.

KFJF—Oklahoma City, Okla., National Radio Manufacturing company, 252 meters.

KFLB—Menominee, Mich., Signal Electric Manufacturing company, 248 meters.

KFLD—Franklinton, La., Paul E. Greenlaw, 234 meters.

KFLE—Denver, Colo., National Educational Service, 268 meters.

KFLH—Salt Lake City, Utah, Erickson Radio company, 261 meters.

KFLP—Cedar Rapids, Ohio, Everette M. Foster, 240 meters.

KFLQ—Little Rock, Ark., Bizzell Radio shop, 261 meters.

KFLR—Albuquerque, N. M., University of New Mexico, 254 meters.

KGB—Tacoma, Wash., Wm. A. Mullins Electric company, 360 meters.

KGG—Hallack & Watson Radio Service, Portland, Ore., 460 meters, 50 watts. Day—2:45 to 3, news. Evening—7:30 to 8, phonograph and sporting news; 9:30 to 10, press and police reports; special Wednesday and Sunday, 11 to 12 midnight, singing concert.

KGN—Portland, Ore., Northwestern Radio Manufacturing company, 360 meters.

KGU—Honolulu, Hawaii, Waiwiwi Beach, Marion A. Mulrony, 360 meters.

KGW—Portland, Ore., Portland Oregonian; 492 meters: Day—1:30, weather; 5:30, lectures and children's hour. Evening—10, music; 11, lecture; 12, music.

KGY—Lacy, Wash., St. Martin's college 258 meters; 10 watts; evening, 10 to 11:30.

KHJ—Los Angeles, Cal., Times-Mirror company, 405 meters.

KHQ—Seattle, Wash., 419 13th avenue, Louis Wasmer, 360 meters.

KJQ—Stockton, Cal., 615 East Main street, C. O. Gould, 360 meters.

KJR—Seattle, Wash., Northwest Radio Service company, 270 meters.

KJS—Los Angeles, Cal., Bible Institute of Los Angeles, 360 meters.

KLN—Monterey, Cal., Monterey Electric Shop, 360 meters.

KLS—Oakland, Cal., 2201 Telegraph avenue, Warner Brothers, 360 meters; director, Miss A. Warner; announcer, S. Warner. Week days, 1:30 to 3; Friday evening, 10 to 11; Sunday afternoon, 2 to 3.

KLX—Oakland, Calif., The Oakland Tribune, 509 meters; 500 watts; silent Sunday;

KSD—St. Louis, Mo., Post Dispatch (Pulitzer Publishing company), 546 meters.

KSS—Long Beach, Cal., Prest & Dean Radio company and Radio Research Society of Long Beach, Cal., 229 meters; 10 watt; Boy Scout news.

KTW—Seattle, Wash., First Presbyterian church, 360 meters.

KUO—San Francisco, Cal., Examiner Printing and Laundry company, 360 meters.

KUS—Los Angeles, Cal., City Dye Works and Laundry company, 360 meters.

KUY—El Monte, Cal., Coast Radio company, 360 meters.

KWG—Stockton, Cal., Portable Wireless Telephone company, 360 meters.

KWH—Los Angeles, Cal., Los Angeles Examiner, 360 meters.

KXD—Modesto, Cal., Modesto Herald Publishing company, 360 meters.

KYQ—Honolulu, Hawaii, Electric Shop, 360 meters.

KYW—Chicago, Ill., Westinghouse Electric and Manufacturing company, 345 meters.

KZM—Oakland, Cal., 13th and Harrison streets, Preston D. Allen, 360 meters.

KZN—Salt Lake City, Utah, The Deseret News, 360 meters; daily except Sunday 9 to 10:30 p. m., music, addresses, stories, news.

KZV—Wenatchee, Wash., Wenatchee Battery and Motor company, 360 meters.

NAA—Arlington, Va., U. S. Navy dept., 435 meters; daily except Sunday, 8:45 to 9:40 a. m., markets; 11:25 to 11:40, markets; 12:45 to 1:20 p. m., markets; 2:25 to 3:40 p. m., markets; 9:05 to 9:20 p. m., weather.

WAAB—New Orleans, La., 137 South St. Patrick street, Valdemar Jensen, 268 meters.

WAAC—New Orleans, La., Tulane university, 360 meters.

WAAD—Cincinnati, Ohio, Ohio Mechanics institute, 360 meters, 25 watts, range, 50 miles.

WAAF—Chicago, Ill., Chicago Daily Drovers Journal, 286 meters; Daily except Sundays and holidays, 8:10, 10:45, 12:40, 3, 4:30 p. m., markets; 10:30, 12:30 p. m., weather.

WAAH—St. Paul, Minn., Commonwealth Electric company, 360 meters.

WAAK—Milwaukee, Wis., Gimbel Brothers, 280 meters.

Continued on Page 14.

IVERSON C. WELLS
EDITOR

Assisted by a Staff of Regular and Special Contributing Writers.

The RADIO MAGAZINE Section is edited with the view of giving authentic news of the radio broadcasting field and authoritative information on the subjects of home construction of receiving and transmission sets, of the operation and maintenance of apparatus, and as an exchange of opinion for its readers.

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Radiophan Seeks to Tune-In Europe

American radio enthusiasts are attempting actively to receive European stations since the reception of American broadcasting has become such a frequent occurrance in Europe.

The one serious difficulty is that of time, as London, for example, is six hours faster than Chicago. This means that the broadcasting wave from Europe must cross a belt of sunlight, with the resulting transmission troubles.

It also means that the hours when European concerts have to be listened for are either those of the American working day, or early in the morning, when even the hardest bitten radiophan is apt to have exchanged his earphones for a pillow.

The sets that are capable of European voice reception, of course, are few and far between, especially so for inland as Chicago. However, there are several circuits capable of doing it, and there are Chicago phans who succeed.

List of Stations.

Below are printed some of the principal stations which broadcast more or less regularly, with the wave lengths, and the most usual broadcasting hours.

The times given are central standard time (Chicago time). Mountain time (Denver) subtract one hour; for Pacific time (San Francisco) subtract two hours.

To compare the time in Europe, the time of transmission of the programs, add six hours to these figures for stations in England, France, Belgium, Holland and Spain. This gives Greenwich standard time, which is official in these countries. The time in Germany, Denmark, Switzerland, Czechoslovakia and Italy is an hour earlier still; for stations in these countries add seven hours.

All Have Same Hours.

353 meters, Cardiff, Wales, 5WA. This has the shortest wave of any of the European stations. It is one of six stations conducted in the British Isles by the British Broadcasting company, which has a monopoly of broadcasting in that country. The other British stations follow, all of them giving programs at the same hours; week days from 9:30 to 10:30 a. m., and from 11 a. m. to 4:30 p. m. (Chicago time); Sundays from 2:30 to 4:30 p. m. The programs are separate for each station.

369 meters, London, England, 2LO. The main one of the British stations (see above). In addition to the same program hours as the other stations, 2LO gives a program at 5:30 to 6:30 a. m. on week days and at 9:30 a. m. on Sundays.

385 meters, Manchester, England, 2ZY. A British station.

400 meters, Newcastle, England, 5NO. A British station.

415 meters, Glasgow, Scotland, 5SC. A British station.

420 meters, Birmingham, England, 5IT. A British station.

450 meters, station of the Telegraph School at Paris, France. Concerts at 1:30 p. m. Tuesdays and Thursdays and from 7:30 a. m. to about 12 noon on Saturdays. Announcements in French. (Paris is pronounced "pah-ree.")

460 meters, station "Radiola-Riviera" at Nice, France (news in French) and concerts at somewhat irregular times, usually about 6 a. m., 11 a. m. and 4 p. m.

Radio Programs

Below are given the complete schedules of all the Chicago and suburban broadcasting stations and those of the out-of-town stations which are most commonly tuned by local radiophans.

These schedules are a regular daily feature in The Chicago Evening Post.

On Thursday of each week a complete list and schedule of every broadcasting station in the United States is published in The Chicago Evening Post's sixteen-page Radio Magazine section.

CHICAGO STATIONS

(Central Time Is Shown.)

KYW—Located in Commonwealth Edison building; 536 meters; Wilson J. Wetherbee, director.

Day—9:30 a. m., news and markets; 10

Continued on Page 18.

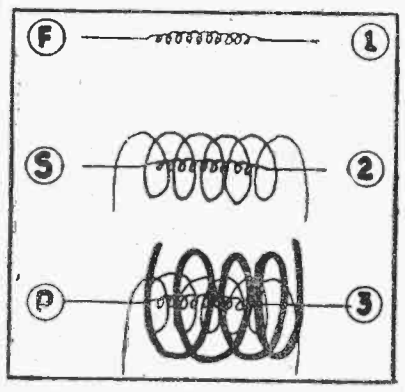


FIG. 3—This illustrates the manner of winding the three elements in the new Pratt tube. No. 1 is the spiral filament. No. 2 is the secondary, or grid, wound over the filament. No. 3 is the plate placed over the grid.

Hear Glasgow, London, on Three-Tube Receivers

A. F. Combs of Enid, Okla., and M. B. Norman, Eureka Center, Wis., report what are believed to be long-distance records for three-tube sets.

Using receivers of the same type that were designed and built by Dr. Fulton Cutting and Bowden Washington, Minneapolis, Minn., Combs, at Enid, listened to three numbers—vocal, orchestra and piano—broadcast by 2-LO, London, England, and Norman picked up a station at Glasgow, Scotland.

Combs verified his feat thru 2-LO'S New York office, and Dick and Adolph Danielson of St. Croix Falls, Wis., were listening in with Norman.

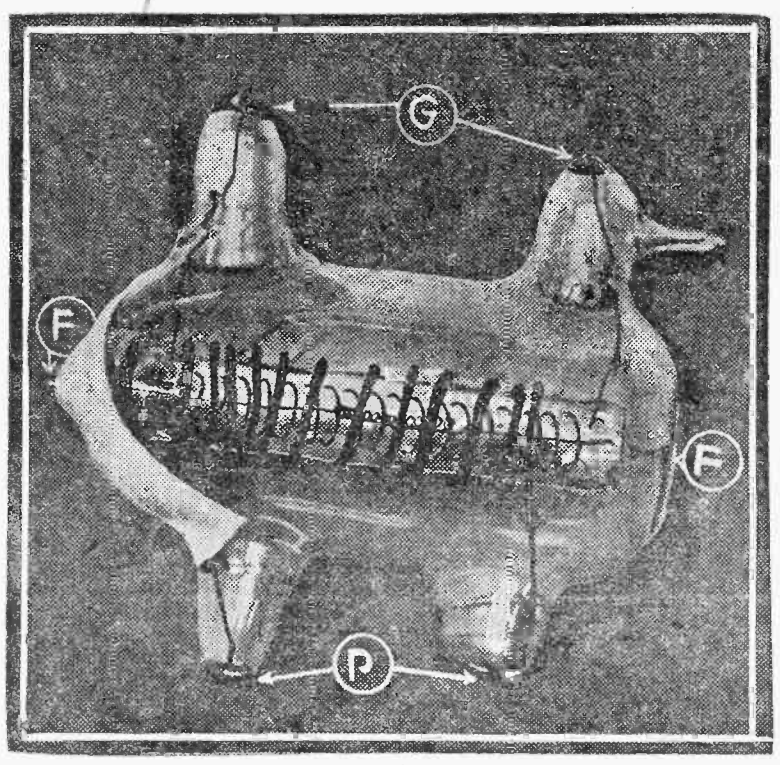


FIG 2—This is the original Pratt tube, first made and used in 1897 for radio, and has the three elements which Dr. Lee de Forest in later years laid claim to as the discoverer. (F) is the filament, (G) the grid, and (P) the plate. Note the way the elements are placed in spiral form and in inductance relation.

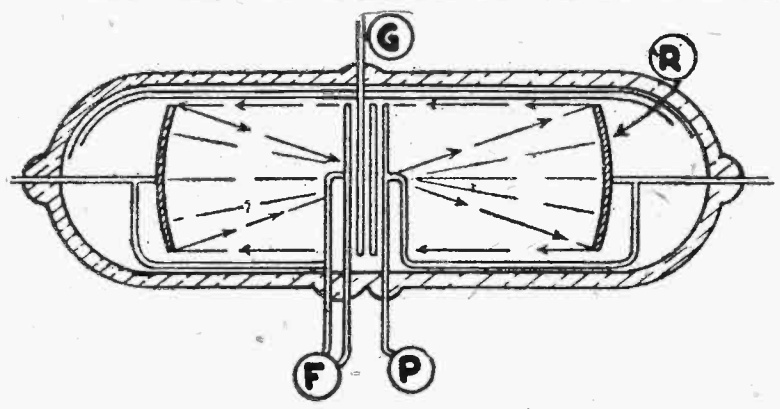


FIG. 1—This is the new Pratt vacuum tube. (R) is one of the reflectors at either end of the tube, between which the stream of radiant pass, the direction of flow being indicated by the arrows. (G) is the grid, (F) the filament and (P) the plate. These three elements are in the form of spirals, as shown in Fig. 2 and Fig. 3.

Sees No U. S. Monopoly in Wired Wireless Plan

BY ISRAEL KLEIN.

RECENT reports that wired wireless, under government supervision, will replace the present system of radio need bring no fears to the dyed-in-the-wool radiophan. Receiving concerts thru rented sets only, and over accredited electric light or power lines, may be the outcome of present difficulties in broadcasting, but loopholes present themselves.

England started broadcasting to radio sets that were rented from the manufacturers. There was a general system of co-operation between manufacturers and government, by which concerts were to be paid for thru rentals and licenses for receiving sets.

But the officials and radio engineers failed to include the real phan, the amateur who makes his own set with what little wires and tubes and other paraphernalia he can collect. Setting up a monopoly in such a "commodity," it is found, is practically impossible.

Attempt at Solution.

So the British have tried to solve their problem by reducing the license fee and trying to induce outsiders to pay the lower tolls. That is left altogether to the discretion of the outlaw fans, who can't be routed out whatever the inducement, and who can go on listening in on the broadcast concerts.

A similar situation may be expected in this country if the practice of renting and licensing radio sets is put into effect. In fact, the number of outlaw fans would be proportionately greater in this country than in England, as the number of radio fans here is today. And in England, the officials estimate 200,000 outlaw radio sets are in use.

Leave it to the ingenuity of the American amateur to find a way out. He can build any kind of a set with the scraps he has on hand, and he can find a way to tune in even on the wired form of wireless.

Try to Stop 'Em.

The result of a monopoly in radio broadcasting might be a monopoly in the manufacture of radio sets for rental only. But parts would also be built, and these parts would easily go into the individual sets that amateurs will put up for their own use. How can they be stopped?

Limitation of manufacture of radio sets and parts, and institution of a fee on the manufacturer for each set, might be even a better way to collect funds for payment to the lecturers, singers and others who are asked to broadcast their specialties. Monopoly of broadcasting by wired wireless—the light and power companies—seems to be just as good an answer to the problem of broadcasting as has been the unsuccessful British monopoly.

Transmits Standard Signals

Standard radio-frequency signals are transmitted from NPG, the naval radio station at San Francisco, on the third Monday of each month at 8 a. m., Pacific time, or 10 a. m., central time. All transmission is on continuous waves from both a medium and a high powered arc set, no voice announcements being made. The six frequencies transmitted range from 28.5 to 125 kilocycles, all long wavelengths.

Coolidge Urges New Radio Law

Radio, which for the first time carried to the continent at large and perhaps to Europe and Central America the President's message, also carried his recommendations for remedial legislation on radio.

Echoing Secretary Hoover's request that the laws affecting radio administration enacted in 1912 be revised, the President personally told congress that new legislation regulating radio interference is needed.

At present Secretary Hoover is operating under a sort of "gentlemen's agreement" between commercial, governmental, private and amateur interests, reached last spring during the second national radio conference.

White Bill Favored.

Secretary Hoover stated recently that Representative White, who fathered the bill which bore his name last session, would introduce a simplified radio bill this session. The old bill, it is understood, has been reduced to first terms so as to permit of proper interpretation with the development of the art and to give the secretary of commerce and his advisory committee liberal and more or less elastic authority over the control of national radio problems.

A recent conference between representatives of the government departments was successful in eliminating such points of disagreement as existed heretofore, and the resultant bill soon will be introduced in the house.

Sees Improvement in Situation.

According to Secretary Hoover, the radio interference situation today is far better than it was at the time the original White bill passed the house last year, due chiefly to the elimination of interference thru the voluntary co-operation of the several interests. There is now little interference between the existing broadcasting stations, which are decreasing in numbers.

Broadcasters Aid White.

The National Association of Broadcasters, of which E. F. McDonald Jr. (WJAZ) of Chicago is president, is working actively to get data into the hands of Representative White from broadcast listeners, manufacturers and others interested.

A form letter, sent out from the national headquarters in New York city, and signed by Paul B. Klugh, executive chairman of the association, was received in Chicago early this week. It reads:

Representative White has asked this association to assist him by obtaining opinions as to what his new radio bill should cover. He is a conscientious, well-informed gentleman who believes that our radio law of 1912

Continued on Page 4.

Dr. Pratt Describes New Tube for Radio

Dr. H. Preston Pratt announces that preparations for manufacturing his new vacuum tube for radio reception and transmission are about completed and that in another week production will be started.

Interest in the new tube, which was illustrated and briefly described in a recent issue of The Post Radio Magazine, has prompted numerous inquiries from readers who seek more details.

In most all lines of scientific research, where fundamental principles are involved, discoveries and inventions, as a rule, are not due to accident, but are developed thru a process of analysis. First comes the conception, then the vision, and finally the mind's eye's photograph of the undiscovered entity or fact.

The discovery of the value of the vacuum tube in radio is no exception to this rule, Dr. Pratt claims.

Began His Work in 1875.

It was in the year 1875 when Dr. Pratt took his first lessons in chemistry. After a year of class laboratory experimenting, he questioned the then accepted theory of chemistry that the force called chemise or chemical affinity was not to be related in any possible way with the electrical phenomena, and that these two forces were separate and distinct.

Dr. Pratt argued that they were one and the same, and also furthermore, that all atoms in the universe are built up from electrical units, carrying both signs—a plus and minus, or electro-positive and electro-negative, and the chemical affinity represented the electrical pull between the electrical units. He held further that the laws of harmonies, a fundamental which can be mathematically demonstrated, causes the formation and arrangement of these electrical units into atomic and molecular groups.

In 1876, Dr. Pratt says, he became convinced that the electrical pull exerted between the atoms and their rate of speed could be measured. To prove his contention he used a vacuum tube and demonstrated to his complete satisfaction that material particles under potential pressure in vacuo produces energy which causes oscillations in an electrical circuit.

Dr. Pratt continued his experiments to determine the contents and acti of material particles in vaculo, an had reproduced himself or secured from others and experimented with every form of vacuum tube known during that period.

This fact alone gave Dr. Pratt the advantage over every other experimenter, and at the announcement of the discovery of the X-ray, in 1896, he was the master of the art at that time, and formulated a working hypothesis of the X-ray as well as being the first to use it therapeutically.

Uses First Tube in Radio in 1897.

The theory of the working of the X-ray corroborated and sustained Dr. Pratt's original work within the vacuum tube. In 1897 he used it for the first time in radio, an account of which performance appeared in the magazine recently. He however used the vacuum tube in 1885 in connection with telephone receivers and telephone transfers.

Today The Post shows a photograph of the first tube Dr. Pratt constructed, using the same principles involved in the tube he now proposes to manufacture.

The tube is of the "pig" type and, until recently, was still capable of being operated. However, Dr. Pratt loaned it to a careless experimenter and it was broken. Adhesive tape, shown in the photograph, holds the broken portions together.

While this tube was developed prior to 1897, it was not used by Dr. Pratt in radio work until that year. By reference to the illustration it will be noted that the tube has the three elements—the grid, plate and filaments to which Dr. De Forest later laid claim to as the inventor.

New Tube Keeps First Idea.

Dr. Pratt's improved tube follows the general shape of the usual radio vacuum tube of today, but still embodies his original idea of concentrating the electric energy in the center of the tube.

The pig tube Dr. Pratt says he designed to be used as a detector, amplifier, transformer or transmitter, and the contents of the tube are constructed in the form and with proper-

Continued on Page 4.

Dr. Pratt Describes New Tube

Continued from Page 3.

ties of an induction coil, having three spiral windings, one winding over the other. They are inductively connected; in other words, a filament, a primary and a secondary winding.

The filament of this particular form is spiral in shape, and was made of platinum, oxidized. The secondary spiral surrounds the filament spiral, and the primary spiral surrounds the other two.

The secondary terminals are attached to the grid. The primary terminals are attached to the plate. The filament terminals are attached to the battery. However, this hook-up may be varied, depending on the circuit.

Fig 3 gives a clearer idea of how the three elements in the Pratt tube are formed.

How the Tube Works.

Figure 1 is a sectional view of the new tube and the two reflecting and deflecting surfaces, which constitute his pet theory. Interposed between the reflecting and deflecting surfaces are three spiral electrodes—the filament (F), the plate (P) and the grid (G).

Thru the center of, between, above and around the surfaces of the spirals, or the three electrodes, are so-called spaces or openings which allow the free movement of the material particles, or the cathode-anode stream, which pass in the direction of the lines of force as shown in the diagram, the arrows indicating their direction and path.

Before describing the movements of the material particles or cathode-anode stream within the tube, Dr. Pratt makes the following statement:

"1. That it is impossible to secure a perfect vacuum, as at all times material particles remain in the tube.

"2. The cathode-anode stream of material particles builds up the electro-static bridge that connects and completes the filament plate circuit over which the electro-magnetic wave passes.

"3. This cathode-anode stream is built up of ionized and electroized particles and passes in the direction of the lines of force as determined by the position, environments and polarity of the particles.

"4. Electrolysis will take place in a gaseous as well as a liquid medium.

"5. All energized moving particles of every kind and description within a vacuum tube become a part of the cathode-anode stream circuit.

Calls Radio Tubes X-Ray.

"6. Whenever the cathode stream is energized and passes in a definite direction, a counter stream of anode particles also is set up and follows the lines of force in the opposite direction.

"7. Whenever the energized material particles from the cathode stream strike the inner surface of a vacuum tube (this includes every known form of vacuum tube) X-rays are produced. The difference of degree vacuum will determine the penetrating power of the ray.

"8. It is true that the cathode stream is more active apparently than the anode stream in the present electron tube, but in a perfectly balanced tube of gases the electro-negative and electro-positive values of both streams are equal.

"9. All elements, all gases, all electrons and all material particles in the universe of every form, description and nature carry both plus and minus charges or polarities. Potassium is one of the strongest electro-positive elements known, while oxygen is the strongest and most active of the electro-negative elements, but both the potassium and the oxygen carry both signs. Platinum when heated to a red color becomes electro-positive, while the increased heat brings out its opposite or electro-negative sign. Tungsten, which is strongly electro-negative when heated to a white heat, develops its positive sign with a change of temperature and environments.

"I question the present electronic theory of electricity as far as the single electro-negative sign is concerned, and I also question the accuracy of the experiment tried and conclusion found whereby a negative electron had been captured without its positive sign, and I think that it is only a matter of time when science will demonstrate that all electrons carry both signs, that of plus on the one hand and minus on the other."

Explains Principles Used.

Dr. Pratt then explained how his new tube works. He said:

"In lighting up the filament radiant energy is produced. This is heat. light, magnetic and electrical radiations, and the energy sets up oscillations of the material particles in the tube, which are ionized and electrolized, and are attracted and concentrated in the center of the tube.

"These follow the lines of force which previously have been established between the reflecting and deflecting surfaces and the electrodes in the tube, which also serve to establish an electro-static bridge, as it were, connecting and completing the filament-plate circuit within the tube, over which the superposed grid impulses pass, the negative impulse to the plate, the positive impulse to the filament, thereby controlling all of the moving entities in the tube.

"The heat and light generated between the reflecting and deflecting surfaces change the characteristic nature of the material particles, whose movements are influenced, guided and directed according to their polarities. In other words, there are streams of material particles passing in both directions."

Dr. Pratt's chief claim for his new tube is that radiant energy is concentrated at a central point by his reflectors, and, being thus controlled, give greater amplification, greater clarity than do any of the present-day tubes.

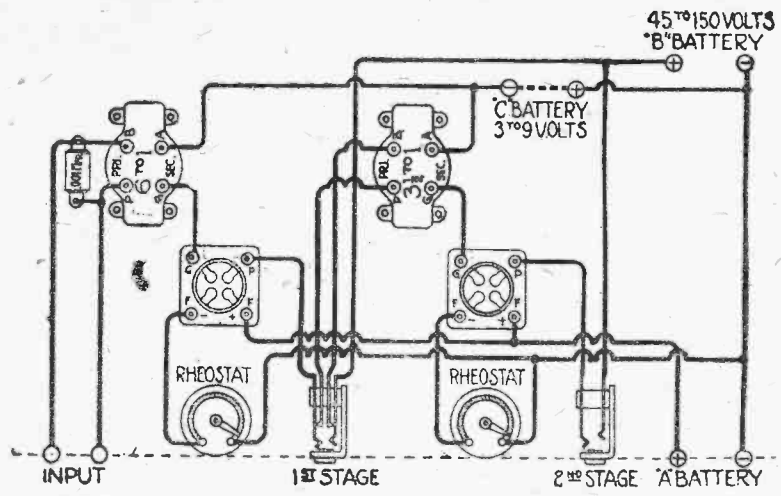
Two Hook-ups for Audio Amplifiers; One for Two Stages, Other Three Stages

By W. H. FARR.
(Radio Engineering Staff, Electrical Research Laboratories, Chicago.)

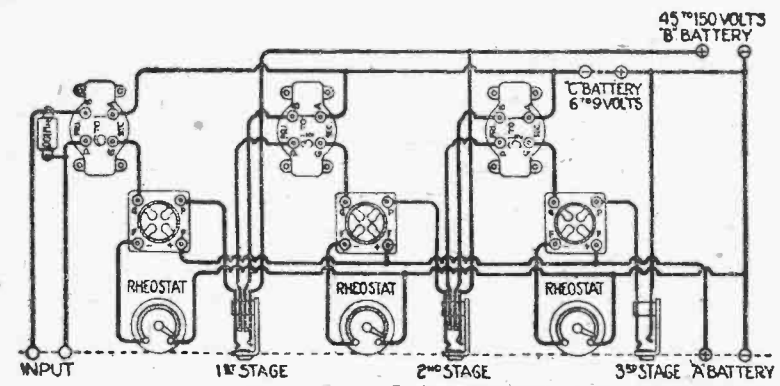
AUDIO-FREQUENCY amplification, one of the greatest factors in making radio reception so popular, has reached the stage where three steps of amplification can be used without hopelessly distorting the signals. This is due to the great improvement in the last year in the construction of the audio-frequency transformers.

Without audio-frequency amplification the satisfaction and convenience of the loud speaker would be unknown and a receiving set would have to be equipped with a head set for every member of the family. In fact, no set is considered complete nowadays without two or three steps of audio amplification and some type of loud speaker.

Most up-to-date receiving sets have the audio-amplifying apparatus built into the same cabinet with the tuning apparatus. A very convenient arrangement, however, is to use a separate audio-frequency amplifying unit, ither built into a cabinet or on a panel. This can be attached to whatever type of receiver you are using, whether it be a crystal set, single tube regenerative, Rheinartz, Flewelling, Ultra Audion, etc., and thus produce results equal to the more elaborate and expensive sets with self-contained amplifiers.



TWO-STAGE AUDIO-FREQUENCY AMPLIFIER—Here is a very clear diagram of a two-stage amplifier to be used as a separate unit to the receiver. The "C" batteries aid in keeping down distortion and protect transformers from high-plate voltage.



Designed by Electrical Research Laboratories.

THREE-STAGE AUDIO-FREQUENCY AMPLIFIER—This circuit was designed as a separate unit for any receiver. Note the jack connections and the location of the "C" or bias battery.

The ideal arrangement is to have separate jacks for each stage, which enables the operator to employ just enough amplification to get the necessary volume.

How to Construct Amplifier.

It is the purpose of this article to give a few pointers and cautions to the radiophans who contemplate building audio-frequency amplifiers, either as a separate unit or as an addition to their present receiving sets.

Hook-ups for an audio-amplifying unit are given in Figs. 1 and 2. A three-stage amplifier, as shown in Fig. 1, will amplify the output of a crystal set or nonregenerative single-tube set up to full loud-speaker volume, while the two-stage amplifier shown in Fig. 2 will be amply sufficient for any type of single-tube regenerative set.

The amplifier unit can be operated from the same "A" batteries as the receiving set, provided, of course, that tubes are used which operate on the same voltage. However, the amplifying circuit requires a much higher plate voltage than a detector circuit, which will necessitate the use of additional "B" batteries.

When the amplifier is built, as a separate unit, the phone terminals of the receiving set are connected directly to the in-put terminals ("P" and "B") of the audio-amplifier. A very convenient method is to equip the input of the amplifier with a cord and plug, by means of which it can be plugged into the phone jack of the receiver in place of the head phones.

When adding audio-amplification to any type of regenerative set it is advisable to connect a fixed condenser of .001 MFD capacity across the primary terminals of the first transformer, as shown in the diagram. This acts as a by-pass for the radio-frequency current floating in the plate circuit, and thus assists the regenerative action of the tube.

Use of Separate Jacks.

It will be noted that the diagrams show a separate jack on each stage. This permits the use of more or less amplification as desired. If for any reason these jacks are not used, connect the "P" terminal to the socket direct to the "P" terminal of the transformer and the "B" terminal of the transformer direct to the positive side of the "B" battery.

A separate rheostat is shown for each tube, but if the tubes are well matched just as satisfactory results can be obtained if the tubes are all controlled by one rheostat. The only precaution necessary is to use a rheostat with sufficient carrying capacity to carry all the tubes without heating.

The most satisfactory tubes for use in audio-frequency amplification are UV-201A, C-301A and Western Electric 216A. UV-199 or C-299 can also be used, but will not be found as satisfactory, as they will not stand as high a plate voltage and will not produce as great a volume as the larger tubes.

The plate voltage applied to an audio-amplifier may be from 45 to 150 volts, but ordinarily 90 volts will be found sufficient. Of course, a higher degree of amplification is obtained by using high plate voltage, but at a sacrifice of quality. A plate voltage of over 90 volts will necessitate the use of a "C" battery.

When a "C" battery is used it is connected in the common grid return lead of all the tubes as indicated in the diagram, paying particular attention that the polarity is correct.

Unless the amplifier is being worked up to full capacity, the "C" battery will make little difference in the quality of the signal. Its chief advantage lies in the fact that it causes a material reduction in the plate current, and thus lengthens the life of the "B" batteries.

For a plate voltage of 90 volts a 6-volt "C" battery will be found sufficient, while for 135 to 150 volts a 9-volt "C" battery will be required. As no current is consumed from the "C" battery, small flash light cells will have ample capacity.

Value of Transformer.

One of the most important considerations in building an audio-amplifier is to use transformers of the highest quality. An audio-frequency transformer is called upon to reproduce sounds of frequencies ranging from about 100 per second up to the upper limit of audibility, which may be 10,000 to 20,000 per second.

If all these frequencies are not equally amplified the result is either a loss of tone quality or an actual distortion of the voice or musical sounds. This becomes more noticeable as the number of stages is increased, and the practical working limits is three stages. In order for the original sounds to be correctly reproduced it is necessary for the fluctuations in magnetic strength of the core to follow with perfect fidelity the form of the sound waves which are being amplified. Thus it can readily be seen that the efficiency of an audio-transformer is very largely dependent upon the proper core design.

Shield Protects Field.

One of the most frequent sources of trouble in audio-amplifying circuits, and particularly in three-stage circuits, is magnetic interaction between the cores of the transformers, which manifest itself in the production of howls and in distortion of signals. To reduce this effect to a minimum it has been the custom in the past to place the transformers with their cores at right angles to each other. Due to the improved design of some of the new type transformers, this precaution is entirely unnecessary, as this transformer is provided with a perfect magnetic shield, being inclosed in a heavy steel shell.

The best results will be obtained by the use of a transformer having a ratio of 6 to 1 in the first stage and ratio of 3½ to 1 in the following stages.

In any audio-amplifier the most perfect reproduction will be obtained when the tubes are not being forced to their maximum. It is far better to get good tone quality with moderate volume than to sacrifice quality to gain intensity.

Coolidge Urges New Law for Control of Radio

Continued from Page 3.

should be brought up to date and reflect the ideas of broadcasters and listeners, as well as the commercial message carriers.

We have agreed to act as a clearing-house and to turn over to Representative White, thru our Washington bureau, suggestions coming into the New York offices which properly and intelligently bear upon the subject.

Representative White's invitation to help should be acted upon without delay, in the following manner:

1. Broadcasters should (a) immediately review, or have their counsel review, the radio laws of 1912 and mail their concrete suggestions to the National Association of Broadcasters, 1265 Broadway, New York city; (b) they should, without delay, prepare a suitable announcement to be read on three nights, urging listeners to do some serious thinking upon this subject, and write their views to the National Association of Broadcasters, 1265 Broadway, New York city.

2. Newspapers carrying radio departments and the radio press should give wide publicity to this matter, and, in concert with the broadcasters, encourage listeners to study the subject, and write their opinions to the National Association of Broadcasters, 1265 Broadway, New York city.

3. Manufacturers of radio apparatus should give careful consideration to the new law, and write their views to the National Association of Broadcasters, 1265 Broadway, New York city.

Much information may be gained from the inclosed digest of Representative White's former bill, and the suggestion is also made that a copy of the radio service bulletin, dated April 2, 1923, be secured from the superintendent of documents, government printing office, Washington, D. C., at 5 cents per copy. Starting at page 9 will be found some interesting data. Particular study should be made of the "interference" problem, and sound, well thought out suggestions made.

Digest of White Radio Bill.

The digest of Representative White's radio bill of 1923, which was designed to amend the radio act of 1912, and to which Mr. Klugh referred, follows:

Section 1—(A) Every station and operator on land or sea within or under United States must have license from secretary of commerce as provided.

(B) Secretary of commerce shall: (a) Classify station and operators' licenses. (b) Prescribe nature of service of each class of station and assign wave bands. (c) Make, alter and revoke regulations which do not affect existing laws or international agreements, regulating service rendered by each class; location, wave length, kind of apparatus (with respect to external effect produced), power, purity and sharpness of waves, area to be served and times and methods of operation of any station. (d) Make other regulations not inconsistent with law to prevent interference between stations affected by this act. Secretary of commerce may "exclude from the requirements of any regulations" any stations or operators or to modify requirements when it will facilitate commerce and compatible with public interest.

(C) Provides in time of war or public peril or disaster, President may cause government to take complete control.

(D) Government stations exempt from Sections A and B. President assigns wave lengths for government use. All government stations, except on government vessels while at sea or beyond limits of United States shall conform to regulations of secretary of commerce when not transmitting government business. Provided in time of war or public disaster the President may amend or suspend regulations. All government stations on land or sea shall have official call letters and be included in list of stations published by department of commerce stations on vessels of United States Shipping Board and Emergency Fleet corporation deemed not to be government stations within meaning of act.

Section 2—(A) Paragraph A section 1, does not apply to persons sending radio messages on foreign ships in United States waters.

(B) Station licenses not granted to or transferable to (a) aliens; (b) foreign governments; (c) company, corporation or association organized under laws of any foreign government, or (d) having alien officer or director or of which more than one-fifth capital stock is foreign owned. Station licenses cannot be transferred or disposed of without consent of secretary of commerce in writing.

(C) No station license for more than ten years and always revocable as provided. Secretary of commerce can refuse license which "is monopolizing or seeking to monopolize radio communication, directly or indirectly, thru the control of the manufacture or sale or radia apparatus or by other means."

PROVIDES FOR PENALTIES.

Section 2—(C) Holder of license can be prosecuted by United States under anti-monopolistic laws. License for commercial international service placed under submarine cable license provided in act of May 27, 1921. Every such license must be approved by President.

(D) Application for license must be made on forms drawn by secretary of commerce.

(E) Licenses must show (a) ownership cannot change; no vested property rights; license cannot be assigned or transferred; (b) secretary of commerce can prescribe other conditions not inconsistent with act.

(F) Licenses revocable for failure to perform as promised; for failure to observe regulations or law or any international law adhered to by United States; or when commercial station fails to provide facilities; or when Interstate Commerce Commission finds unreasonable charges; unreasonable regulations; or when public interest demands revocation; or where monopoly of radio communication is threatened thru control of manufacture and sale of radio apparatus. Provided thirty days' notice of revocation and hearings.

Section 3—(A) Transmitting apparatus must be in charge of licensed operator.

(B) Temporary operators' licenses in emergency.

(C) Requirements for operators' license.

(D) Operator must be proficient and not alien.

(E) Conditions controlling suspension of operators' license.

(F) Conditions controlling covering revocation.

Section 4—(A) Stations in process of building and to be built must secure permit.

(B) Conditions governing granting of permit.

Section 5—Provides secretary of commerce with advisory committee of fifteen members, government departments naming eight and secretary of commerce seven. Expenses of commission paid from department of commerce appropriation.

Section 6—Radio stations whose signals can interfere must keep licensed operator listening for distress signals while station operates.

Section 7—Attempts wave length regulation (radiophone listeners are particularly interested in sections aiming to clear up interference).

Section 8—Penalties.

Section 9—Fees.

Squier Quits Post to Take Radio Uplift

After more than forty years of active service, Gen. George O. Squier, chief signal officer of the United States army, retired Dec. 31 from active service. It was at his own request, that he may devote more time to scientific and technical research.

In this connection the following announcement has been made by Secretary of War Weeks:

"Gen. Squier is retiring at his own request and is not resigning. He is greatly interested in technical questions, so doubtless finds his present duties irksome, and wishes to devote his time and energies to the work in which he has demonstrated such brilliant ability."

Col. Charles McK. Saltzman, senior colonel of the signal corps, has succeeded Gen. Squier.

Invented Wired Wireless.

Not only radiophans but thousands of readers generally have come to know of Gen. Squier and his work in radio communication. Probably the two achievements for which he is remembered more than others, are that of the invention of "line radio," also called "wired wireless," and the invention of the new radio alphabet, by which messages may be sent many times more rapidly than by the usual code signals.

Wired wireless, or line radio, as Gen. Squier prefers to call it, is a system of sending radio impulses along wires, these impulses traveling to the receiver at the other end, even if high-power electric currents are coursing along these wires at the same time. In fact, a great many radio-frequencies may be sent along wires at the same time, thus making it possigle to send to the receiver programs of music, speeches, sports, news, etc.

How Systems Differ.

This is done by sending each of these programs on a separate frequency. There are several such systems in actual operation today, and it is predicted by some experts this system will be the broadcasting system of the future.

In contradistinction to the line radio, the usual method of broadcasting, where radio waves travel from an antenna thru space to the receiving antenna, is called "space broadcasting," because the radio impulses (radio waves) do not travel along wires, but thru space.

Making Phone Condenser

A phone condenser can be constructed easily. Cut out two strips of tinfoil 3 inches wide and 2 feet long, and three strips of thin paraffined paper 4 inches wide and 2 feet 3 inches long. After pasting the tinfoil sheets on each side of one of the paper strips, sandwich the whole between the remaining two paper strips and roll it up, binding the roll with tape or cord. Connections are made to the two tinfoil sheets.

Here's Competent Guide Who Takes You Thru a Factory to See How Sets Are Built

FIG. 1—A PART OF THE ASSEMBLY-ROOM—Women are, as a rule, more careful and delicate in this work, which must be accurate to the last detail. (2) A part of the wiring-room. (3) A punch press knocking fixed condensers out of one-eighth-inch sheet brass. (4) Sand Blasting—The operator watches his work thru a window and handles it with rubber gloves and sleeves fastened to the hand-holes, as the sand would remove his skin instantaneously. (5) Scale rings going into the electro-plating bath.

BELIEVING that the radiophan reader, be he home builder or not, would be interested in a trip thru an efficient radio-receiver factory, The Post today presents such a tour, with Dr. Bowden Washington as a guide. The factory is one over which Dr. Washington presides as vice president and chief engineer—the Cutting & Washington Radio corporation. The Post believes you will enjoy the trip.—The Editor.

By BOWDEN WASHINGTON.

AMONG all phases of electrical work that I know of the manufacture of radio instruments is the most exacting. Sometimes even the slightest film of tarnish on a vital part will make a receiver defective.

Were the radio-loving public to take a trip thru a modern factory where every detail of a radio receiver, in the process of being built, receives the attention of engineers and carefully trained workers, the reasons for the wonders that lie in this black box with a black front and a few knobs and dials would become obvious.

Very few people, unless engaged in the manufacture of some more or less complicated product, have any idea of the amount of work involved in a thing of this type containing a great many parts. Also, it is not commonly realized that the mechanical work in a radio receiver, tho not comparable in accuracy to that of a watch, still has to be of a pretty high grade, and there is a great deal of it.

The electrical work such as connections and soldering has to be much more carefully done than in any other branch of electrical work. In the manufacture of generators, motors and other heavy electrical machinery the currents and voltages are such that a poor connection usually will be indicated by a flash and spark, while the voltages dealt with in a radio receiver are so low—the power of an incoming signal often being as little as a millionth of a millionth of a watt—that even the slightest film of tarnish, which easily would be pierced even by the low voltages used in the wire telephones, will constitute an open circuit for these feeble radio impulses.

This means that the connecting up of a radio receiver has to be extremely carefully done, and the testing more than elaborate. How many friends have you who have put together a radio receiver from parts and had it work the first time? Probably very few.

Yet every receiver turned out by a reputable factory must be in perfect condition and remain so. If 1 per cent of receivers turned over to the testing department from the wiring department show defects in wiring it would be considered poor workmanship on the part of the wiring-room.

The number of times that a particular part is handled and worked upon by different people is a revelation to be unitiated.

Most radiophans are familiar with the formed nickle plated wiring used in connecting up most radio receivers. Let us follow the course of one of these wires thru the process that prepares it for use. It arrives in the receiving-room as square copper wire wound on a reel. First, it is straightened in a machine. Then it is cut to proper lengths of connections to which it is destined, and is passed thru a bending machine which forms it into the proper shape. Next, it is nickle-plated and, finally, the ends are "tinned," or dipped in solder, to make it easier for the "wire man" to solder it into place. It is returned to the stockroom and finally issued to the wiring department.

That gives some idea of the handling even the simplest part requires. It would take a great many pages to follow courses of the other converging parts that go into a receiver, each piece, perhaps, passing thru a dozen hands.

This may seem inefficient, yet with the output of several hundred sets a day, it is enough to take the whole time of at least one person for one small detail. And if that person does nothing else he becomes more efficient in that particular job.

Such a trip as I mentioned thru a modern factory undoubtedly would be of considerable interest to the man who "builds his own," and undoubtedly he would be quite envious of the facilities offered. He would start at the receiving-room, where various raw materials—brass, bakelite, wire, walnut and many others, arrive. From there the route would lead down long corridors thru various departments in which the materials are fabricated.

There is the punch-press room, in which dials, scales, brackets, tube socket springs, etc., are punched and formed out of sheet metal, one part for each stroke of the presses. Then the sawing-room where panels and subpanels are sawed and beveled.

There is the drilling department, the screw machines, five of which can be attended by one man. These machines feed themselves the raw stock, perform a half-dozen operations on it automatically and drop into a hopper knurled thumb screws, regeneration coil shaft bushings and similar parts.

Now the electro-plating and sand-

Continued on Page 6.

Radio Popular in Holland

Commercial reports from the Netherlands tell of an unusual demand thruout that country for radio receiving sets. New broadcasting stations will be opened within a short time and the increased number of concerts in the air is expected to stimulate the radio activity. Dutch manufacturers are able to supply vacuum tubes, having made them for local as well as export trade for a considerable length of time.

Teeth Phones Convey Radio Music to Sleeping External Ears of Deaf Mutes

DAILY science is getting closer to the solution of the problem seeking some means of compensation for those lacking any of the human senses.

Radio is taking its part in this field especially in its contributions by which the deaf—or at least the near-deaf—may be enabled to hear.

Even before the popular use of radio, deaf-mutes have been able to tell what a person was saying by touching the vocal cords, or watching the lips. Now radio makes it even easier. For those who could not be taught to discern talk by the sense of feeling or sight, may now "hear" it thru use of what is called an osophone.

Editor Improves Idea.

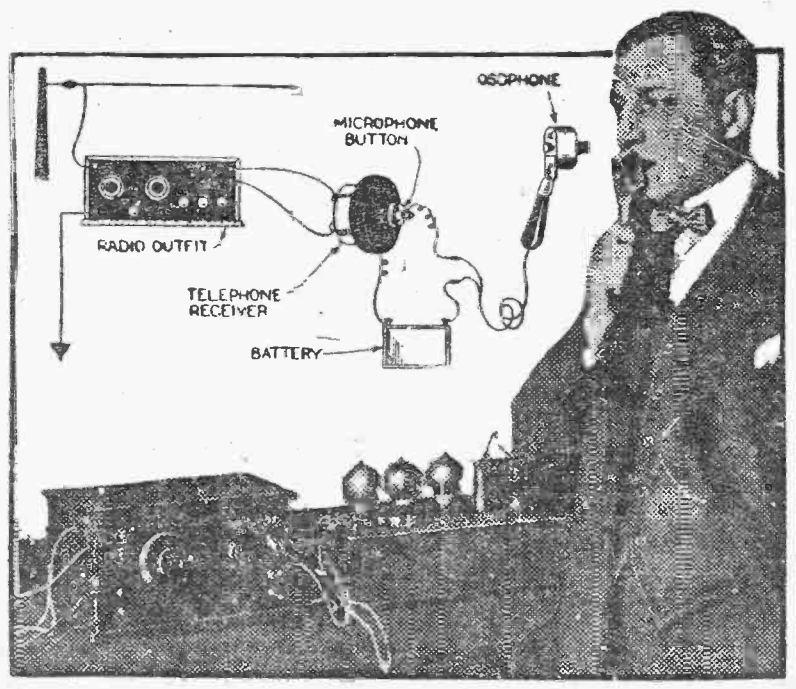
Such an instrument was invented a few months ago by an English scientist, but it has been left to H Gernsback, editor of Science and Invention, and Radio News, New York, to perfect this instrument for simple application.

Gernsback's osophone depends on the transmission of radio waves in the form of vibrations thru the teeth. The teeth, Gernsback says, are more sensitive to the slightest vibrations than any other part of the body. Therefore, by adapting a receiver-form of instrument for the teeth, in place of the ears, and attaching it to a receiving and transmitting instrument, he believes he has discovered the boon for deaf persons.

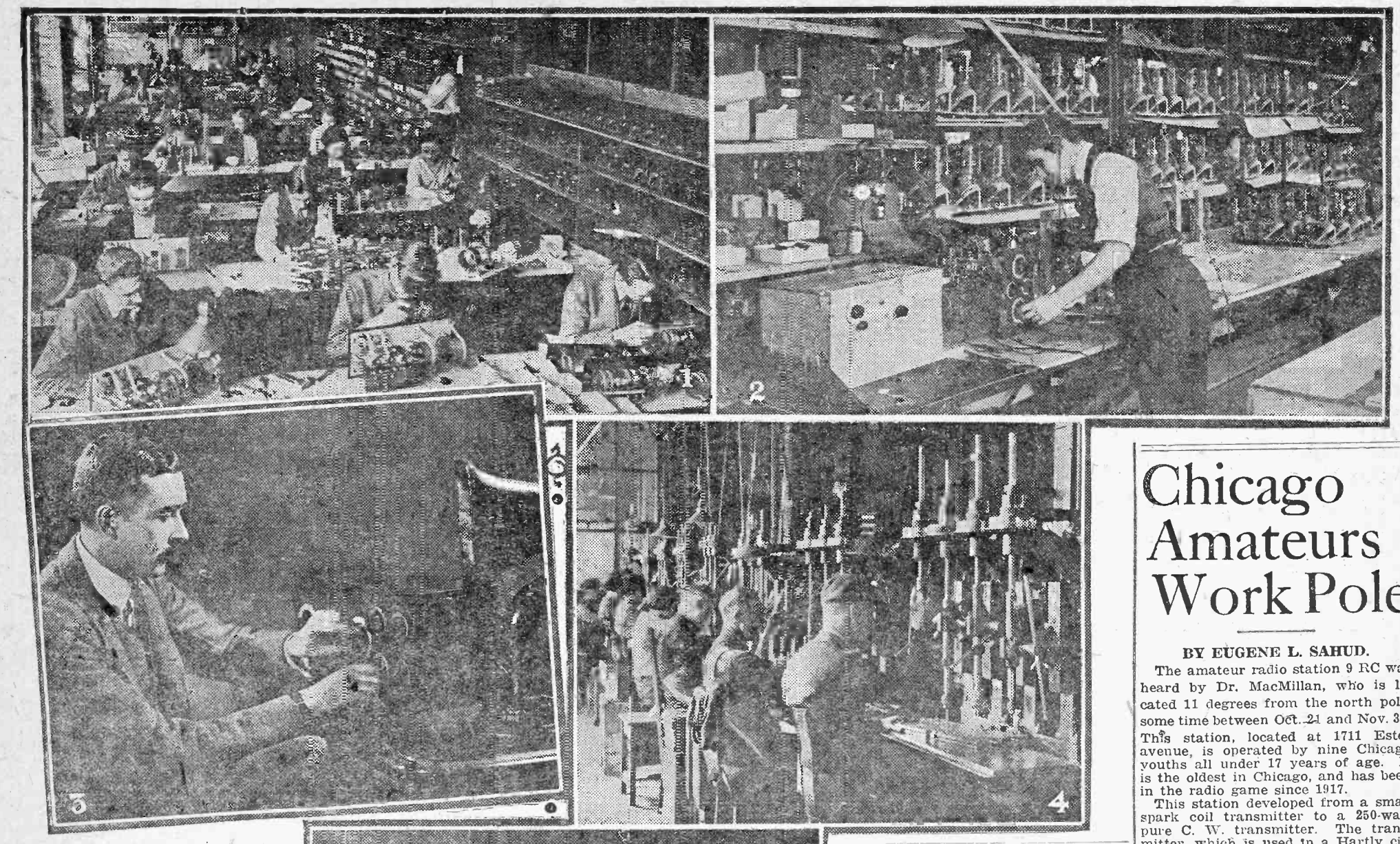
Teeth Convey Vibrations.

From the teeth, the vibrations are transmitted thru the bony structure of the head to the auditory nerve. So that if this nerve functions at all, however slightly, the osophone will in a way restore his hearing.

All that is needed is attachment of a special form of radio receiver between the osophone and the transmitting instrument. Just as a normal person puts a telephone receiver to his ear, the deaf "listener" puts the osophone between his teeth, to carry on a conversation.



H. Gernsback, inventor of the osophone, showing how it is used, and (above) diagram showing how the osophone is connected.



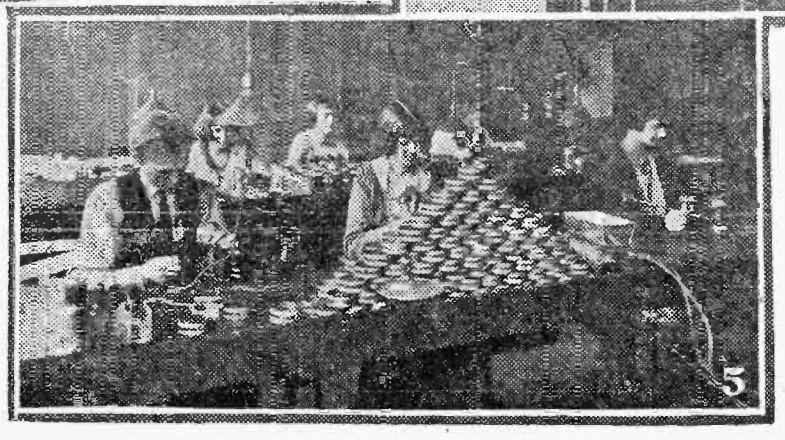


FIG. 1—A part of the assembly department at the Cutting & Washington factory. (2) Testing—The "artificial broadcasting transmitter" is the light-colored box at the left. (3) The Finished Product—Bowden Washington listening to one of the machines, which he designed and supervised the manufacture of, perform on a loud speaker. (4) Drilling Panels—The panels after being cut out to size are clamped in a "jig" consisting of a steel plate with hardened steel bushings where the holes should be. The operator merely inserts the drill thru these bushings and thus does not have to lay out the drilling for each panel. (5) Soldering leads on coils and painting with collodion.

Guide Takes Radiophans Thru Factory

Continued from Page 5.

blasting departments, the latter to produce a mat finish on bakelite pan els and certain other parts by subjecting them to a stream of fine sand forced from a nozzle by compressed air almost like a stream of water from a fire hose.

On the next floor, perhaps, will be the stockroom, to which these various fabricated parts are delivered, to be inspected and issued to the assembly department. Here the coils are wound, the subassemblies and final assemblies are made.

After this the scene is in the wiring department, where many "wire men" work busily. These "wire men" are extremely skilled and will wire a three-tube regenerative receiver, having more than seventy connections, in approximately twenty minutes.

This is efficiency, however, not speed. The wiring, considering the expertness of these men, is slow and careful and, as does the whole set, stands strict inspection and testing.

This means slow and careful wiring and unusually strict inspection and testing. For instance, every bolt and nut in the whole receiver has three separate inspections at various times to insure tightness. The wiring is tested electrically, inspected and each joint put under a severe strain by two or more inspectors. The set is then delivered to the electrical inspectors, who connect it up and listen to a standard signal from an artificial broadcasting transmitter, and by means of "quick-throw" switches compare this signal to that of standard receiver kept in the laboratory and known to be in perfect condition.

This comparison is made with various numbers of tubes in use and of various wave lengths. Then, while the signal is being received, each and every connection of the set is plucked in the manner of a banjo string, under which treatment any loose connection will make a tremendous rattle in the headphones.

This inspector also gives the receiver a final mechanical inspection, and is then delivered to the cabinet-room to be mounted. After this it is made to receive signals once more as a check against any damage while being placed in its cabinet. It is then sealed in paper and delivered to the shipping-room. It is ready to be used.

Radio Service to Japan Operates Continuously

The radio telegraph circuit between the United States and Japan is operated continuously, carrying a large portion of the trans-Pacific telegraph traffic. When the recent disastrous earthquake devastated Tokyo and Yokohama, the radio service was not interrupted.

The first news of the disaster came to the United States over this radio circuit, and for several days thereafter the most complete dispatches describing the extent of the losses and damage came via the Radio corporation service.

There are several Japanese stations working with America. First, there is the Iwaki radio system, owned and operated by the Japanese government, comprising a transmitting station at Haranomachi and a receiving station at Tomioka. The general location of these stations was determined by the comparative freedom of the district from seismic disturbances.

The transmitting aerial at Haranomachi is of the umbrella type, supported by a self-supporting central tower and an outer ring of eighteen spliced, guyed wooden masts at a radius of 1,300 feet. The central tower is a re-enforced concrete tube 660 feet high, 57 feet in outside diameter at the base and fourteen feet outside diameter at the top. The wooden masts in the outer ring are 250 feet high and consist of three sections.

Amateur Aids in Emergency with His Radio

WASHINGTON, D. C., Jan. 10.—In commenting upon radio communication in the annual report of Herbert Hoover, D. B. Carson, commissioner of navigation, emphasizes the service to their community that radio amateurs may give in times of stress and public disaster.

In his opinion the radio relay traffic system of the American Radio Relay league, by which private messages may be dispatched to any point in North America, is no less than an "auxiliary communication system" than can be relied upon when wire systems are out of commission.

This statement has been proved many times in the last year, when storms, floods and other disasters have torn down telephone and telegraph wires in such states as Colorado Wyoming, Oklahoma and Vermont During the telephone strike in New England amateurs were of service While such stations are operated primarily for the amusement of their owners, they can be of great public help on short notice.

"Few realize the importance of our amateur auxiliary communication system," declared Mr. Carson, "which can be put into immediate operation and temporarily provide a means for dispatching trains, giving flood warnings, and transmitting emergency messages to and from sections temporarily deprived of wire facilities.

"There is no abatement in amateur activity. The number of licensed amateur transmitting stations has increased from 15,504 in 1922 to 16,570 on June 30, 1923. Serious effort is being made by the amateurs to improve their apparatus so as to reduce interference and increase the efficiency of their stations. Annually these experimenters conduct transatlantic tests with European amateurs.

Overplaying the Rheostat

When you turn on your rheostats too far you produce a conglomeration of noises that not only spoil your own reception, but that of others in a radius of several blocks. Burn your filaments just bright enough to produce clarity of sound and sufficient volume.

French Phan Sends Relay to North Pole

HARTFORD, Conn., Jan. 10.—An amateur radio message from France to the north pole has covered the farthest distance ever traversed by an amateur relay, arriving safely in the ice-bound cabin of Capt. Donald B. MacMillan's schooner Bowdoin after a 9,565-mile journey across the Atlantic and the territory of four nations.

The same night after M. Leon Deloy at Nice, France, transmitted a message to the Arctic explorer, a repetition of the dots and dashes came in on the headphones of Donald Mix, radio operator for MacMillan, 11 degrees from the pole and inside the aurora.

In order to reach Refuge Harbor, Greenland, the message took a roundabout course across the Atlantic to South Manchester, Conn., where it was received by John L. Reinartz, operating amateur station 1XAM. Reinartz gave the message by telephone to Boyd Phelps of Hartford, operator of 1HX, who relayed it to 6XAD at Avalon, Catalina island, off the coast of California. From thence it was sent to Jack Barnsley of 9B2, Prince Rupert, British Columbia, who finished the relay.

The distance covered by each relay was about as follows: Nice to Hartford, 3,500 miles; Hartford to Catalina island, 2,500 miles; Catalina to Prince Rupert, 1,305 miles, and Prince Rupert to Refuge Harbor 2,260 miles, making the greatest amateur relay mileage.

In this remarkable record the French amateur used two foreign tubes with a twenty-five cycle plate supply and an input of about 400 watts. The receiving set used by Reinartz was home-made with his own type of well-known circuit. Phelps' set was a Tuska 220 receiver. Mr. Mott of 6XAD used a Grebe CR-13 for receiving and a quarter kilowatt tube for transmitting. Canadian 9BP used one fifty-watt tube for sending, while the north pole receiver is a Zenith "1R."

The combined efforts of all of the amateurs concerned make this one of the greatest achievements ever accomplished in the history of amateur radio short wave communication.

U. S. Leads World in Exports of Radio Parts

Exports of radio apparatus from the United States during the first eight months of 1923 were valued at $2,200,000, according to the department of commerce figures. American manufacturers are leading the world in exports of radio instruments.

In August, Argentina led other countries in the purchase of American equipment, the exports to that country totaling $99,059. Uruguay was second with $40,984, while Canada, importing $27,648 worth of apparatus, ranked third. Total exports going to forty-one countries in August amounted to $307,127.

The peak of American radio exports was reached in July, when a total of $682,885 worth of equipment went to foreign countries, and $443,000 of this went to Sweden. The average value of exports is about $270,000, but this figure is influenced considerably by construction of large transmitting stations in foreign lands. August exports of $307,127 were above the average, altho much less than the July figure.

Chicago Amateurs Work Pole

BY EUGENE L. SAHUD.

The amateur radio station 9 RC was heard by Dr. MacMillan, who is located 11 degrees from the north pole, some time between Oct. 21 and Nov. 31. This station, located at 1711 Estes avenue, is operated by nine Chicago youths all under 17 years of age. It is the oldest in Chicago, and has been in the radio game since 1917.

This station developed from a small spark coil transmitter to a 250-watt pure C. W. transmitter. The transmitter, which is used in a Hartly circuit, put 6½ amperes into the antenna, which is forty feet long and eighty-five feet high. A cage lead-in is used on the antenna, which consists of a six-inch cage. The plate is supplied with 4,400 volts of pure B. C. A relay is used, as the key is in the plate circuit. A motor-driven chopper is used for I. C. W.

Many types of receiving sets have been used, but the best results were secured with a Paragon two-step amplifier and a set using one-step tuned step audio-frequency amplification.

The station has been heard 100 miles off the coast of England and in Brazil. It has worked all the districts and carried on a half-hour conversation with Los Angeles.

All of the nine operators belong to the ARRL and to the North Shore Radio club. A complete log is kept of all transmitting done. No C-Qing is allowed and no transmitting is done between 7:30 and 10 p. m.

Two of the operators, Bob Wahlstrom and Fred Clark, who are in Champaign attending the University of Illinois, keep in communication with the home station by a prearranged schedule.

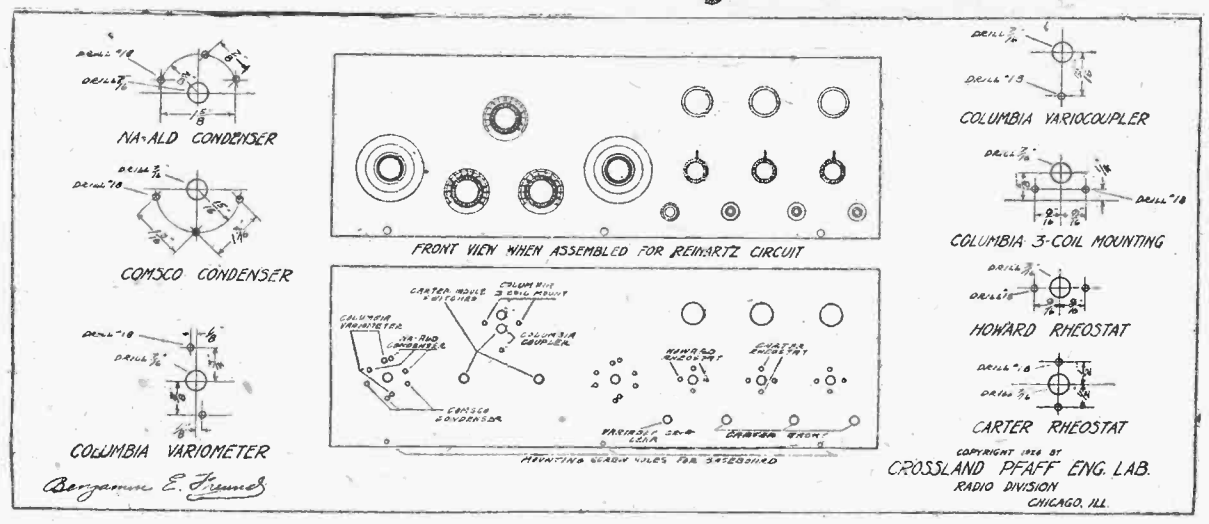
One or two of the following operators can be heard on the air every night: Bob Rogers, Fred Wahlstrom, Jack Kreer, Malcolm McRae, Millard Crittenden, Willard Hagn and Baylor, B. G. I.

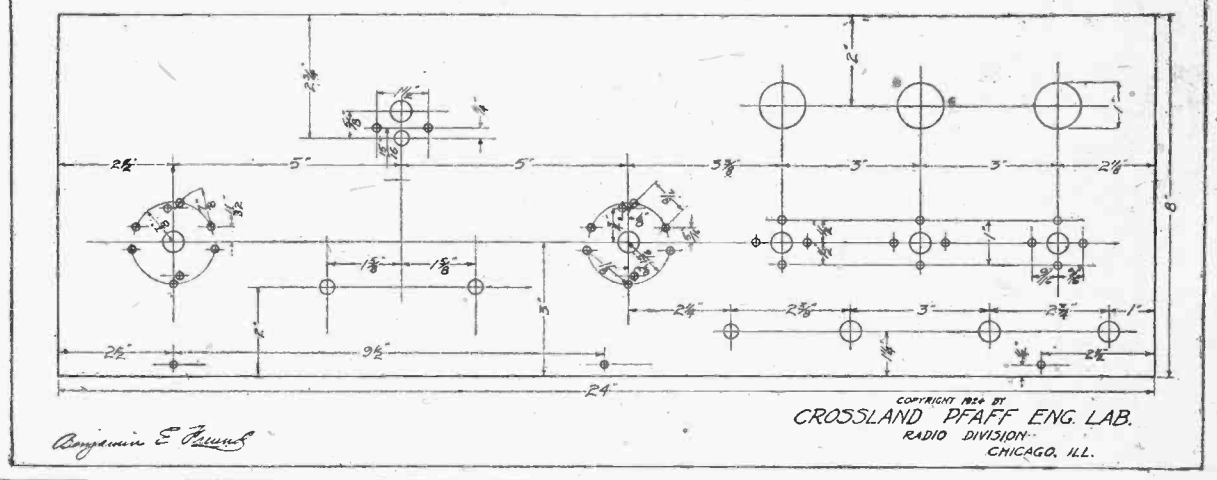
University Takes College to Students by Radio

Actual college study by radio has been started in Oregon by the state university. Certificates are issued to those who listen to a series of twelve lectures. Questions regarding the course are answered by mail. While lectures by professors are a popular feature of the program of most of the large broadcasting station, this is said to be the earliest effort to give a real course by wireless.

How to Make a Universal Panel to Hook Up Any Circuit You May Want to Build

HERE is a real idea—fully protected by a copyright, as Mr. Freund assures us, but still open to any home-builder. It is one of the most helpful ideas The Post has given its readers and you amateur experimenters are going to say it is the one thing you have been waiting for.—The Editor.





By BENJAMIN FREUND.
(Chief Engineer, Radio Division, Crossland Pfaff Engineering Laboratories.)

Being a dabbler with radio all my life and becoming fascinated by various circuits as they are developed and introduced, I have found it quite expensive to fulfill my desire to give the various circuits which have been proven meritorious on trial.

The expense list of a radio enthusiast far exceeds that of all his luxuries combined, tho seldom he is aware of the fact.

Like the end of a perfect dream, generally, he awakens to the fact that he's been asleep and that his interest in radio has caused him to sacrifice many necessities.

Radio fast is becoming a habit with the American people. The industry is growing into permanency and the manufacturers fast are realizing this fact.

The development of new circuits in radio have been so numerous and the introduction of special apparatus so great that the average pocketbook has had a difficult time keeping pace.

The subject has drawn my attention and after giving it great thought, finally I have designed a universal circuit panel which will enable the radio

enthusiast to push forward in his desire more fully to comprehend the mysteries of this ever-fascinating pastime.

If a person should take upon himself to build a Reinartz, or a Flewelling, or a short-wave tuner, either of them would cost at least $35 or $40.

Of course, opinions on circuits differ and tho some circuits appeal to one more than others, there always is a desire of satisfying your opinion or belief by trial.

While some seem to be absorbed in the Reinartz circuit, others are inclined to lean toward the three-coil honeycomb type of set on account of its flexibility in the handling of all wave lengths. Some have taken a liking to the Cockaday circuit.

On the whole, we all would like to give all these meritous circuits a trial, but the expense has kept us down.

If the contents of the remainder of this article and the illustrations be adhered to, anyone may be able to try all of the best and most popular circuits at a cost which is just a little more than what the parts of any one of the circuits would amount to.

Ten circuits which have been the most familiar in the various publications will be described and illustrated in these columns. Only one panel is necessary for all of the circuits. The arrangement of apparatus on the panel has been designed by the writer, so that if any one of the ten circuits is assembled and wired the finished set bears the appearance and impression that the panel was designed especially for that circuit.

When any of the ten circuits is assembled and wired not a single screw hole is visible which is not in use.

In order to enable all the screwholes to be hidden when in use for the various circuits products were chosen of manufacturers whose apparatus was found best suitable and which were proven to be efficient under tests and which could be obtained in most radio stores.

The list of parts as illustrated and tested for the entire ten circuits amounts to $68.04. These are list prices and by shopping around a saving can be had.

Of course other parts might now be on hand and if the drilling or mounting holes are well suited and are within a radius of one inch of the center hole or shaft they may be substituted to fit the discrimination of the user.

The parts used and illustrated in the accompanying drawings are as follows:

1	8x24x3-16 Formica panel	$3.84
1	Columbia triple coil mounting	4.50
1	Columbia 35 twin coil (mounted)	1.50
1	Columbia 50 twin coil (mounted)	1.50
1	Columbia 75 twin coil (mounted)	1.60
1	Columbia 100 twin coil (mounted)	1.75
1	Columbia split variometer	5.50
1	Columbia 180 degree variocoupler	4.50
3	Carter induction switches	6.00
2	Howard or Carter rheostats (20 ohm)	2.20 or 3.50
1	Howard or Carter vernier rheostat (6 ohm)	1.50
2	Comsco or Na-Ald variable condenser (23 plate)	9.00
1	21-tap Reinartz coil	2.50
1	No. 103 Carter jack (filament control)	.90
2	No. 105 Carter jacks (filament control)	2.20
1	variable grid leak	1.35
1	.00025 Erla or Freshman fixed grid condenser	.35
1	.002 Erla or Freshman fixed condenser	.35
3	1-inch Erla bezels	
3	Fireo or Erla indestructible sockets	3.00
2	Thordarson low ratio (3½ to 1) transformers	8.00
7	binding posts	.70
3	Na-Ald 3-inch dials	1.50
1	baseboard for mounting	.50
1	Star-Ko Cockaday four-circuit coil	2.00
		$68.04

It will be noticed that two types of rheostats and condensers are described in the drawings showing the drilling templates for the various instruments. Only the holes for the type of condenser or rheostat which you decide to use or can obtain need be drilled.

For the various circuits which necessitate the use of switch levers and taps, the writer has chosen inductance switches on account of the single hole jacklike mounting and the ease with which they can be removed when necessary.

The more familiar circuits which will be described in these columns and which this universal panel was designed for are as follows:

Reinartz circuit; "Old Reliable" or 3-circuit short wave tuner; ultra-audion; Miloflex; Flewelling; 150 to 20,000 meter 3-circuit tuner; Cockaday; Super-duc, and the Coldyne circuit, a new radio-frequency circuit developed recently by the writer and which is still under experimentation.

Get your panel all drilled this week and be ready to try a different circuit every week, starting next week.

The next article will show the wiring of the first of the ten circuits with detector and two stages of amplification. The detector and two-stage amplifier will be permanent when once wired so that it will be an easy method to change the tuning unit without having to change the detector and two-stage amplifier.

The next article shows how this can be done and how easily one circuit can be changed to another. Any of the readers who cannot wait for the next article may commence on any of the suitable circuits to the best of their abilities.

England Solves Problem of Broadcasting Station

Recent statements of the British postmaster general indicate that a solution has been found to the problem connected with the establishment of the Britsh empire wireless chain.

Not all points connected with the issuance of wireless licenses have been disposed of, but there is every indication that the government has adopted a policy which will permit private radio companies to establish high-power stations both in the United Kingdom and in the colonies.

At the same time the postoffice will proceed with its own plans for a high power station in England. The new postoffice station will be located near Rugby, a site with an area of 800 acres.

Radio Drama Forces New Technique for Acting

Radio dramas have been broadcasted by the WGY station of the General Electric company at Schenectady for nearly a year. During that period the little group of WGY players has had the largest audiences ever before accorded dramatic offerings.

There are at least 2,000,000 radio sets in the country, and of that number 1,500,000 are almost nightly within range of WGY.

From the very first the radio drama has been a success. Edward H. Smith, formerly an actor and director on the professional stage, has been handling this feature of the WGY programs. Mr. Smith and his players have pioneered in the art of the radio drama.

They have had to develop a new technique. It has been found necessary to make occasional changes in play manuscripts, especially where a climax depended upon sight for its appreciation. The entrance to or departure from a room by one of the characters has to be indicated by sound, as a closing door. A bell helps somewhat in announcing a newcomer to the invisible stage. Various sound devices have been created to produce atmosphere. A telegraph key and an imitation of an engine whistle have helped in a railway station scene. Storms have been stimulated by devices similar to those used on the stage.

Schools Hold Spelling Tests by Use of Radio

Interscholastic competition may be a new function for radio, if indications from first experiments at Sacramento, Cal., are upheld by future tests.

Will C. Wood, state superintendent of public instruction for California, recently held a spelling contest by radio, and drew enthusiastic response from forty high schools with some 3,000 senior students as participants.

While every school listened in, the series of spelling tests were conducted from a central broadcasting station.

"Practically all of the schools which took part in the contest have written in asking that I repeat the performance," says Mr. Wood. "I intend to do so, but the next time with a mental arithmetic test."

Hear WBZ Chimes All Over Country

Reports have been received from all over the country that the Springfield, Mass., municipal chimes, which is broadcast every Sunday night by WBZ, is being heard clearly. The chimes as played do not consist simply of the ringing of a bell. Municipal Chime Ringer Ernest Newtown Bagg presents a half hour of musical selections in their entirety.

Worse Than the Dentist

A New York paper says that Ellis Parker Butler recently was pallophotophoned. Some folks not as up to date on radio as they should be immediately wanted to know if the humorist would recover.

Radio Bible Class Has 800,000 Pupils at WJY

Station WJY opened its Sunday program last Sunday with the largest Bible class in the world—for since the inauguration of the radio Bible classes arranged by the board of education of the Methodist church a month ago over 800,000 members form a conservative estimate of its size.

The teaching of the Bible lesson for the week and the musical worship services have proved the most successful method of presentation, and, judging from returns received, Bible classes are far from out of date in the mind of the American public.

Here Is "The Hired Hand" Station You Hear Every Night from Dixie Land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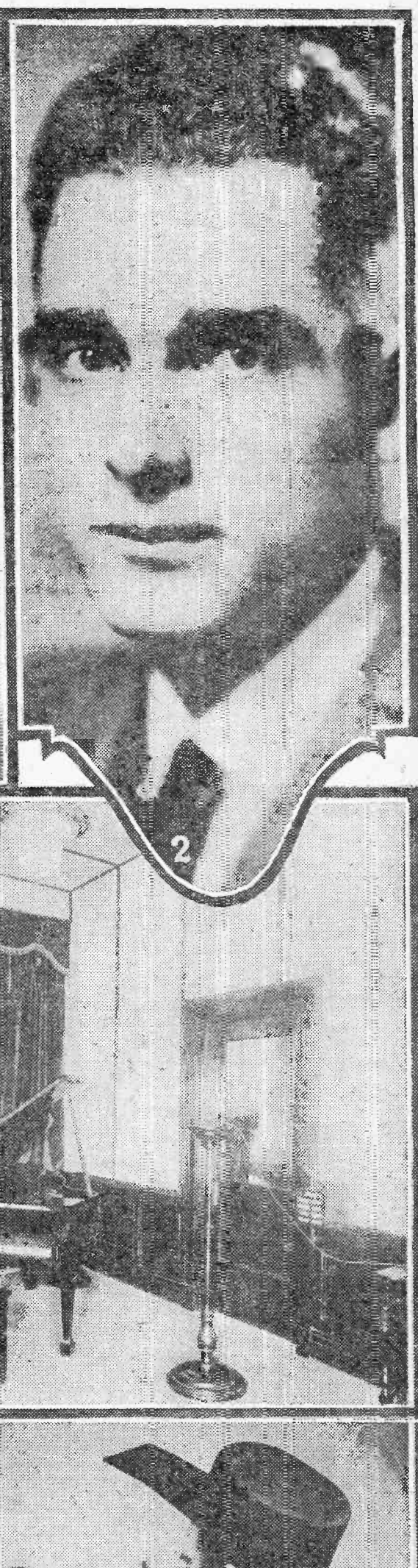
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WE WHO hear "voices out of the air" nightly often wonder what their owners look like. The Post each week is presenting intimate pictures of the popular stations and those who operate them. This week we have our old favorite—WBAP of Fort Worth, Texas. You meet today, not only "The Hired Hand," but his two co-workers.—The Editor.

Fig. 1 is the operating-room at WBAP (Fort Worth, Texas). Fig. 2 is G. C. Arnoux, announcer, who does the regular evening programs. Fig. 3 is E. L. Olds, the market-report announcer. Fig. 4 is the studio of the station, one of the best equipped in the United States. Fig. 5 is "The Hired Hand." He runs the midnight revue and frolic.

CHICAGO broadcast listeners are as familiar with WBAP (Fort Worth, Texas) as they are with any of the local stations, because WBAP "comes in like a ton of brick" and is one of the liveliest stations among those regularly tuned in.

Who hasn't heard of "The Hired Man" and his cow bell? Who has not joined the "Truthful" club?

Next to WDAF and its "night hawk" midnight joymakers from Kansas City, and, perhaps, the "radiowls" from Atlanta, "The Hired Man" announcer at Fort Worth is the one best bet for the midnight prowler who seeks diversion.

Radiophans like pep. WBAP has it.

Once upon a time, Chicago had a station that gave us something about like WBAP and WDAF gives us now. That was when WDAP was owned and operated by Thorne Donnelly and Eliott Jenkins, and "The Sheik" was giving us the midnight vaudeville. However, those are the days that have passed, and so now we must tune out "local interference" and bring in Fort Worth and stations like that.

"The Hired Man" is not so much on good looks, as his pictures elsewhere would indicate. But his co-workers are regular "sheiks." It is doubtful if there is a station in the entire United States that can boast of two as handsome young men as Arnoux and Olds, who do the regular stuff for WBAP.

We don't hear so much from Olds, who does the day schedule mostly, but Arnoux, who announces the regular evening program, has a voice that is as well-known to Chicago radiophans as is a stockyards' smell to south siders.

We get WBAP twice every evening—once early for the regular concert stuff, and again along about 11 until midnight for the late show program. The early program does not come in so good for some reason or another, and when Chicagoans do get it there seems to be a lot of Mexican static—a sort of chile con carne as it were. The late program, however, comes in about as good as any of the near-by long distance stations.

Improving Binding Posts

An ordinary screw binding post can be improved considerably by slotting it lengthwise with a hacksaw. The wire then can be inserted in this slot and the nut screwed down, making it unnecessary to bend the wire. With such a slot cut in the binding post the phone terminals of a radio set and similar tips can be held securely without the danger of slipping from under the nut, or the necessity of obtaining regular phone posts.

South Africa to Build Big Radio at Cape Town

The Wireless Telegraph Company of South Africa (Ltd.) recently was organized to provide international telegraphic service for the dominion. The principal high-power station is to be located at Klipheuvel station, Cape province, about thirty miles by rail from Cape Town, according to advices to the department of commerce. The site comprises about 1,000 morgen (2,110 acres) of farm land and is so located as to be about ten miles distant from any mountains. It is estimated that the station will be in operation in about eighteen months. The power of the new station will be 750 kilowattts and it is probable that it will operate on a wave-length of about 16,000 meters.

The aerials will be supported by sixteen towers 800 feet in height, arranged in the form of a circle having a diameter of one and one-half miles. Beneath this circle an earth screen will be supported on 250 towers forty feet in height. The use of the earth screen was determined as the result of experiments carried on at the Marconi station at Carnarvon, Wales.

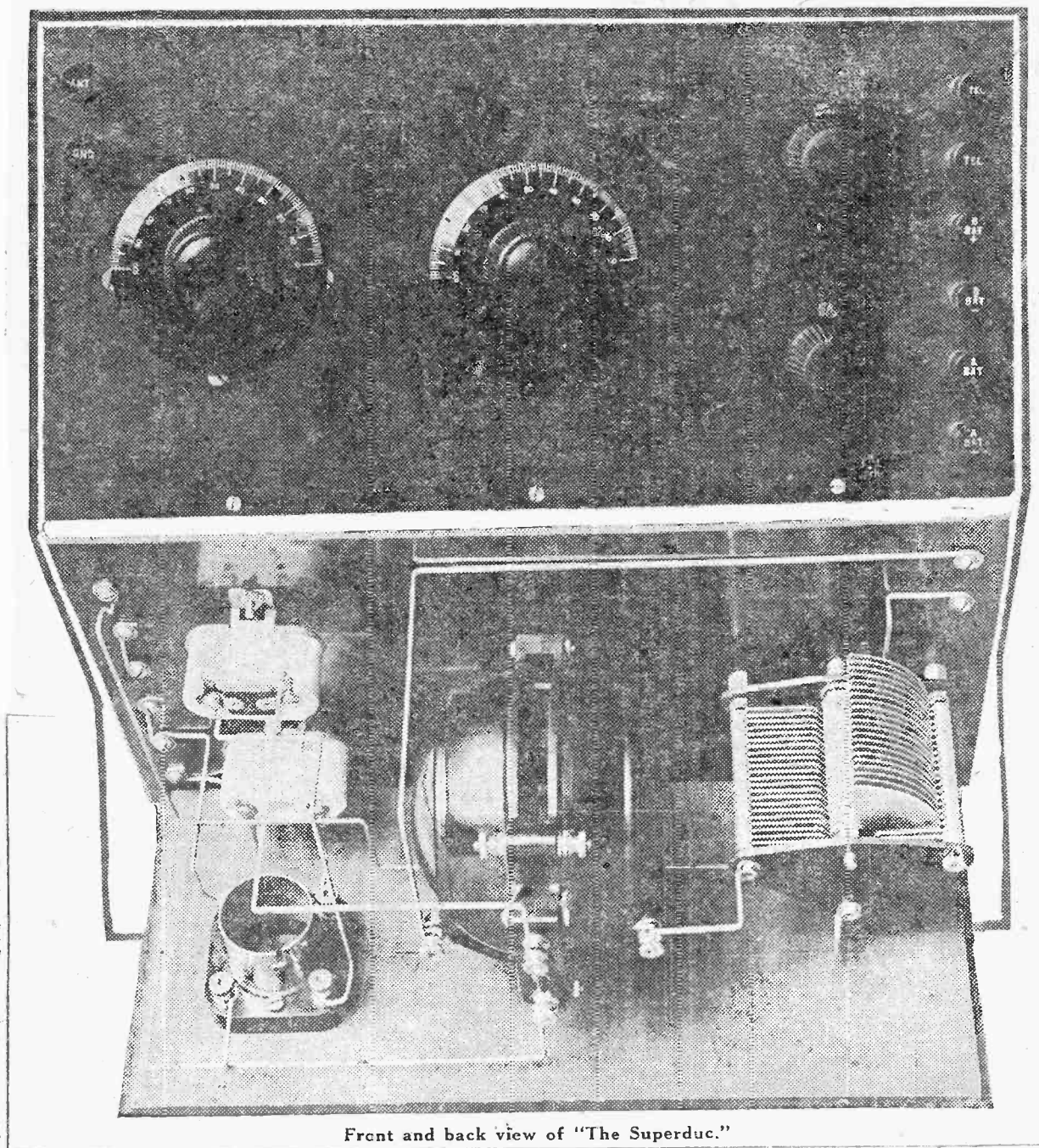
Scrap Wire from Ford Magneto Makes Good Loop

The radiophan with limited means who desires a loop aerial is sometimes up against it because of the high price of such apparatus. Still, as long as necessity is the mother of invention, and as long as we have scrap heaps, the radiophan can at least rig up a substitute for that which he desires.

Expensive stranded or ribbon wire is desirable for use on a loop, and if the experimenter will go to a Ford garage he can get an old Ford magneto field coil for little or nothing. On this field is wound about 200 feet of copper ribbon wire, ¼-inch wide, in 16-foot lengths. This kind of wire is said to be far superior to ordinary wire for aerial purpose, owing to the increased surface it gives to the flow of the radio-frequency currents.

Ribbon wire may also be used to shield panels, connect up your set, and short pieces may be used as connecting links, or battery connectors; therefore, a roll of it should prove a valuable addition to the radio experimenter's hope chest.

"Post" Panel Layout and Wiring Plan for "Post" Experimenters



Front and back view of "The Superduc."

experimental laboratory, a number of makes of apparatus for the set were tested out. The results of these tests proved this:

Any good variable condenser will do. Six makes were tested and with the exception of a defective one using mica dielectric, all worked with approximately the same degree of efficiency. Of course, the more expensive condensers, with smooth-running bearings, made tuning easier. A vernier was not necessary, but helped.

Trouble was encountered with the variometers. This was because some did not have a high enough ratio of inductance or had too much wire on the stator. Variometers could be put in three classes as follows:

Moulded, lattice and skeleton wound and wooden. Of the three the moulded worked best with the lattice a close second.

If the couplings on the lattice, between rotor and stator, had been closer they would have been the best, but it seems as tho the manufacturers are unable to wind their coils with enough accuracy, so we'll have to wait until they do before they can be used on a circuit that requires any high degree of accuracy.

Variometer Is Critical.

Among the moulded variometers there were several well-known and accurately made types that had too much wire. This was corrected by shunting different capacity condensers across the rotor. Be sure when buying that you specify sixty turns on the stator and sixty turns on the rotor. A few less won't hurt, but more prevents reception of the low wave lengths.

Several variometers also were constructed poorly and great trouble was experienced with loose bearings and cracking of the composition when the connections were tightened up.

With the wooden variometer the results varied. Some of the better types gave results that were as good as the best, but it was hard to find a good one, so you must be careful here.

The lattice-wound, as I have said before, were nearly as good as the moulded, but without exception the stator had from a quarter to three-eighths of an inch clearance. Aside from this they averaged O. K. Very good results were obtained with a skeleton-wound variometer, but these are hard to get and expensive and added results are not worth it.

When I tackled the grid leaks I was up against some problem, as there were eight different makes and these varied so much in size, construction and principle the task was tremendous, but I was determined to know the truth and nothing but the truth, so I dived in.

If Jack Nelson of WDAP only knew the tricks those leaks played with his enchanting voice he sure would advocate every phan buying a good one. Four of the eight absolutely were useless, two more were doubtful and the others good.

The rheostats were easy and, to a certain extent, made up for trouble encountered with the grid leaks. Nearly all seemed to be the product of a great deal of thought and true industry.

I guess the difference in quality between the grid leaks and rheostats is due to the fact that nearly any Tom, Dick and Harry can make a pencil or India ink grid leak, while it takes real engineering and mechanical skill to make a rheostat.

Suffice it to say that nearly any good rheostat will do. A vernier is not necessary, but is a good thing to have.

The Panel and the Tubes.

As for the panel, most anything except wood or cardboard will do. As a caution I might mention that if the parts are mounted experimentally on a wood baseboard, care should be taken to insulate them from the wood.

For a tube the UV-200 worked best. The dry cell tubes were efficient, but required forty-five volts of "B" battery in the majority of cases. Be sure to have the correct ohmage rheostat for your tube.

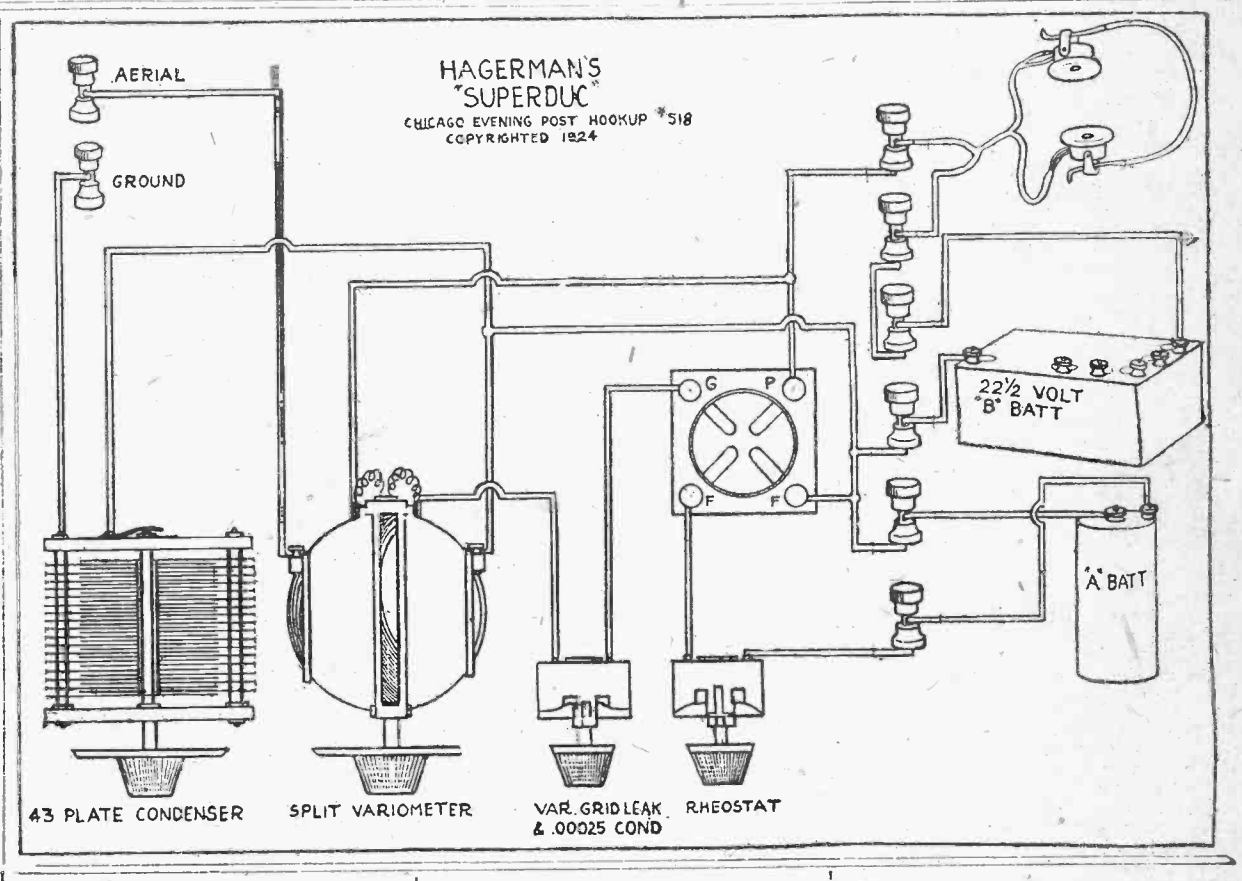
Naturally, in the course of these tests, many peculiar things were discovered and next week I will give you several different variations of the Superduc to try out.

The accompanying diagrams and photographs show a Superduc I made to illustrate the manner of mounting the parts in order to get the utmost efficiency from them and make the simplest wiring. Do not think because I used the parts shown that they are the only ones that can be used. Any good standard parts that live up to the foregoing specifications will do.

On the panel layout the position of the parts is shown. No mounting holes were given for the variometer and condenser because of the fact that no two instruments use the same. Be sure to solder all connections and keep the wires as far apart as possible.

To tune the set turn the variometer and condenser until a station is heard. Then very slowly adjust the grid leak. This is very important and the proper care must be taken to get the correct adjustment.

While listening in Monday night, or rather Tuesday morning, I heard Montreal and, by a slight adjustment of the leak, Los Angeles could be heard. This illustrates the importance of the grid leak.



Length of Horn Controls Volume of Loud Speakers

"The Acoustics of Loud Speakers" is discussed, among other things, by Mr. Nyman in the Journal of the American Institute of Electrical Engineers. "Speech and music are both modified considerably, depending upon the length and shape of the horn, also on the volume of the sound," states this authority. "A horn longer than one-quarter wave length of the lowest pitch available gives the best reproduction.

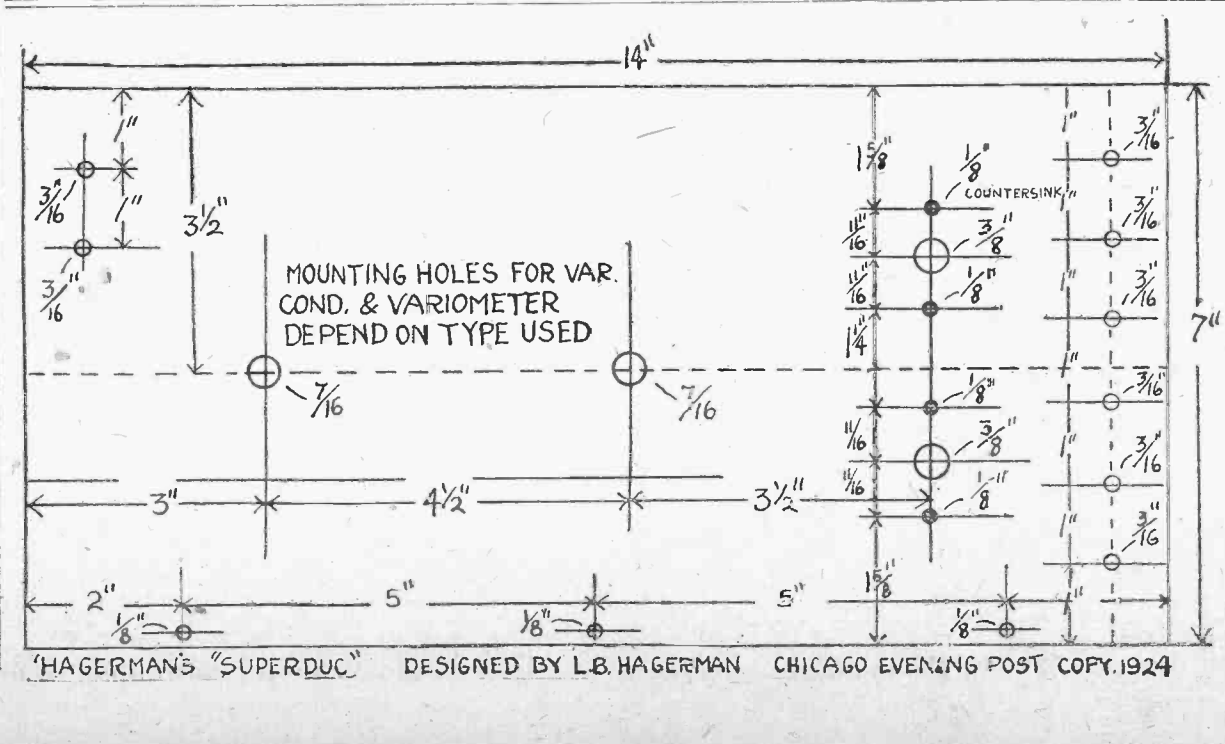
"However, in practice the length of the horn seldom exceeds three feet, approximately one-fourth of the wave length of ninety cycles, the fundamental of the horn. If the horn is shorter than one foot (270 cycles fundmental) the bass and barytone voices are likely to be distorted, since their fundamental, which is below 270 cycles, would be reduced. It has been found that a loud speaker with a magnetic balance and a horn about two feet long is capable of very good reproduction of even very low frequencies.

"Careful study has been made of materials to be used in diaphragm and in the horns in so far as it affects the quality of reproduction. Aluminum or micarta diaphragms apparently give the best results, while a wood horn or horn made of some 'dead' material like hard rubber is least likely to introduce a strange quality."

U. S. Estimates 145,000 Farmers Own Radio Sets

The speed with which farmers have taken up radio for practical and social purposes is shown in a recent survey made by the United States department of agriculture. County agricultural agents estimate that there are approximately 40,000 radio sets on farms in 780 counties. This is an average of 51 sets per county. Applying the average to 2,850 agricultural counties, a total of more than 145,000 sets on farms thruout the country is estimated.

Keep your set clean. It will repay you with better service. The condensers especially should be free from dust.



Keeps Two-Way Radio Talk

While speeding westward at a 120-mile-an-hour rate, Airmail Pilot Jack Knight, in his radiophone-equipped plane, convinced officials of the post-office department and enginers of the Westinghouse Electric company that two-way radio telephone communication between an airship and the field was possible.

Jack Knight left Omaha, bound for North Platte, one of the regular stops on the transcontinental air route, on a test flight early this week. Eugene Sibley, radio traffic supervisor of the United States airmail service, was his only passenger. The radio equipment in the plane had been tested previous to his taking off, and found to be in perfect operating condition.

The Airmail field at Omaha, which is the headquarters of the superintendent of the western division of the air-mail service, had been chosen by General Superintendent Carl F. Egge as the place at which the new one-kilowatt radiophone transmitter was to be installed.

Location Ideal for Tests.

As Omaha is practically the mid-point on the New York-San Francisco journey, the location of this powerful unit is ideal from a point of centralized communication east and west. It was by means of this specially designed and built set that the officials of the Airmail field at Omaha kept in touch with Knight's plane as he was flying to North Platte.

For nearly three hours, that is, the time it took for the pilot to fly between the United States Airmail fields at Omaha and North Platte, signals were exchanged between the speeding airship and the men in the radio-room of the Omaha field. A schedule had been worked out, whereby the pilot would "report" to the division superintendent the progress of the plane as it speeded across Nebraska. The voice of the pilot was received clearly, and was received on a loud speaker in the radio-room of the field, so that Superintendent D. B. Colyer, special assistant of Postmaster General J. V. Maggee; Mayor J. C. Dahlman of Omaha, R. L. Davis, radio engineer of the Westinghouse Electric; members of the press, and many others followed the progress of the plane with a map.

Great Aid to Air Service.

When the postoffice department undertook to transport mail by means of airplanes, the necessity for some means of communication between fields, and between planes and fields, was plainly apparent. In fact, the need of a radio communication circuit for such purposes was well appreciated by Second Assistant Postmaster General Paul Henderson as far back as 1919, when the earliest air mail service experiments were performed, using a radio direction finder.

Since then many developments have been made by the department, and more recently tests have been inaugurated between flying planes and fields, In November, 1922, were begun the experiments which culminated in the demonstration held at the Omaha field nearly a year later with gratifying results.

Due to the farsightedness of Second Assistant Postmaster General Henderson, and to the vision of E. B. Mallory, radio manager of the Westinghouse Electric company, the air service was able to conduct the first satisfactory experiments in communicating between the field and the flying plane.

Limits Range of Set.

The problem of communicating between plane and ground is a very peculiar one. Due to the technical limitations of the radio apparatus because of its reduced size and weight and its operation with reduced antenna facilities and available power, the range of the aerial set is necessarily limited.

To reach the speeding plane from the ground has been equally as difficult. Due to the noise of the engine, local interference picked up by the receiver from the ignition and other electrical circuits of the motor, the use of a comparatively poor antenna system and the limitations of the equipment in the plane, the accomplishment is no small one.

The thousand-watt transmitter used, which was specially designed and built for the air mail service of the post-office department, is the first to be installed at any of the air mail fields. The range of the transmitter is estimated at about 300 to 500 miles daylight, and up to 1,000 miles at night. By means of this transmitter it is possible for superintendents at the fields to talk to any of their pilots while the plane is in flight between fields as these are less than 500 miles apart. The radiophone equipment will no doubt be an adjunct to night flying, and will make that service much safer.

THE HOME WORKSHOP

Short Grid Leads

Where variable grid leaks must be mounted on the front panels because of the critical adjustment certain circuits demand of this instrument, so mount your detector tube, either on the panel or baseboard, so that the lead from the grid terminal to the grid ox shall be the shortest possible.

Phones Have Polarity

Nearly all the standard telephone receivers and loud-speaker units have positive and negative terminals. This is a fact few radiophans seem to appreciate. If you are not getting the volume you expect, try changing terminals on the phone posts or plug.

Aids Unit's Tone

If there is a rattle in the phone unit used as a loud speaker, carefully remove diaphragm and place a washer of thin cardboard underdeath. Replace diaphragm and screw down the caps of the receiver until quality of tone is best.

Home-Stranded Aerial

An aerial of exceptional efficiency can be made by twisting four strands of bare copper wire over a manila rope core.

Insulates Aerial Wire

Employ two insulators at each of your aerials, separating them by a few inches of cable. This makes doubly sure of nonleakage.

San Juan's Only Radio Station "Ditches" Phans

It is estimated that about $50,000 has been spent in radio sets and equipments during the last few months by radiophans and radio students in and near San Juan, and who are now complaining of not getting any service out of their sets.

It is nearly three months now that the broadcasting station in San Juan has remained silent, and the thousands of radio fans over the island have given up hopes of obtaining any service for their costly receiving sets.

There are at present more than 1,000 radio sets distributed all over the island and more than three-fourths were installed during the period when the Radio Dealers' association sent out radio programs from the broadcasting station located on top of the Telephone building.

The story goes that the Radio Dealers' association in the town has been unable to come to any reasonable understanding as to how the expense of broadcasting programs is to be distributed among themselves, as well as among other dealers who refuse to share the expense. Some of the well-established dealers desire to pay as much as those who are newcomers in the business, and hence the misunderstandings and present static position of radio broadcasting. In the meantime, those phans who save enough to buy what they believe an overpriced radio set, sit idly at home brooding over their ill fortune when they bought their $15 to $175 sets.

Bulgaria Shows Interest in Radio Communication

Business circles in Constantza, Bulgaria, are much interested in a projected wireless telegraph plant. The present radio station at Constantza is used for little more than the distribution of shipping intelligence.

The bankers and shippers generally want not only telegraph and telephone (wireless) connections with western Europe, but also with Constantinople, the Piraeus and Odessa.

The project for the construction of such a station has secured the approval of the Bulgarian ministers of communications, finance and industry and commerce, and, with a certain supply of German material on hand, it is expected that the new enterprise will soon take definite form at a cost of approximately 800,000 lei.

New York Tests Rented Wired Wireless Receivers

There recently was given the first demonstration of commercial wired wireless broadcasting, as applied to electric light wires, on Staten Island New York city. The studio is not unlike the usual radio studio. The output, instead of going to an aerial and ground connection is delivered to the electric wires passing by the studio.

The wired wireless broadcasting company is planning an eighteen-hour daily program. Electric light users can subscribe for the service, in which case they are furnished with a compact receiving set which is attached to any electric light socket or outlet by means of the conventional plug.

The lowest subscription rate provides for a crystal set and head phones, while the highest rate provides for a loud-speaker set.

If the Staten Island installation works out successfully, both technically and commercially, the idea eventually will be extended to other electric light systems.

Prize Awards For Useful Suggestions

THE POST offers $1 for every accepted and published suggestion made by readers which will enable the home builder to improve his work.

A special prize of $3 each week is made for the best of these suggestions.

Send your entries to Workshop Editor, care Radio Dept., Chicago Evening Post. Inclose pencil sketch if necessary to convey idea.

IMPROVED CATSWHISKER.

A strip of tin foil one inch in length and three-quarters of an inch in width is cut into prongs resembling the teeth of a hair comb. The strip is rolled into a small tube or cylinder and placed in the catswhisker support of the crystal detector. With the "teeth" spread apart and resting on the crystal, it makes quite an improvement over the ordinary whisker.

CHARGING EDISON BATTERY.

The voltage of an Edison battery on LOAD is the only good means of indicating the state of charge. This should not be allowed to drop below 0.9 volts on normal operation, altho the battery may be entirely discharged without damage.

AS TO FADING.

When a station "fades out" after it has been tuned in there is no use trying to find it by shifting the tuning dial. By waiting a few seconds, the station will come in again with maximum intensity.

SWITCH ON "B" BATTERY.

A switch in the "B" battery circuit is advisable in order to eliminate any chance of short-circuiting the "B" battery while changing connections or otherwise working on the set.

THREE STAGES OF AUDIO.

When building three-stage amplifiers it is best to use all three audio transformers of the same ratio—not over 3½ to 1.

PHONES NOT LOUD SPEAKERS.

Telephone receivers are not intended for loud speakers and when forced to work as such distort badly.

How to Test Polarity of Your Storage Battery

A simple method of determining the polarity of a battery or cell, and at the same time roughly measuring its strength, it as follows: Dissolve one part of potassium iodide in twenty-five parts of water; place the solution in a shallow dish, soak several pieces of white blotting paper in it, then remove them and allow to dry. To use, moisten a piece of the prepared paper and touch it with wires leading from both poles of the battery, keeping them about one-half inch apart. A dark-brown spot will immediately be produced where the wire from the positive pole touches the blotter. A dead cell or battery will produce no spot. A little experience in judging the rapidity with which the spot is formed, and the shade of the color produced, will soon enable one to tell the condition of the battery fairly accurately, whether it is nearly dead, half charged, or fully charged. This method is applicable to both storage batteries and dry cells, altho the wires must be farther apart in the case of storage batteries.

TIP ON REAMING.

When using a larger sized drill as a reamer, always grind the cutting edge away at right angles to the flutes, instead of the usual sharp edge. This prevents the drill from tearing things, altho it will cut slower.

SET MAKES "STATIC."

There is more good static generated by loose connections—in the receiver lead wires and mainly in the contact arm of the detector rheostat, than is produced by accumulation of clouds.

BATTERIES ARE VITAL.

"A" and "B" batteries require renewal once in a while—and perfect performance depends mainly on the "A" and "B" battery supply.

EXPECT LESS, GET MORE.

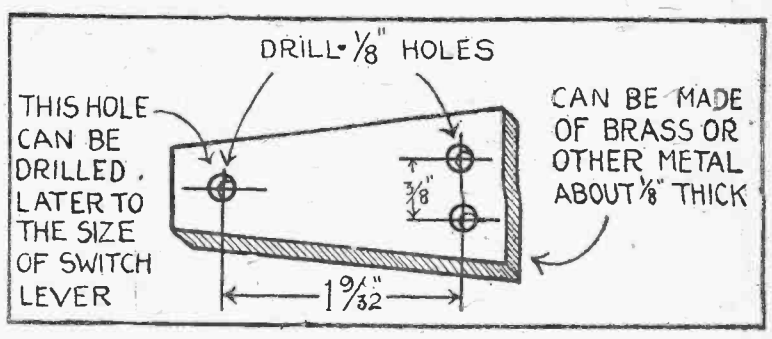
You can get more out of radio by being satisfied with just a little less than the outfit will give.

TUNE IN ONE PROGRAM.

There is nothing to be gained in shifting from one station to another—and thereby annoying those listening with you. Your guests will be more pleased with a real program from one station than snatches from half a dozen.

GROUNDED TRANSFORMERS.

Transformer cores should be grounded even if the instrument is shielded.



HERE is a handy little tool for the amateur radio builder. It is a template for drilling the holes for the attenna inductance switch and switch points.

Note the accompanying sketch. By drilling switch hole first, then the template can be can be attached to the panel with one of the switch-points. The first hole is drilled and one of the switchpoints can be put in then. The next hole is drilled and the plate is moved up one hole and drilled. This keeps the switchpoint evenly spaced and is a complete circuit.—J. DUSHEK, 2440 Princeton Ave., Chicago.

Panel Layout for Simple Hook-Up of Armstrong Three-Circuit Regenerative Receiver Set

THIS is the last of the series of articles on the Armstrong three-circuit regenerative circuit. The panel layout for the seven-by-thirty receiver is shown and also a completed set is illustrated of the deluxe hook-up, using the eleven-by-twenty panel described last week.—The Editor.

By IVERSON C. WELLS.
Radio Editor, The Chicago Post.

YOU WHO have been waiting for the simple panel layout of the Armstrong three-circuit regenerative circuit are being accommodated today. The accompanying sketches show the location for the various instruments and the necessary data on drilling.

There is not much more to say. The same instructions about wiring given last week on the other panel layout will fit in very well on the present layout.

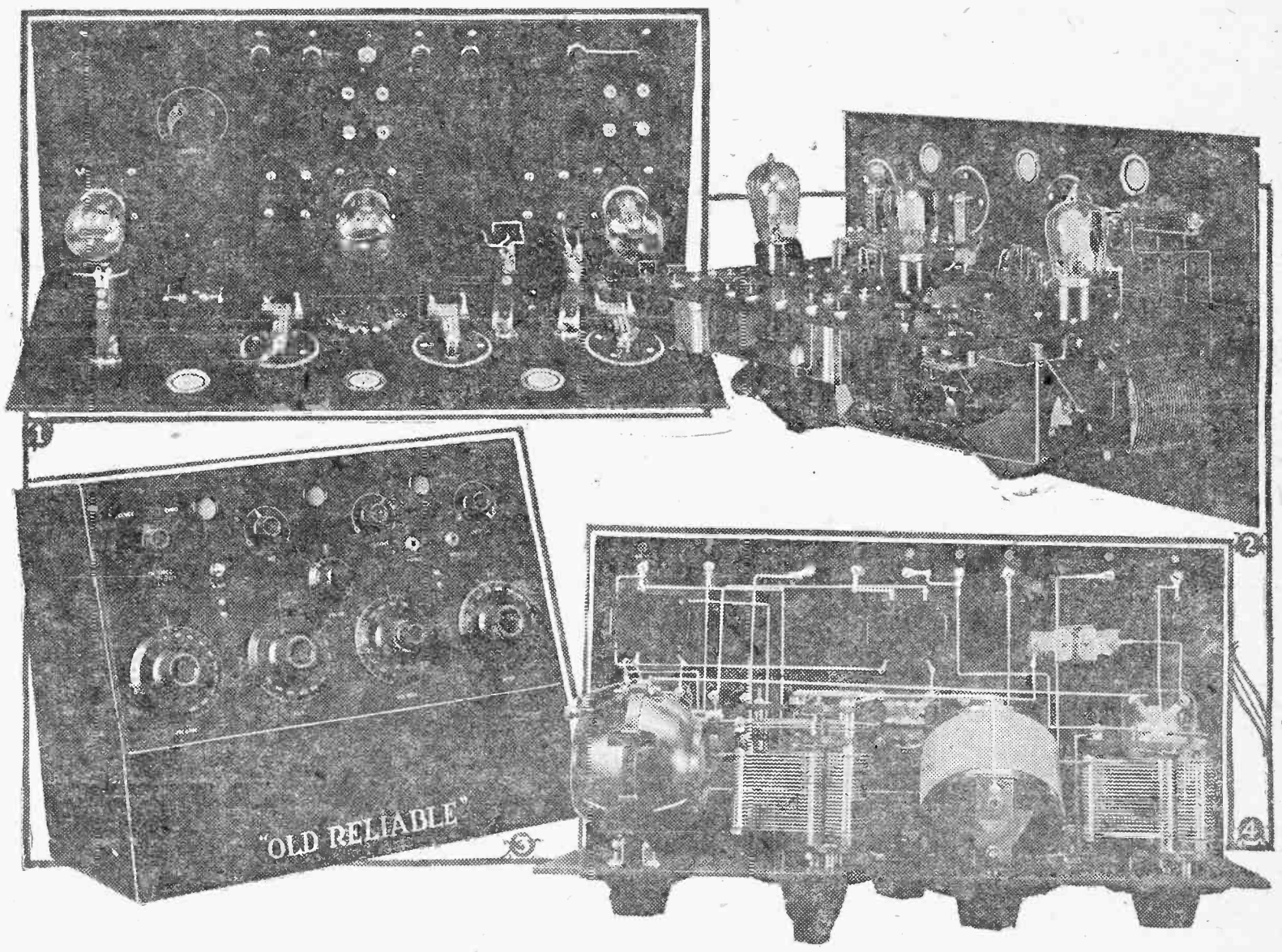
You will note that on the shelf panel layout I have failed to indicate the holes for the transformers. This is because different instruments require different holes. The same is true on the front panel. Only the center or shaft holes are shown for the main instruments.

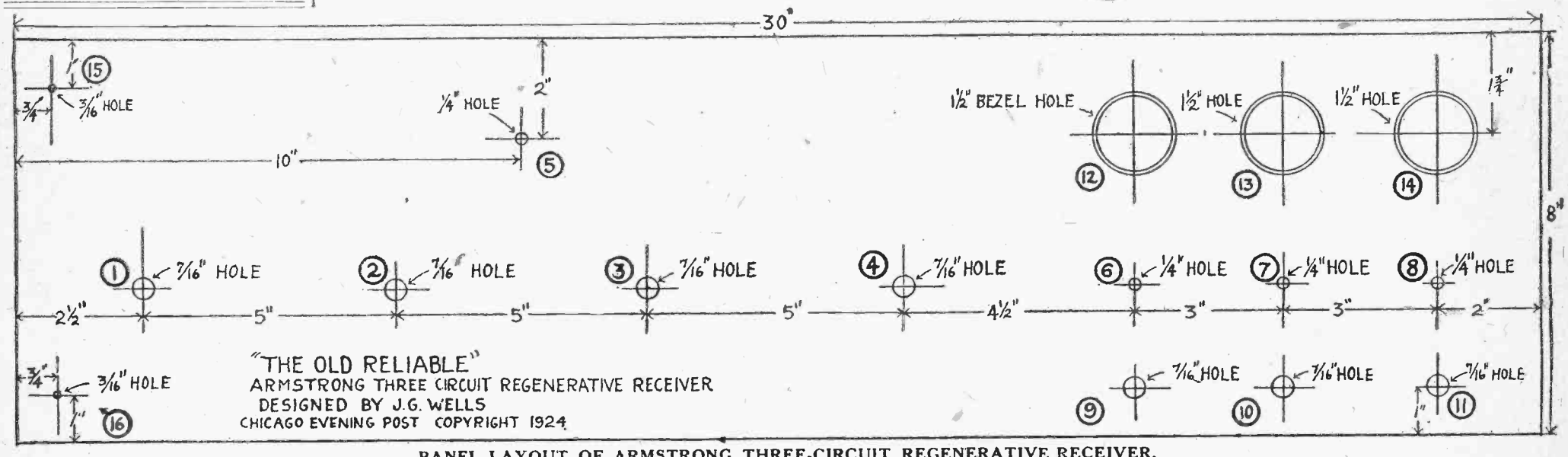
It looks as if about half the nation is building this set, judging from the letters that are pouring into The Post each and every mail.

Like every circuit there are successful builders and unsuccessful builders. However, most builders are meeting with wonderful success and the few failures that are reported are due to faulty workmanship and not to the circuit.

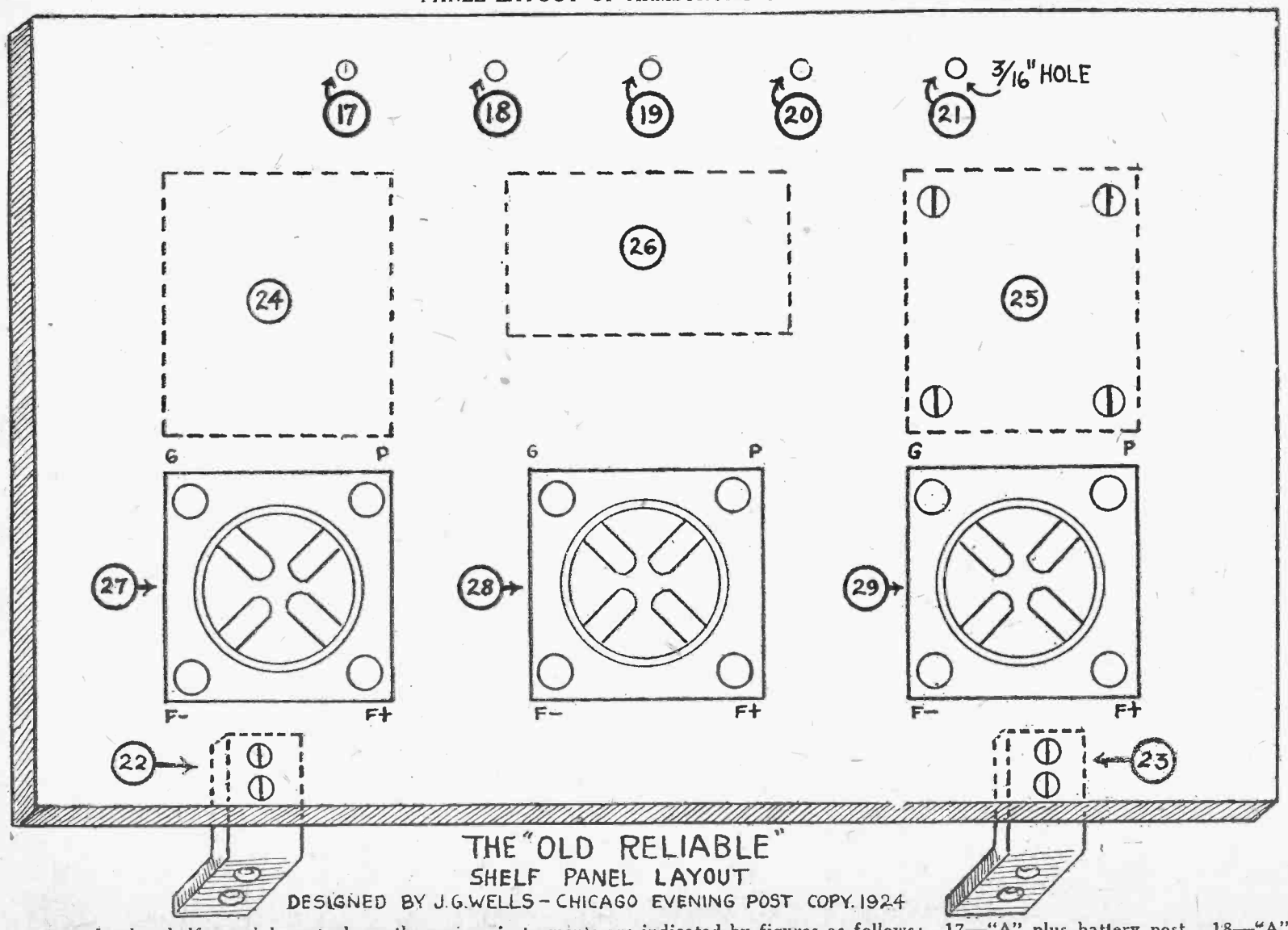
Leave Well Enough Alone

Once you get your set working well, leave it alone. It will continue to give good results.





PANEL LAYOUT OF ARMSTRONG THREE-CIRCUIT REGENERATIVE RECEIVER.



In the shelf panel layout above the various instruments are indicated by figures as follows: 17—"A" plus battery post. 18—"A" minus battery post. 19—"B" minus battery post. 20—"B" plus, 22½-volt, battery post. 21—"B" plus amplifier battery post, 90 volts. 22, 23—Mounting brackets of heavy brass one-eighth-inch thick. Set to clear instruments after being temporarily mounted. 24, 25—Audio-frequency transformers, 5-1 and 3-1 ratio. Transformers are mounted underneath shelf. Screw holes should be countersunk fairly deep, so as not to touch sockets. 26—Gridleak and .00025 condenser. 27, 28, 29—Tube sockets.

In the panel above the various instruments are indicated by figures, as follows: 1—Primary condenser, 43-plate, plain. 2—Coupler, secondary. 3—Secondary condenser, 43-plate vernier. 4—Plate variometer. 5—Primary inductance. 6—Detector filament control. 7—First amplifier control. 8—Second amplifier control. 9—"A" battery switch. 10—Detector and first stage output for phones. 11—Second stage output for loud speaker. 12, 13, 14—Bezels for tubes. 15—Aerial post. 16—Ground post.

Questions You Ask and Answers We Give

GOOD HOOK-UP.

1044—CHICAGO: I would like to know the best hook-up for a one-tube set, consisting of one variocoupler, one variable condenser (23 plate), one rheostat and one .00025 M. F. condenser.

Refer to No. 513 in hook-up column.

MORE RESULTS.

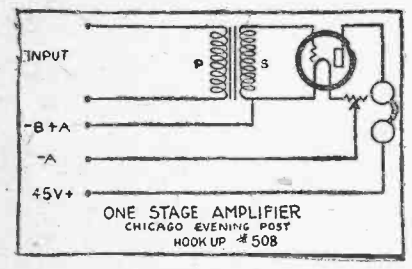
1045—FORT DODGE: I've been reading with a lot of interest what you have been saying about your Old Reliable. In fact, you have me much disgusted with my radio-frequency detector and two-stage amplifier. I'm listening to Atlanta just now, but there are a lot of others I can't get as I want them. My set is located in my office, which may be the reason some of my results aren't good. I'm on the seventh floor of an eight-story office building. If I build a set in accordance with the diagrams you have published and use WD- 12 tubes, UV-199 or De Forest 1-A tubes, what sort of results can I expect. Which of the three tubes I mentioned will give the best results? Can you mail me drawings in scale for the panel, sub-panel, placing of the various parts? If you can I'd surely like to have them. I understand the proper placing and spacing has a lot to do with the working of the set.

UV 199 tubes with the proper bias "C" battery would be the best of the three types of tube mentioned. The information you wish will appear in this and subsequent issues of the Radio Magazine.

VARIOMETER CONSERVATION.

1047—CHICAGO: A friend has given me his discarded variometer which needs new wire on both windings and will you please give your advice on a couple of points regarding the variometer. It is a Workrite make. What kind of "stickum" or glue do you suggest I use to hold the stator winding in place, same being wound on the inside of mold. Diameter of both windings is approximately 3½ inches and how many turns are necessary for each winding, the variometer to be used in an ultra-audion set? Will variometer give greater selectivity than 150-turn coil having eleven taps that I now use? Is the stator or the rotor the input winding? Your reply will be appreciated and favor reciprocated whenever possible by a new subscriber for your mailing list, as your paper well deserves willing missionary work by its readers.

Any good radio cement can be used to hold the stator winding of a variometer in place. There should be sixty turns of No. 22 wire on the stator, that is 30 on both sides, and the same amount of No. 24 wire on the rotor. A variometer will give better results than a tapped coil in the ultra-audion set. The stator should connect to the aerial, the rotor to the grid and 23-plate condenser.



Q. & A.—1522: A one-stage amplifier that can be added to a tube as well as to a crystal set. A five-to-one transformer is used.

ULTRA-AUDION TROUBLE.

1319—COAL CITY: I am using the enclosed hook-up, and would like to inquire from you what all is wrong with it, and how it can most readily be improved. It was originally an ultra-audion, but I made certain changes and removed certain parts. The grid leak, for instance, seemed to have no effect whatever on the reception, so I removed it entirely, after trying it at various places and at all capacities from 0 to 5. The lead from the minus B to the ground had no effect either, so I removed it. I have two stages of amplification, and am able to get the Chicago stations very distinctly (with head phones), and without interference one with another, but am unable to get outside of Chicago. The variometer is lattice wound, in a wooden frame, and has about 75 turns on the rotor, and apparently about the same number on the stator. The detector tube is a UV-200, and the two amplifiers are UV-210-A. I have a 6-volt storage battery, and 90 volts of B battery. The detector rheostat is a 6-ohm Howard vernier, but the vernier is of no use, because I have to keep the rheostat turned on full to get the signals loud enough to be heard properly. The amplifier rheostats are 25-ohm, and work best when turned on one-third to one-half full. I am using 100 feet of 16-strand, insulated wire for an aerial, strung thru the house, and sometimes permit 20 feet or so of it to hang out the window. Am living on the second floor of a two-family flat in Austin. The set works practically the same without any aerial whatever, as with the one I am using. Will you please tell me (1) what to do to the set to get a fair degree of distance, (2) why the detector rheostat must be turned on full to get any volume, while the amplifier rheostats seem to work best when not turned on full, (3) whether radio-amplification can be added, and if so, how, and (4) give me the hook-up for a good nonregenerative set, preferably a reflex circuit.

The answers to your questions are as follows:

(1) Rewire it as per No. 507 in hook-up column. (2) The hook-up used was incorrect. (3) Radio-frequency amplification on a circuit of this wind is not advised. (4) A hook-up for a reflex circuit was given in answer to question 1.

MORE REFLEX.

1474—CHICAGO: I have no radio material of any description, but have fully decided to build a single-tube reflex receiving set. Will you kindly send me wiring diagrams of a complete hook-up for the above set, also a complete list of every part I will need to get to build a set which will deliver maximum efficiency when properly assembled? This is not an experimental effort, as I have been a close reader of the different circuits, and believe the single-tube Reflex will give the service I am looking for. I have room here for a 100-feet aerial.

The hook-up of reflex is given in hook-up column No. 505. The list of parts you request appears in answer to Q. and A. No. 1509.

CRYSTAL AMP. WITH JACKS.

1522—CHICAGO: Inclosed is a diagram of set I am using. I would like to put in one stage of audio with Baldwin unit. Kindly tell me what parts and changes I will have to make. I am using tube C-300 and would like to use a jack for plug. Your magazine is just what I have been waiting for. It fills the bill.

The diagram of one stage of A. F. with jacks appears in hook-up column No. 525.

REINARTZ R. F.

1319—COAL CITY: Will you kindly send me a drawing of the Reinartz circuit, using one-step radio-frequency detector, and two stages of audio-frequency. Am using UV-199 tubes. Kindly give me ratio of transformers and value of equipment to be used. I desire to use jacks on detector, and each stage of audio. Would a "C" battery be of any value in this circuit? If so, kindly include same in diagram.

I enjoy the radio department of The Post.

The diagram you request has been mailed. A "C" battery is not necessary.

ONE-STAGE HOOK-UP.

1512—CHICAGO: I have a Radiola Sr. receiving set, after which comes two stages of amplification, which I believe is called audio-frequency. Is that the right name? How may I add additional amplification and would this be practical to receive farther stations?

Audio-frequency is the right name for the type of amplification you refer to. An additional stage can be added, as per the diagram, given in hook-up column No. 508, altho distortion might result.

FREE SERVICE

QUESTIONS asked on any subject pertaining to radio will be answered in this department in either the daily edition or the Radio Magazine published each Thursday. No charges are made for this service.

Due to the immense volume of letters being received by the Question and Answer department, the following restrictions must be made:

All letters must be plainly written in ink and preferably typewritten, and only on one side of the paper.

Drawings, hook-ups, etc., must be on a separate sheet from question and clearly drawn, showing values of parts.

Do not ask for panel layouts, construction details, etc., for a set unless they have appeared in the columns of this magazine. Self-addressed and stamped envelope must be inclosed. Address all your letters to Radio Questions and Answers Department, The Chicago Evening Post, 12-14 South Market Street, Chicago.

FLEWELLING HOOK-UP.

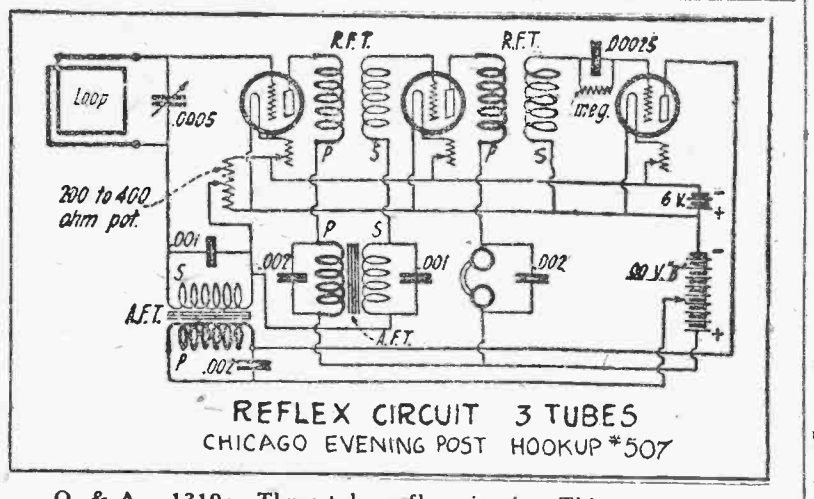
1037—CHICAGO: I am submitting Flewelling hook-up we are using. We are not getting the results we ought to get. Would be very pleased if you could improve on this hook-up or send us a correct one for these parts and a hook-up for a two-stage audio-frequency amplifier and where same should be connected to detector circuit. Am a constant reader of your radio section, and, as you have helped many others, I am hoping that you will also help me out.

The hook-up you request was mailed you.

SUPER-HETERODYNE RECEIVER.

1038—CHICAGO: After seeking help from other mediums I now find that there is a real "honest-to-goodness" radio supplement to The Chicago Evening Post, and after waiting "several" weeks for a little information from another paper, I will ask if you will be so kind as to give me your opinion on the model C super-heterodyne receiver, three stages tuned radio, two stages audio, two detectors, oscillator using UV201-A thru out. The Experimenters Information Service of New York build this model C receiver. (1) Do you believe this the last word in radio reception, or the "Rolls-Royce of Reception" as they term it? (2) Do you consider this receiver capable of receiving any phone station in the United States or better? What is the approximate range under ordinary conditions, using outside aerial? (3) Was it this model C receiver that received English phone stations during the transatlantic tests, or was it a specially constructed super-heterodyne receiver?

(1) The set you refer to is surely the "Rolls-Royce of Radio Reception," but, of course, it requires a thoro knowledge of the principle of radio and its application in order to get the maximum results. (2) The range of this set is from 2,000 to 4,000 miles. (3) In the tests you mention we take it for granted a model C was used. It is not likely that a misrepresentation would be made, as these were official tests.



Q. & A.—1319: Three-tube reflex circuit. This can be used on loop and is very selective.

NEUTRODYNE HOOK-UP.

1523—CHICAGO: Have a one-tube set, but want to make a three-tube neutrodyne. Please send hook-up, using, if possible, a Hilco vario-coupler, fixed crystal and Erla No. 1 radio-frequency transformer. If not possible please send hook-up of regular set, using any of the parts mentioned that will work. I am inclosing an addressed envelope for reply. Thanking you as a radiophan, I congratulate you on your versatile paper.

Hook-up for a three-tube neutrodyne set that you request appears in hook-up column No. 503.

REFLEX PARTS.

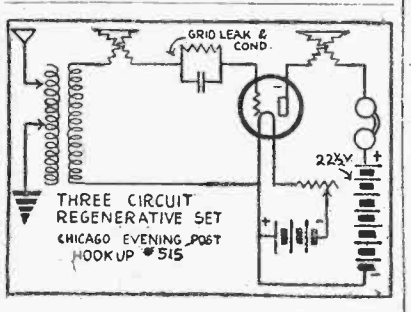
491—CHICAGO: I am a regular reader of The Post and would like to build a one-tube reflex receiving set. I have no radio equipment of any kind. Will you please send me, in the inclosed envelope, a complete list of the parts and equipment I will have to get to build a maximum efficiency set? Also kindly send a wiring diagram and oblige.

A diagram for a Reflex one-tube set is given in hook-up column No. 505. The list of parts necessary is as follows: One variocoupler, one twenty-three-plate variable condenser, one 6½ to 1 audio-frequency transformer, one No. 1 Reflex transformer, one socket, one twenty-five-ohm rheostat, one fixed crystal detector 3-.001 condenser, 1-200 ohm pot, one 7x14-inch panel, eight binding posts, fifteen feet of No. 14 bus bar wire, two three-inch dials, one UV-201-A tube, two 45-volt "B" batteries, four dry cells, one pair of phones, baseboard, screws, etc., aerial, lead-in and ground wire.

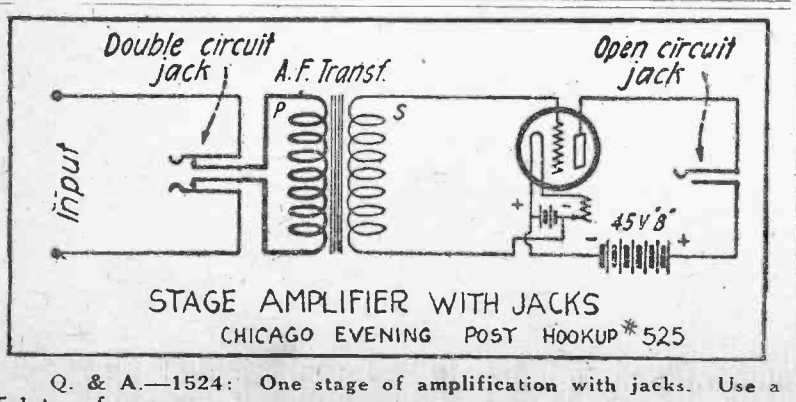
RHEOSTAT OHMAGE.

1043—FREEDOM, PA.: I enjoy reading The Post Magazine, as it's the best on radio. I would like to ask your advice on following:: (1) Will inclosed hook-up give good results? (2) What is your personal opinion of the Sun radio? (3) What causes loud roar on second-step jack? Can't use head phone on second jack. Detector and first-step jack are O. K. Am using 10 to 1 and 2 to 1 transformers, C-301A tubes with six-ohm rheostats; have ordered thirty-ohm rheostats.

(1) The circuit mailed us will work O. K. (2) Our opinion of the Sun radio set is favorable. Tests made in our laboratory have proved it to be an efficient receiver. (3) The hum on the third stage you mention is due to the fact that you are using six-ohm rheostats on UV-201A tube.



Q. & A.—1040: A three-circuit set using two variometers and a coupler. This is Armstrong's original hook-up.

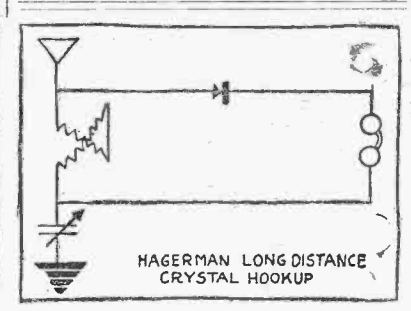


Q. & A.—1524: One stage of amplification with jacks. Use a 5-1 transformer.

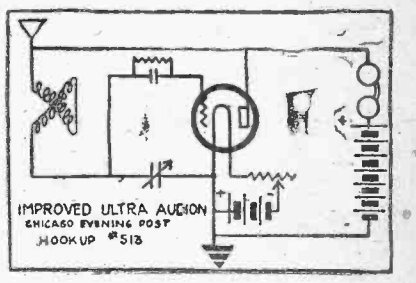
THREE-CIRCUIT HOOK-UP.

1040—CHICAGO: I have a modified hook-up of the Reinartz circuit furnished by a local company. Am using the tapped coupler with 2-23 plate condensers and a WD-11 tube. Local stations come fairly good, but outside ones not clear. Would you please send me a copy of the Armstrong circuit?

The hook-up you request appears in hook-up column No. 515. Kindly refer to it.



Q. & A.—1035: Above appears the Hagerman crystal hook-up. A 43-plate condenser and molder variometer are used.



Q. & A.—1044: The above is an ultra-audion using a variometer. This is a very efficient hook-up and fine for the beginner.

PARTNERSHIP ANTENNA POOR BUSINESS.

1039—CHICAGO: Am writing to you to ask a favor. I have a four-wire antenna seven feet above gravel roof of a two-story brick house. I pull off two wires and my tenant upstairs pulls off two of these wires; we both made our own crystal sets and got good results. At times we had Zion City and KDKA, East Pittsburg.

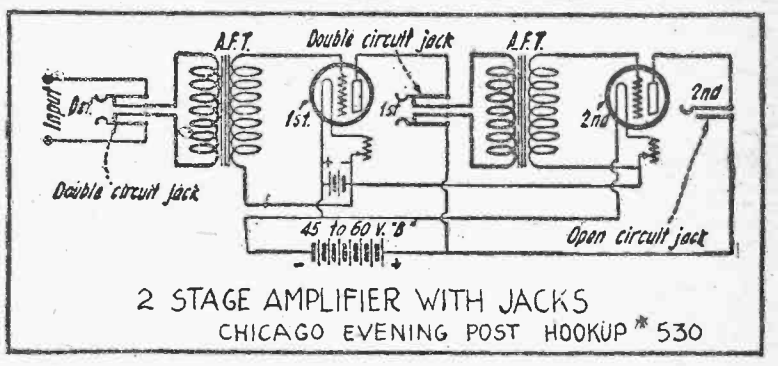
But now the trouble begins. My tenant made a Zenith three-tube set and whenever he tunes in I get nothing but screeches, catcalls, whistling and what not. Even when he has local stuff, I get mine very faint. I have crossed and recrossed my equipment with no better results.

The antenna wires are spaced 12½ inches by 16½ inches and 12½ inches apart, 48 feet long, lead-ins are ½-inch galvanized pipe, driven about 5 inches in the ground, 18 inches apart and wires clamped to them with regular ground clamps.

Will we be bucking one another, if I hook-up a three-tube set, which I hope to get eventually? I have been waiting for the final information on that Armstrong set that you were going to print on Dec. 27, but will have to prolong the agony another week, or wait your pleasure for final information. All set on an Armstrong nothing else.

I will state that the neighbor to the north of me has his antenna in the center of the building, running due east and west, the neighbor to the south has one six-wire running northeast to southwest and one north and south 75 feet south of me; mine runs southeast to northwest; closest point to neighbor on south is about 12 feet. He has a five-tube set neuterdyne set from which we were receiving out-of-town entertainment.

As long as your aerial runs parallel to and within twenty feet of your neighbor's aerial, you are going to be bothered by re-radiation from his set, whether you use tube or crystal. Would advise running aerial at right angle to other two on roof and keep it as far as possible from both.



Q. & A.—509: A two-stage amplifier with jacks. Use 5-1 and 3-1 transformers.

CRYSTAL HOOK-UP.

1035—CHICAGO: I would be pleased to receive your diagram covering crystal set with which loud speaker can be used.

The diagram you request appears in hook-up column.

OLD RELIABLE DATA.

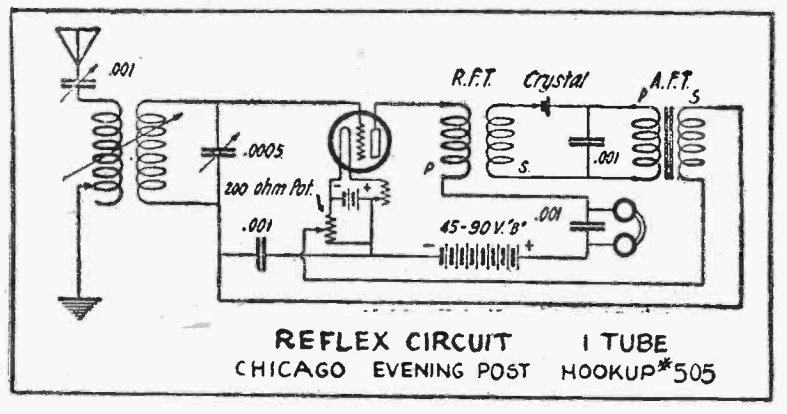
1042—CHICAGO: Have followed your hook-up of "Old Reliable" and find I have two condensers, both vernier, but one only twenty-three-plate. Can this be used, and, if so, in which position? Can UV-199 tubes be used on this set? Is there much chance of the government stopping the use of regenerative sets?

The condensers you mention can be used in "Old Reliable." Use the twenty-three across the secondary of your variocoupler. UV-199 tubes may be used if the proper "C" battery is inserted. We have never heard of the government attempting to stop the use of regenerative sets. We do not understand why or how this could be accomplished, as there is no law prohibiting the construction or use of a regenerative receiver if it is for your own personal requirements.

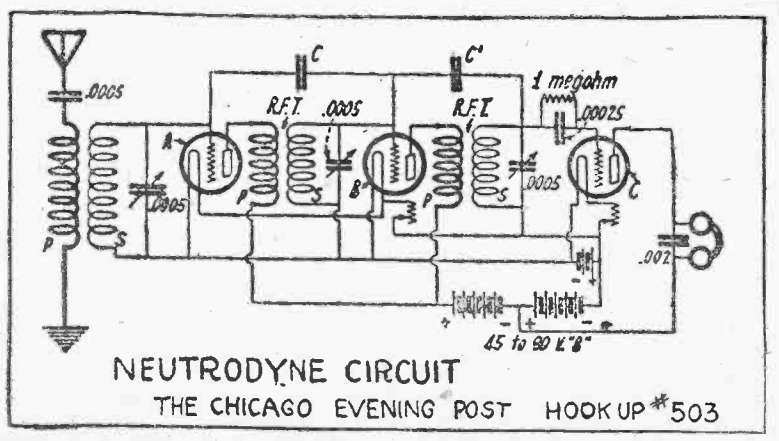
AUDIO-FREQUENCY.

1509—CHICAGO: Hook-up No. 1 is the one I am using. Hook-up No. 2 is the one my brother-in-law is using. Which should give the best results? Will you please add to this sketch one step of audio-frequency and two steps of radio-frequency? Is this the best amplifying hook-up for this receiving hook-up? What ratio transformer would be the best, and mark down size of rheostats and additional "B" battery voltage. Would two steps of audio-frequency give just as good results as the one of audio and two of radio-frequency? If it would, please submit that unit instead. Could I use one step of audio-frequency and have it function, for the time being?

In answer to your questions regarding two hook-ups submitted, hook-up No. 1 would be slightly better. An additional 22½ volts of "B" battery would improve both sets. We would not advise two steps of radio-frequency on your hook-up. A diagram showing two stages of A. F. amplification appears in hook-up column No. 530.



Q. & A.—494: This is a good reflex set. It can be built using any standard parts.



Q. & A.—1523: Three-tube neutrodyne receiver.

REFLEX VOLUME.

1036—CHICAGO: I am building a reflex set as shown in hook-up below. Will this set operate a loud speaker on local stations?

The hook-up you mailed us will operate a loud speaker on local stations.

MORE VOLUME.

1034—CHICAGO: I have an Armstrong regenerative circuit made by the Tuska Radio company. It is a 225 model, an 11-plate variable condenser and varicoupler and two stages of amplification. Could you tell me how to improve this set without adding another stage of amplification and what you think of this set, or would you rather have the hook-up?

There is no method to increase your volume except by adding audio-frequency amplification. If you wish to increase your range and make your set finer tuning, add a good wave trap.

Tank Apparatus Costly

Some beginners in radio construction make the mistake of buying cheap parts, with a mistaken idea of economy. Poorly designed apparatus is the most expensive in the long run.

Today's Radio Programs

Continued from Page 3.

a. m., market reports; 10:30 a. m., financial news and comment; 10:58 a. m., naval observatory time signals; 11 a. m., market reports; 11:05 a. m., weather report; 11:30 a. m., news and comment of the financial and commercial market; 11:35 a. m., table talk by Mrs. Anna J. Peterson.

Evening—6:30 p. m., News, financial and final market and sport summary furnished by the Union Trust company and Dun's review; 6:50 p. m., children's bedtime story; 8 to 8:20 p. m., twenty minutes of good reading by Rev. C. J. Pernin, S. J., head of department of English, Loyola university, Chicago; 8:30 to 9:30 p. m., musical program furnished thru the courtesy of the Bush Conservatory of Music; also Herbit Mintz, pianist, and "Sen" Kaney, KYW'S music maker.

WAAF—Located at Union stock yards; 286 meters.

Day—Live stock reports at 8:40, 10:30, 10:45 a. m., 12:30, 12:45, 4:30 p. m.

Evening—No schedule.

WMAQ—Located on Hotel LaSalle; 447.5 meters. Miss Judith C. Waller, station director.

Thursday—4:30 p. m., program of series arranged by Illinois Federation of Woman's Clubs; 7 p. m., weekly talk to Boy Scouts; talk by Rockwell R. Stephens, auto editor of the Daily News; 7:45 p. m., opera, "Cavalleria Rusticana," "Pagliacci."

WJAZ—Located on Edgewater Beach hotel; 447.7 meters. E. Warren Howe, program director.

Day—This station has no regular day schedule.

Evening—10 p. m. to 2 a. m., Florence K. White, soprano; Laura K. Eiberg, pianist; Banjo James, banjo; Oriol orchestra; "Sobbing Blues"' "Susie," by Oriole orchestra; "Morning" (Speaks), "A Dream" (Bartlett), by Florence K. White; piano solos, selected, by Laura K. Eiberg; "Sextette" ("Lucia.") (Donizetti), "Southern Medley," by Banjo James; "Sunflower Maid," "Wonderland of Dreams," by Oriole orchestra; "By a Broken Brook," (Coleridge-Taylor), "Shepherd Love" (Manahan), by Florence K. White; piano solos, selected, by Laura K. Eiberg; "Georgia Moon" (Barron), "Beautiful Rose" (Hearst), by Banjo James; "Drifting Back to Dreamland," "So This Is Venice," by Oriole orchestra; "Come and Trip It" (Handel), "Marcheta" (Schertinger), by Florence K. White; piano solos, selected, Laura K. Eiberg; "Sobbing Blues" (Kassel), "My Dream Moon," Oriole orchestra.

WDAP—Chicago Board of Trade, located at Drake hotel; 390 meters.

Day—9:30 a. m., 10 a. m., 10:30 a. m., 11 a. m., 11:30 a. m., 12 noon, 12:30 p. m., 1 p. m., 1:30 p. m., quotations and market reports direct from the Chicago Board of Trade.

Evening—10 p. m., Chcago Conservatory of Music, Jack Chapman's orchestra.

WPAD—Formerly on W. A. Weibold's & Co.'s School street and Ashland avenue.

Notice—This station has closed and is being moved to Armour institute, where it will be operated by the radio department of that institution.

WSAH—Located at 4801 Woodlawn avenue; 248 meters.

WSAX—Located on Chicago Radio laboratory; 268 meters.

SUBURBAN STATIONS

(Central Time Is Shown.)

WCBD—Zion, Ill.; 345 meters; J. H. Depew, station manager.

Day—2:30 p. m. to 3:45 p. m., sacred solos and duets, and an address either by Wilbur Glenn Voliva, general overseer of the Christian Catholic Apostolic church in Zion, or one of his representatives.

WCAY—Milwaukee, Wis; 261 meters: No silent nights.

Day—1 p. m. to 4:30 p. m., special concert; novelty and test programs as announced.

Evening—7:30 p. m., regular concert program.

WHAD—Marquette University, Milwaukee, Wis.; 280 meters:

Wednesdays—At 7:30 p. m. only.

WIAB—Rockford, Ill.: 252 meters: Wednesday and Friday evenings; Monday evening, 9 p. m., MacDonald's Melody orchestra, in latest hits; Friday evening, 8 p. m., vocal and instrumental selection; Sunday, 12:30 p. m., religious service by the Rev. Toykmann and choir of the Mission Tabernacle church.

WJAN—Peoria, Ill.; 280 meters: Daily except Sunday.

Day—9 a. m., live stock market; 9:15 a. m., weather; 11:30 a. m., Chicago, Peoria and St. Louis live stock and grain markets; 1:30 p. m., Chicago and Peoria grain and produce markets; United States agriograms.

Evening—Tuesday and Thursday, special musical program to be announced by radiophone.

WRM—Urbana, Ill., University of Illinois; 360 meters: 8:50 to 9:30 p. m., lectures and news.

WTAS—Elgin, Ill.; 286 meters.

FOREIGN STATIONS

CKAC—Montreal, Canada; 430 meters:

Day—12:30 to 2::30 p. m., Rex Battle and his Mount Royal Hotel Concert orchestra; 3 p. m., musical tea; 3:30 p. m., news, weather and stock reports; 6 p. m., kiddies' stories in French and English; 6:30 p. m., Rex Battle and his Mount Royal Hotel orchestra; 7:30 to 9:15 p. m., studio entertainment; 9:30 to 11:30 p. m., Joseph C. Smith and his Mount Royal Hotel Dance orchestra; late news.

PWX—Havana, Cuba; 400 meters: Jose Isquierdo, chief operator; Urbano del Castila, program director; Remberto O'Farril, announcer; regular broadcasting nights, Wednesday and Saturday, 7:30 to 10 p. m., central standard time.

TSF—Paris, France; French Post and Telegraph department, 103 Rue de Grenelle, Director, M. G. Valenst; assistant, M. Chanton; 400 meters; 500 watts:

Daily except Tuesday at 2:21 p. m., Tuesday at 1:51 p. m., music, classical theater and a course in English literature; Tuesdays, a course in the Morse code. Every ten days, scientific lectures.

OUT-OF-TOWN STATIONS

Eastern Programs.

(Central Time Is Shown.)

KDKA—East Pittsburg; 326 meters:

Day—8:45 a. m., Union live stock market reports furnished by the National Stockman and Farmer; 10:55 a. m., Arlington time signals; 11 a. m., weather forecast, United States bureau of market reports furnished by the National Stockman and Farmer; 11:10 a. m., noonday concert; 5:15, dinner concert.

Evening—6:30, farmers' period; 6:45, children's period; 7:15, farm feature; 7:30, orchestra, artists.

WBZ—Springfield, Mass., 337 meters:

Day—10:55 a. m., Arlington time signals; weather reports, Boston and Springfield market reports.

Evening—6:30 p. m., children's hour; farmers' period; 7 p. m., concert; 8 p. m., bedtime story for grown-ups.

WCAE—Pittsburg, Pa.; 462 meters:

Day—11:30 a. m., news, weather reports, reading of daily program; 2 p. m., special orchestral program by the Allegheny Troubadours; 3:30 p. m., stock market reports, Sunshine Girl and Uncle "Kaybee," news; 5:30 p. m., dinner concert transmitted from William Penn hotel.

Evening—6:30 p. m., Uncle "Kaybee"; 7 p. m., silent period; 7:30 p. m., concert by "Bunny" Laughman's Kifights of Tempo.

WEAF—New York city; 492 meters.

Day—10 a. m., market reports by American Agriculturist and United States department of agriculture; 1:40 p. m., Elizabeth Garrett, dramatic soprano, and other musical program to be announced.

Evening—6 to 11 p. m., midweek services under the auspices of the New York Federation of Churches; United Cigar Stores Daily Sport Talk by Thornton Fisher; radio talk by John V. L. Hogan, consulting engineer; Arthur Mason, well-known author, to tell "When the Radio Came to the Bogs of Ireland"; Emma Morris, dramatic soprano; Vernon Archibald, barytone; special musical program to be announced; talk by the Bank of America; musical program direct from the recording studio of the Columbia Phonograph company; one-act play by the Ever-ready Entertainers under the auspices of National Carbon company; 11 p. m., program by Gimbel Bros.; Vincent Lopez and his orchestra direct from the grill of the Hotel Pennsylvania.

WHN—New York city, Lowe's State broadcasting station; 360 meters:

Day—1:15-2:30 p. m., Walter Richardson, tenor, singing "Immigration Rose" and "Mickey Donahue"; 1:30-2 p. m., musical program, to be announced; 2-2:15 p. m., Ann Austin, singing popular songs; 2:45-2:55 p. m., Sara Gould singing his own composition, "Hugo"; 2:55-3 p. m., Buddy Truly singing "I'm Going South" and "More"; 3-3:10 p. m., Fritzi Leyton singing "I'm Sittin' Pretty"; 3:10-3:15 p. m., Lew Pollock and Sidney Mitchell singing "How My Sweetie Loves Me" and "Midnight Rose"; 3:15-4:15 p. m., Oresto and his Pekin orchestra from the Peek Inn Rest; 4:14-4:30 p. m., Harry Romaine, tenor, singing popular songs.

Evening—8:30-9 p. m., Lou Gold's Wigwam Club orchestra; 9-9:15 p. m., Ann Austin, singing popular songs; 9:15-9:45 p. m., Melo Club orchestra, Dave Reisch leader; 9:45-10 p. m., Ross Fowler, barytone, singing "Supposing," "Chansonette," "Kiss in the Dark"; 10-10::30 p. m., Maurice Klein's Collegians orchestra; 10:30-11 p. m., musical program, to be announced.

WGI—Medford Hillside, Mass.; 360 meters:

Day—11 a. m., program of selections on the Edison laboratory phonograph and by the Ampico in the Chickering; 11:40 a. m., New England weather forecast, furnished by the United States weather bureau; 11:45 a. m., closing report on farmers' produce market report; 12:30 p. m., closing stock market reports, furnished by Elmer H. Bright & Co., members of the New York and Boston stock exchange; agriograms furnished by the United States department of agriculture; live stock market reports.

Evening—Lecture, music.

WHAZ—Troy, N. Y.; 330 meters: This station broadcasts only on Monday evenings.

WGY—Schenectady, N. Y.; 380 meters:

Silent night Wednesday

Day—10:55 a. m., time signals; 10:30 a. m., stock market report; 10:40 a. m., produce market report; 10:45 a. m., weather forecast; 5 p. m., produce and stock market quotations; news bulletins; 5 p. m., news, markets.

Evening—7:45 p. m., musical program, piano solo, "Second Arabesque" (DeBussy), by Paula E. Smith; soprano solos, "Miss You So" (Strickland); "Were My Songs with Wings Provided" (Hahn), by Beatrice Zollinger, Paula E. Smith, accompanist; violin solo, "Minuet" (Schubert), by Thomas F. O'Neil, Joseph F. Dwyer, accompanist; contralto solos, "Sunshine and Rain" (Blumenthal), "Sorta Miss You" (Smith), by Lorena A. Kehoe; two-piano number, "Sous Bois" (Victor Staub), by Paula E. Smith, first piano, Edith I. Kehoe, second piano; soprano-contralto duets, "I Know a Bank Whereon Wild Thyme Blows" (Horn), "The Sweetest Story Ever Told" (Stults), by Beatrice Zollinger and Lorena A. Kehoe; address, Hon. Leo N. Doody, commissioner of charities and overseer of poor, Albany, N. Y.; violin solo, "Andante" (Wienawski), by Thomas F. O'Neil; contralto solos, "O dry Those Tears" (Del Riego), "Springtime of the Year" (Rusk), by Lorena A. Kehoe; piano solo, "Music Box" (Liadow), by Paula E. Smith; soprano solos, "There's a Lark in My Heart" (Spross), "Two Little Stars" (O'Hara), by Beatrice Zollinger; violin solo, "Caprice" (Brahms), by Thomas F. O'Neil; contralto solos, "Homing" (Del Riego), "I Heard You Go By" (Wood), by Lorena A. Kehoe, piano solo, "Sequidilla" (Albenzi), by Paula E. Smith.

WGR—Buffalo; 319 meters:

Day—9:45 a. m., weather forecast for Buffalo and western New York; 11 a. m., weather, produce and live stock market reports and agriograms from the United States department of agriculture; 11:30 a. m., organ, dining-room Hotel Statler, George Albert Bouchard, Zampa Overture (Herold), "By the Waters of Minnetonka" (Thurlow Lieurance), "Chorus of Angels" (Scotson Clark), "Since We've Met Again" (Harold Dixon); 1:30 p. m., closing prices of Chicago Board of Trade; 2:30 p. m., closing prices of New York Stock exchange; 3 p. m., tea-time music, Palm room, Hotel Statler, Miss Martha Gomph, harpist; Miss Catherine Stang, violinist; 5:30 p. m., dinner music, Vincent Lopez, Hotel Statler, dance orchestra.

Evening—6:30 p. m., Digest of the day's news; second broadcasting of all daily reports; industrial employment bulletin; the American boy story.

WJY—New York city; 405 meters:

This station broadcasts only on Sundays at 2:30 p. m. to 6 p. m.

WJZ—New York city; 455 meters: No silent night.

Day—2 p. m., organ recital on the Hotel Astor organ, by Leo Riggs, by direct wire from the Hotel Astor; 3:45 p. m., concert.

Evening—6:30 p. m., dinner music from Hotel Adelphia Concert orchestra, A. Candelori, director.

WOO—Philadelphia; 509 meters: Silent Sunday, Tuesday, Thursday, Friday and Saturday evenings.

Day—10 a. m., grand organ; 10:30 a. m., United States weather forecast; 10:55 a. m., United States naval observatory time signals; 11 a. m., luncheon music, by the Tea Room orchestra; 3:45 p. m., grand organ and trumpets; 4 p. m., sports results and police reports.

Evening—Silent.

WOR—Newark, N. J.; 405 meters:

Day—1:30 p. m., Louise Masline, soprano; 1:45 p. m., violin selections by Francis Mayer; 2 p. m., continuation of soprano solos by Louise Masline; 2:15 p. m., violin selections by Francis Mayer; 2:30 to 3 p. m., Mrs. Henry Moskowitz of the United States housing commission in a talk entitled, "Housing Conditions in the United States"; 5:15 p. m., to be announced; 5:30 to 6:30 p. m., "Music While You Dine," Tom Cooper's Country Club orchestra.

Evening—Silent.

WRC—Washington, D. C., 469 meters: Silent Tuesday, Thursday and Saturday evenings.

Day—2 p. m., fashion developments of the moment, prepared by Women's Wear; 2:10 p. m., piano recital by Rebecca Easterbrook; 2:25, Bradstreet's financial report; 2:35 p. m., song recital by John Bland, barytone; 2:50 p. m., current comment by the editor of the Outlook; 3 p. m., farm and home reports; 4:15 p. m., instruction in code practice; 5 p. m., children's hour, by Peggy Albion.

Evening—Silent.

WDAR—Philadelphia, Pa.; 395 meters:

Day—11 a. m., organ recital from the Stanley theater; features from the studio; Arcadia Concert orchestra, Fery Sarkozi, director; 1 to 2 p. m., Arcadio Concert orchestra; artist recital from the studio; 3:30 p. m., Woman's club hour; 6:30 p. m., Dream Daddy.

Evening—Silent.

Midwest Programs.

WCAL—Northfield, Minn., St. Olaf college, P. Skifter, director; Ellu Hjertass, program director; 360 meters:

Sunday, 11 a. m. and 8:30 p. m.; Thursday, 9 p. m.; Friday, 7 p. m.; Saturday, 12 noon.

WCX—Detroit, Mich.; 517 meters:

Day—1 p. m., news bulletins; 1:15 p. m., stock quotations; 1:20 p. m., Rev. Gaius Glenn Atkins, D. D., speaker; a twenty-minute exposition of the international Sunday school lesson; 1 50 p. m., government weather forecast; 3:15 p. m., music; 5 p. m., dinner concert, broadcast from Hotel Tulier;

Evening—7:30 p. m., musical program, Ford band, broadcast from Arcadia auditorium.

WJAX—Cleveland; 390 meters: Silent every night except Tuesday and Thursday.

WLAG—Minneapolis, Minn.; 417 meters: No silent nights.

Day—9:30 to 10:45 a. m., announcements, news, markets; 10:45 a. m., household hints; 11:35 a. m., surprise program; 1:30 p. m., markets; 2 p. m., Woman's club, dancing lesson by Tess Cooperman; 2:35 p. m., Ronning's Leamington orchestra; 4 p. m., short story; 4:30 p. m., markets; 5:30 p. m., children's hour, Tess Cooperman, story-teller; 6 p. m., sport hour, Dr. J. S. Dick Jr., "Dogs."

Evening—6:15 p. m., Osborn's Minneapolis Athletic Club orchestra; 7:30 p. m., farm lecture program; 9:15 p. m., weather and time report.

WLW—Cincinnati; 309 meters: Silent Friday and Saturday.

Day—10:30 a. m., weather forecast and business reports; 1:30 p. m., market reports; 3 p. m., business reports; 4 p. m., piano solos by Adelaide Apfel.

Evening—10 p. m., concert program by the Crosley Radarians, directed by Helen Schuster Martin, and Instrumental Trio from the Cincinnati Conservatory of Music under the direction of Thomie Prewitt Williams. Soprano solos by Kathryn Reece. (1) Opening numbers for violin, cello and piano, Garner Rowell, Jack Paton and Thomie Prewitt Williams. (a) "Gavotte" (Grieg) (b) "Song Without Words" (Mendelssohn); (2) selected songs by Miss Leah Fred, soprano; (3) radario comedy in one act, "Between the Soup and the Savory"; in the case: The Cook, Olive Vail; the Maid, Dorothea Barlow; the Slavey, Helen Rose; Descriptionist, Ralph Haburton; scene, a kitchen; (4) selection for violin, cello and piano, "Novelette" (Schumann), "Bolero" (Moszkowski; (5)) songs by Miss Leah Fred, soprano, including "A La Patrada," "Songs My Mother Taught Me" and "Robin, Robin, Sing Me a Song"; (6) selections by the Conservatory Instrumental Trio, "Sevillana" (Massenet), "Salut D'Amour" (Elgar); (7) songs by Miss Fred, including "Romanza" from "Cavalleria Rusticana," "Bitterness of Love" and "Toy Balloon"; 11 p. m., popular program by the famous Justin Huger Dance orchestra, playing "Pekin," "Sunshine of Mine," "Marcheta" and other popular numbers released by the National Association of Broadcasters.

WOC—Davenport, Iowa; 481 meters: Silent Tuesdays.

Day—10 a. m., opening market quotations; 10:55 a. m., time signals; 11 a. m., weather and river forecast; 11:05 a. m., market quotations; 12 noon, chimes concert; 2 p. m., closing stocks and markets; 3:30 p. m., educational program and concert; 5:45 p. m., chimes concert; 6:30 p. m., Sandman's visit.

WTAM—Cleveland; 390 meters: Broadcasts only Wednesday and Saturday evenings at 7 to 8 p. m.

WWJ—Detroit, Mich.; 517 meters: Silent Saturday.

Day—12 noon, dance music by Jean Goldkette's orchestra, broadcast from the Graystone ballroom.

Evening—Music.

WOI—Ames, Iowa, Iowa State College; 360 meters:

Evening—Miss Amanda Jacobson "Accessories in Furnishing the Living-Room."

Southern Programs.

KSD—St. Louis; 546 meters: Silent Friday.

Day—Opening midseason and closing quotations on the St. Louis grain markets; live stock conditions; Liverpool and New York cotton market; New York stocks, bonds and money market; metal markets, weather reports, forecast and news bulletins are broadcast at 8:40, 9:40, 10:40, 11:40, 12:40, 1:40, 2:40 and 4 daily.

Evening—8 p. m., broadcasting the concert of the St. Louis Symphony orchestra, Rudolph Ganz, conductor; Michel Gusikoff, violin soloist, as given at the Odeon.

WBAP—Fort Worth, Texas; 476 meters:

Day—10 a. m. to 4 p. m., markets and financial review.

Evening—7:30 to 8:30 p. m., concert by a group of Fort Worth artists; E. L. O. announcing; 9:30 to 10:45 p. m., concert by the Fort Worth Euterpean club, presenting its monthly recital; G. C. A. announcing.

WDAF—Kansas City, Mo.; 411 meters:

WFAA—Dallas, Texas; 147 meters: Silent Wednesday.

Day—10:30 a. m., United States weather bureau report and forecast and C. A. M. A. A. highway condition bulletin for the southwest, followed by Dallas produce market quotations, early cotton market report and Wall street review; 12 m., music by the Red Head Girl and talk by J. C. Morse; 2:30 to 2:45 p. m., Dallas live stock market, late general markets, sport news; 3:30 to 4 p. m., agriograms, health bulletins, Texas market news, sport news; 5:30 to 6 p. m., bed-time story and fairy tale, told by Miss Mary C. Tooney.

Evening—8:30-9:30 p. m., Gibson Mandolin and Guitar club, Tom D. Collins, manager.

WGV—New Orleans; 359 meters:

Evening—7 to 8 p. m., concert.

WHAS—Louisville; 400 meters: Silent Mondays.

Day—4 to 5 p. m., selections by the Walnut theater orchestra, Walter Davison, conductor; selections by the Strand theater orchestra, Harry S. Currie, conductor.

Evening—9 to 10:30, music.

WHB—Kansas City, Mo.; 411 meters: Silent Monday, Wednesday and Friday.

Day—8:25 to 8:30, estimated live stock receipts; 9:25 to 9:40, live stock, grain quotations; 10:25 to 10:40, live stock and grain quotations, weather and shippers' forecast, road conditions and foreign exchange; 11:25 to 11:40, live stock, grain quotations; 12:35 to 1 p. m., popular musical program: "Havana," "Love, My Heart Is Calling You," "The Roof Blues," "Ten Ten Tennessee," "No, No Nora," "Sittin' in a Corner"; 1:25 to 1:50 p. m., closing grain and live stock reports; 2 to 3 p. m., ladies' hour program of classical and popular musical selections by the Sweeney Radio orchestra: Grand Processional March from "The Queen of Sheba" (Gounod); Pantomime, "Harlequin and Columbine" (Millegram); trumpet and trombone duet, selected, by Arthur Winter and James Sell; "Valse Triste" (Sibelius); "March Militaire" (Schubert); saxophone duet, selected, by Floyd Estey and Roy Sanford; "Veil Dance" (Friml); selected popular music by Sweeney orchestra; 3 to 3:05 p. m., information from the United States weather bureau; 3:05 to 3:20 p. m., grain market review.

Evening—7 to 7:45 p. m., Travelogue talk, by James W. Fifield, D. D., on "Egypt and the Treasures of King Tut's Tomb"; piano solo, selected, by George Parrish; trumpet solo, selected, Arthur Winter; 8 to 9 p. m., regular Thursday evening musical program. First half consisting of requested classical selections; second half of requested popular music, by Sweeney Radio orchestra.

WNAV—Knoxville, Tenn.; People's Telephone and Telegraph company; 236 meters; 500 watts:

Evening—7:30 to 8:30 p. m., musical program.

WMC—Memphis; 500 meters: Silent Wednesday.

Day—Stocks and news every half hour from 9 a. m. to 10 p. m.

Evening—8:30 p. m., concert by the Chisca Hotel Philharmonic orchestra, Clara Ahern directing.

WOAI—San Antonio, Texas; 385 meters: Silent nights, Mondays, Wednesdays and Thursdays.

WSB—Atlanta, Ga.; 428 meters:

Day—5:25 p. m., kiddie program and Burgess bedtime story by Miss Bonnie Barnhardt.

Evening—8 to 9 p. m., Atlanta Sacred Quartet; Miss Lily Allen, coach; 10:45 p. m., transcontinental radiowl entertainment.

WHAB—Galveston, Texas; 360 meters:

Pacific Coast Concerts.

KOG, Oakland, Cal.; General Electric company; 312 meters.

KDZE—Seattle, Wash.; 455 meters: Silent nights, Tuesdays, Thursdays and Sundays.

KFDR—San Francisco; 509 meters:

Evening—Music.

KGW—Portland, Ore; Portland Oregonian; 492 meters.

KHJ—Los Angeles; 395 meters:

Evening—10:45, 11:30 p. m. to 1 a. m.

KPO—San Francisco; 424 meters; 500 watts: Crair F. Morrison, station director, Ada Morgan O'Brien, program director. Friday nights silent.

Day—2 p. m., time signals from the naval observatory; 3 to 4 p. m., Rudy Seiger's Fairmont Hotel orchestra, by remote control.

Evening—8 p. m., Harold Montague Schulteis at the console of the Robert Morton organ, playing selected pieces; 10-11 p. m., E. Max Bradfield's versatile band playing in the Palace hotel Rose room bowl from 11 p. m. to 1 a. m.

Opinions of Phans Freely Given

ARC LIGHT INTERFERENCE.

Here's a letter The Post has received from A. W. Bolte, of Bolte's, manufacturing confectioners, 208 West 3d street, Davenport, Iowa. It presents a proposition of a problem which numerous readers, especially outside of Chicago, have presented.

The Post is going to publish it frankly because it considers it to be a problem that none of the radio staff can settle. We are going after it, and, we will find an answer.

However, since we have had no less than four kicks from Davenport alone on the same interference, and, since this seems to be something the electrical engineers, as well as the radio engineers, must determine, we are submitting it to our family of willing good fellows for a solution. We hope you will beat us to it. Here is the letter:

RADIO EDITOR: Thru the courtesy of some of my Chicago friends I have been receiving their old copies of your Radio Magazine and wish to state that it surely is one of the best publications I have ever run across which treats on radio.

Inasmuch as your staff seems to be so well advised on various subjects pertaining to radio and so willing to offer assistance when asked for, I believe it might be possible that it can give me some information on the elimination of arc light interference, which is a bugbear some of us have to contend with in some parts of this city.

To be in the zone of this interference is absolutely the worst thing that could happen to anyone interested in radio, inasmuch as it is next to impossible to tune thru it.

I have written to, and have asked, practically everybody who I thought might help to solve this difficulty, and after about eighteen months of inquiring around and experimenting with counterpoises, wave traps and various kinds of hook-ups, I am almost ready to call it "quits."

We have D. C. arc lights here for street illumination over the entire city, there being about fifty or sixty circuits, each one of which takes care of some particular section. Each circuit has about fifty lamps in series and each lamp is rated at eighty volts, making about 4,000 volts on each circuit.

Some of these circuits are furnished by rectifiers which produce what is known as a pulsating D. C., and as far as we can determine, cause no trouble, but then, where the trouble seems to be is, is that the utilities company has two old type generators which furnish the balance of the circuits not taken care of by the rectifiers.

In the evening, when these generators are started at the power house, one always can tell what is going on as the racket produced when operating a receiving set is unbearable. This happens before the lights actually are turned on. Then when the light are lighted we say good night. It is impossible to hear yourself think.

We have taken up this matter with the company but it seems as tho they do not seem to know what to do about it or else they don't care to do anything, inasmuch as it has been brought to their attention on numerous occasions.

If you would please tell us what is the cause of this interference we might be enabled to take this up with the company and get it to remedy it.—ARTHUR W. BOLTE, care Bolte's, 208 West 3d street, Davenport, Iowa.

A possible method of eliminating the arc lamp interference that you mention would be to run a wire parallel to the antenna you are using and connect one end of it to an external ground or water pipe if this is not convenient. Another method would be to connect this external wire to your set instead of a ground. In this position it would act as a counterpoise.

Out in Oak Park, where the writer has his experimental station, he has two peculiar hums. He is located one-half a block from the Chicago and Aurora electric railway. However, his aerial runs at right angles. Fifteen feet below his aerial, which is a "ribbon," and of proven efficiency, there is a telephone lead-in.

In recent weeks we have tested this ribbon aerial under the most severe tests. It works exceedingly efficiently. Also we have tried it on the north side of Chicago, within a few blocks of WJAZ, which, you must confess, is a hard one to get away from, and it did things few aerials can or will do.

Yet, in the present location, as described, this writer gets a continual hum, something like an alternating current hum. Yet, I have looked over the neighborhood, and I can find nothing that would indicate the trouble.

Here's a problem. Let's do it.

LIKES HAGERMAN'S CRYSTAL SET.

RADIO EDITOR: With your hook-up of condenser variometer, crystal and phones, I have truly a wonder set. The reception is clear as a bell and tuning out stations is perfect.

I would call this a loud-speaking crystal set—absolutely reliable and one that delivers the goods.

I have a single phone receiver fastened on to the end of an old-fashioned auto-horn megaphone. This I have fastened to the head of the bed and the wires run fully fifteen feet to the set on a table across the room. Before I turn in (or tune in), for the night, I set the crystal, tune in for the clearest station (which can be heard faintly across the room), jump into bed and I'm all set for the night's entertainment. It's a great little set and the darn thing either keeps me awake all night or lulls me to sleep.

I certainly appreciate the hook-up and thoroly enjoy your Radio Magazine section. —J. LAWRENCE ROSE, 1928 West Madison Street, Chicago.

BREAKING THE RULES.

RADIO EDITOR: There is so much misinformation published in present-day radio articles. I had hoped The Post, as noted in its initial bow, would endeavor to correct flagrant copy so that it might command the support of those in the profession as engineers, or, at least, those of technical training, but, I regret, copy, right or wrong, seems dominant. To be specific:

How is anyone going to secure any degree of even primary selector tuning when using a .001 or, approximately, a forty-three-plate condenser, in series with antenna? Again, why a forty-three plate to tune your "Old Reliable" secondary? Further, another .001 across primary of first audio and position bias on amplifier. Will the accepted rule, the A B C of radio, viz., "the ratio of inductance to capacitance should be as high as possible," ever soak in?

I quite realize this letter is sarcastic—but man, man, know your radio fundamentals before publishing data that can only hope to hurt radio.—GEORGE. E. SINBAR, Green Bay, Wis.

NOTE: And yet, notwithstanding all this, friend, "Old Reliable" does percolate and does it most efficiently, producing all the volume anyone wants, is highly selective and works consistently. I refer you to some of the letters published this week. You are right, in theory, at least, on the secondary condenser criticism. A twenty-three-plate variable condenser would work, but—so will a forty-three plate. The larger capacity is employed because it can be used in any hook-up, and when you are buying good parts, why not buy something that always can be used? You are wrong, however, about the primary condenser. You would have to do a lot of unnecessary tapping on your varicoupler if you used a smaller capacity and also rewired your coil with several turns to get proper wave length. What's the use? Forget the unit taps, stick in the forty-three plate and just note the results. Some day, when you are in town again, come up and see us. Perhaps you will change your mind about several of the so-called "accepted rules of the A B C of radio.—THE EDITOR.

WANTS 'EM MOVED TO DUNES.

RADIO EDITOR: Interesting and constructive as your much-looked-for Thursday edition is, let's improve upon it quite a bit.

We have tried to be decent with these air hogs who use six out of every twenty-four hours to cry out their wares and to those who agree to maintain a silent night once a week and then find that they have some junk to let the people "get for nothing" on the first good Monday night of the season. There is a limit to the patience of all good and decent people.

Why don't you start a campaign thru this Thursday edition to move all of these stations to the dunes and run private wires to their studios? This would permit them to operate every night of the week without any objections from those who then could select a good program and stay with her. I am quite sure that the American Telephone and Telegraph company would be willing to co-operate with them in the running of wires to the studios. And, furthermore, I am quite sure that fully 100,000 listeners in Chicago would contribute $1 apiece toward the expense of moving the towers to some such place.

If the Consumers company wanted too much money for space at the Dunes why not pick out some small town fifteen or twenty miles away that would be glad to be "put on the map" by the aid of these "air hogs." Persuade dear old L. Jones of your literary section to bend his efforts along these lines. Tell him that I have a world of humor in a story for him if he will do it.—CHARLES A. DUPEE, 29 South LaSalle Street, Chicago.

RADIO EDITOR: Your article on "Local Interference" sure did register 100 per cent with the north side fans.

It is now 3:30 a. m. New Year's day, 1924, and station HOG has been going only five and one-half hours with the talent of another local station.

Please send me name of the people who are getting up the petitions to present to the federal authorities asking that the "license of a certain local station be cancealed." I will guarantee to get 1,000 bona fide signatures by myself.

The first real good cold night of the year and silent night at that and this nuisance in—silent night! This station does not know the meaning of ethics or honor.

What can one do using the best set money can buy—disconnecting aerial and ground and still getting this station. And what a wonderful harmonic wave they have! They must have figured it out. Knowing that their 448 (question mark), meter wave would kill everything above 380 meters—so they must have designed their aerial to give the wonderful harmonic to get the rest of the meters. And then, best of all, to hear a "tired-voiced announcer" say "Shorten your aerial and you will not be bothered." (Space reserved for laughter.)

Well, have wasted three and one-half house hoping to hear California. This station wins again! Guess we north siders had better move to Oak Park.—H. A. WEDDELL, 4208 Kenmore Avenue., Chicago.

WHERE IS WAVB?

RADIO EDITOR: My sincerest congratulations on your Thursday magazine section. It is far superior to anything else of its kind. Keep up the good work.

I just finished looking thru the last two or three issues again for the last part of your list of broadcasting stations arranged alphabetically by cities. In none of the issues did the list go farther than "S." I can think of any number of cities with broadcasting stations whose names lie in that part of the alphabet between "S" and "Z." I hope this omission will be remedied or, if it is just my blindness, that you will make this last part as conspicuous as the first part of the list.

Now, for the reason for my looking in the last part of the list. Last Saturday night (Dec. 29), about 10 o'clock, I picked up a station down on about 250 meters sending out some good dance music. I heard them announce two or three times and each time it seemed like, "WAVB, Washington, Pennsylvania." I would be less willing to swear to the call than to the city.

I distinctly heard "Washington, Pennsyldance orchestra was composed of students from Ohio university, Athens, Ohio."

I would appreciate any information you could give me in regard to any such station existing, as my curiosity is just strong enough to demand that I trace to the bottom every station that I pick up.—JOHN D. M'CURRACH, 645 Hinman Avenue, Evanston, Ill.

[NOTE—We have no record of any station at Washington, Pa., nor of one with the call letters, "WAVB." There is WBAV at Columbus, Ohio, and WBAD of Dayton, Ohio, that have similar sounding call letters and WABE of Washington, D. C., that may be the one you refer to. There is a possibility, of course, that some new station has been registered since the last list published (two weeks ago), by the government. The best we can do is to refer your query to the big-hearted family of Post radio readers. Some one may be able to supply the information and send it in to us so we can publish it for you and the rest of the clan.]

HEARS WOC ON CRYSTAL.

RADIO EDITOR: I noticed letters in the Radio Magazine by Rose Cuneo Paneri and Pearl Leisner about hearing station WOC on their crystal sets. I also heard that station on that night around 9 o'clock on my very simple crystal set. It surely "knocked me off my feet," as it is the first out-of-town station I have heard with this set, having had it for about a year.

I wish to take this opportunity to commend you on the excellent radio magazine you are putting out. It sure "takes the cake." I am now a daily reader of The Chicago Evening Post, as I have found out that your daily radio programs are put out in more detail than any other Chicago newspaper has them.—IRVING ERICHSON, 1901 North Mozart Street.

A SIMPLER WAY.

RADIO EDITOR: "How to Make Amplifier Free of Distortion Even in the Third Stage," appearing in your magazine of Jan. 3, is read with considerable interest. However, the same end can be attained by the use of three Thordarson 3½ to 1 ratio transformers instead of using fixed condensers and choking with primaries from Thordarson bell ringing transformers. The writer has used three such 3½ to 1 transformers in a Cockaday four-circuit set with very gratifying results. UV-199 tubes were used throughout, including detector.—E. B. WILSON, President M. Am. Soc. GE., Monadnock Block, Chicago.

SUBMITTED TO READERS.

RADIO EDITOR: I heard a program broadcast from a Pacific mail steamship; I think the announcer said it was the Venezelos. Will you please tell me thru your radio column where it was and the call letters. Best wishes for the continued success.—L. O. GODWIN.

Alphabetical List of U. S. Radio Stations

ABERDEEN, Wash.—KNT.
ABILENE, Texas—WQAQ.
AGRICULTURAL COLLEGE, N. D.—WPAK.
AKRON, Ohio—WOE.
ALBANY, N. Y.—WNJ.
ALEXANDRIA, La.—KFFY.
ALLENTOWN, Pa.—WCBA.
ALLENTOWN, Pa.—WSAN.
ALTADENA, Cal.—KGO.
AMARILLO, Texas—WDG.
AMARILLO, Texas—WQAC.
AMARILLO, Texas—WRAU.
AMES, Iowa—WOI.
AMSTERDAM, N. Y.—WPAS.
ANDERSON, Ind.—WABC.
ANN ARBOR, Mich.—WQAJ.
ANTHONY, Kan.—WBL.
ARDMORE, Okla.—WOAA.
ARLINGTON, Ore.—KFGL.
ASHEVILLE, N. C.—WFAJ.
ATLANTA, Ga.—WGM.
ATLANTA, Ga.—WSB.
ATLANTIC CITY, N. J.—WHAR.
ATWOOD, Kan.—WEAD.
AUBURN, Ala.—WMAV.
AUSTIN, Texas—WCM.
AUSTIN, Texas—WNAS.

BAKER, Ore.—KFDA.
BAKERSFIELD, Cal.—KDZB.
BALTIMORE, Md.—WCAO.
BALTIMORE, Md.—WEAR.
BALTIMORE, Md.—WKC.
BALTIMORE, Md.—WNAY.
BANGOR, Me.—WABI.
BANGOR, Me.—WPAY.
BATON ROUGE, La.—KFGC.
BAUDETTE, Minn.—KFGY.
BAY CITY, Mich.—WTP.
BEAUMONT, Texas—WMAM.
BELLINGHAM, Wash.—KDZR.
BELLOWS FALLS, Vt.—WLAK.
BELOIT, Kan.—WPAR.
BELOIT, Wis.—WKAW.
BELVIDERE, Ill.—WOAG.
BERKELEY, Cal.—KQI.
BERKELEY, Cal.—KRE.
BERRIEN SPRINGS, Mich.—KFGZ.
BILLINGS, Mont.—KFCH.
BINGHAMTON, N. Y.—WIAV.
BIRMINGHAM, Ala.—WSY.
BOISE, Idaho—KFAU.
BOISE, Idaho—KFDD.
BOISE, Idaho—WFFB.
BOONE, Iowa—KFGQ.
BOSTON, Mass.—WNAC.
BOULDER, Colo.—KFAJ.
BOWLING GREEN, Ky.—WNAB.
BOZEMAN, Mont.—KFDO.
BRIDGEPORT, Conn.—WKAX.
BROOKINGS, S. D.—KFDY.
BROOKVILLE, Ind.—WSAL.
BUFFALO, N. Y.—WGR.
BURLINGTON, Iowa—WIAS.
BURLINGTON, Iowa—WLAT.
BURLINGTON, Vt.—WCAX.
BUTLER, Mo.—WNAR.
BUTTE, Mont.—KFKY.
BUTTE, Mont.—KFLA.
BUTTE, Mont.—KFAP.

CAMDEN, N. J.—WRP.
CAMERON, Mo.—WFAQ.
CANTON, N. Y.—WCAD.
CANTON, Ohio—WWB.
CAPE GIRARDEAU, Mo.—WSAB.
CARTHAGE, Ill.—WCAZ.
CASPER, Wyo.—KFDF.
CAZENOVIA, N. Y.—WMAC.
CEDAR RAPIDS, Iowa—WJAM.
CEDAR RAPIDS, Iowa—WKAA.
CEDAR RAPIDS, Iowa—KFLP.
CENTERVILLE, Iowa—WDAX.
CHARLESTON, S. C.—WNAQ.
CHARLESTON, S. C.—WOAH.
CHARLESTON, W. Va.—WPAZ.
CHARLOTTE, N. C.—WBT.
CHENEY, Kan.—KFGP.
CHICAGO, Ill.—KYW.
CHICAGO, Ill.—WAAF.
CHICAGO, Ill.—WBU.
CHICAGO, Ill.—WDAP.
CHICAGO, Ill.—WJAZ.
CHICAGO, Ill.—WLAG.
CHICAGO, Ill.—WMAQ.
CHICAGO, Ill.—WPAD.
CHICAGO, Ill.—WSAH.
CHICKASHA, Okla.—KFGD.
CINCINNATI, Ohio—WAAD.
CINCINNATI, Ohio—WHAG.
CINCINNATI, Ohio—WIZ.
CINCINNATI, Ohio—WLW.
CINCINNATI, Ohio—WMH.
CINCINNATI, Ohio—WSAI.
CLARKSBURG, W. Va.—WHAK.
CLEARFIELD, Pa.—WPI.
CLEMSON COLLEGE, S. C.—WSAC.
CLEVELAND, Ohio—KDPM.
CLEVELAND, Ohio—WHK.
CLEVELAND, Ohio—WJAX.
COLLEGE PARK, Ga.—WDAJ.
COLLEGE STATION, Texas—WTAW.
COLORADO SPRINGS, Colo.—KFCK.
COLORADO SPRINGS, Colo.—KFFQ.
COLUMBIA, Mo.—WAAN.
COLUMBUS, Ohio—WBAV.
COLUMBUS, Ohio—WCAH.
COLUMBUS, Ohio—WEAO.
COLUMBUS, Ohio—WMAN.
COLUMBUS, Ohio—WPAL.
CORVALLIS, Ore.—KFDJ.
COUNCIL BLUFFS, Iowa—WPAP.
CRANSTON, R. I.—WKAP.

DALLAS, Texas (portable)—KFFZ.
DALLAS, Texas—WDAO.
DALLAS, Texas—WFAA.
DALLAS, Texas—WRR.
DARTMOUTH, Mass.—WMAF.
DARTMOUTH, Mass.—WSAQ.
DAVENPORT, Iowa—WHAI.
DAVENPORT, Iowa—WOC.
DAVID CITY, Neb.—WRAR.
DAYTON, Ohio—WABD.
DAYTON, Ohio—WJAJ.
DEARBORN, Mich.—WWI.
DECATUR, Ill.—WBAO.
DECATUR, Ill.—WHAP.
DENVER, Colo.—KDZQ.
DENVER, Colo.—KFAF.
DENVER, Colo.—KFDL.
DENVER, Colo.—KFEL.
DENVER, Colo.—KFEF.
DENVER, Colo.—KFIC.
DENVER, Colo.—KFLC.
DENVER, Colo.—KLZ.
DES MOINES, Iowa—KFDP.
DES MOINES, Iowa—WGF.
DETROIT, Mich.—WCX.
DETROIT, Mich.—WWJ.
DETROIT, Mich.—KOP.
DOUGLAS, Wyo.—KFEV.
DUBUQUE, Iowa—WQAK.
DULUTH, Minn.—WJAP.
DULUTH, Minn.—WMAT.

EAST LANSING, Mich.—WKAR.
EASTON, Pa.—WMAP.
EAST PITTSBURG, Pa.—KDKA.
EAST PROVIDENCE, R. I.—WKAD.
EDGEWOOD, R. I.—WEAG.
ELGIN, Ill. (Near)—WTAS.
EL MONTE, Cal.—KUY.
EL PASO, Texas—WDAH.
EL PASO, Texas—WPAT.
EMPORIA, Kan.—WAAZ.
ERIE, Pa.—WOAV.
EUGENE, Ore.—KFAT.
EVANSVILLE, Ind.—WNAM.
EVERETT, Wash.—KFBL.

FAIRBANKS, Alaska—WLAY.
FALL RIVER, Mass.—WSAR.
FALL RIVER, Mass.—WTAB.
FARGO, N. D.—WDAY.
FAYETTEVILLE, Ark.—KFDV.
FLINT, Mich.—WEAA.
FORT DODGE, Iowa—KFER.
FORT DODGE, Iowa—WEAB.
FORT MONROE, Va.—WNAW.
FORT SMITH, Ark.—WGAR.
FORT WORTH, Texas—WEAP.
FRANKFORT, Ky.—WOAK.
FRANKLINTON, La.—KFLD.
FREMONT, Neb.—WOAE.
FRESNO, Cal.—KMJ.
FROSTBURG, Md.—WPAQ.

GAINESVILLE, Ga.—WKAY.
GALVESTON, Texas—WHAB.
GALVESTON, Texas—WIAC.
GLADBROOK, Iowa—KFIK.
GLOUCESTER CITY, N. J.—WRAX.
GRAND FORKS, N. D.—WOAB.
GRAND ISLAND, Neb. KFJA.
GRANVILLE, Ohio—WJD.
GREAT FALLS, Mont.—KDYS.
GREELEY, Colo.—KFKD.
GREENCASTLE, Ind.—WLAX.
GREENSBORO, N. C.—WQAZ.
GREENVILLE, Ohio—WCBB.
GREENVILLE, S. C.—WQAV.
GRIDLEY, Cal.—KFU.
GROVE CITY, Pa.—WSAJ.
GUNNISON, Colo.—KFHA.

HAMILTON, Ohio—WBAU.
HAMILTON, Ohio—WRK.
HARRISBURG, Pa.—WABB.
HARTFORD, Conn.—WDAK.
HASTINGS, Neb.—KFKX.
HAVRE, Mont.—KFBB.
HILLSBORO, Ore.—KFFO.
HOLLYWOOD, Cal.—KFAR.
HONOLULU, Hawaii—KDYX.
HONOLULU, Hawaii—KGU.
HONOLULU, Hawaii—KYQ.
HOOD RIVER, Ore.—KFHB.
HOOD RIVER, Ore.—KQP.
HOULTON, Maine—WLAN.
HOUSTON, Texas—KFCV.
HOUSTON, Texas, WCAK.
HOUSTON, Texas—WEAY.
HOUSTON, Texas—WEV.
HOUSTON, Texas—WRAA.
HUNTINGTON, Ind.—WHAY.
HUTCHINSON, Kan.—KFHX.
HUTCHINSON, Minn.—WFAN.

INDEPENDENCE, Mo.—KFIX.
IOLA, Kan.—KFID.
IOWA CITY, Iowa—WHAA.
ITHACA, N. Y.—WEAI.

JACKSONVILLE, Fla.—WABG.
JACKSONVILLE, Fla.—WDAL.
JEFFERSON CITY, Mo.—WOS.
JOHNSTOWN, Pa.—WTAC.
JOPLIN, Mo.—WHAH.
JUNEAU, Alaska—KFIU.

KALAMAZOO, Mich.—WLAQ.
KALAMAZOO, Mich.—WOAP.
KANSAS CITY, Mo.—WDAF.
KANSAS CITY, Mo.—WMAJ.
KANSAS CITY, Mo.—WHB.
KANSAS CITY, Mo.—WOQ.
KEARNEY, Neb.—KFHP.
KELLOGG, Idaho—KFEY.
KENOSHA, Wis.—WOAR.
KNOXVILLE, Tenn.—WNAV.

LACEY, Wash.—KGY.
LACONIA, N. H.—WKAV.
LA CROSSE, Wis.—WABN.
LAKE FOREST, Ill.—WABA.
LAKESIDE, Colo.—KFKH.
LAMONI, Iowa—KFFV.
LANCASTER, Pa.—WDBC.
LANCASTER, Pa.—WGAL.
LANSING, Mich.—WHAI.
LAPORTE, Ind.—WRAF.
LARAMIE, Wyo.—KFBU.
LAREDO, Texas—WWAX.
LAWRENCEBURG, Tenn.—WOAN.
LE MARS, Iowa—KFCY.
LE MARS, Iowa—WIAU.
LEXINGTON, Ky.—WQAH.
LIHUE, Hawaii.—KFHS.
LIMA, Ohio—WOAC.
LINCOLN, Neb.—KFDU.
LINCOLN, Neb.—WFAV.
LINCOLN, Neb.—WJAB.
LINCOLN, Neb.—WKAC.
LINCOLN, Neb.—WMAH.
LINDSBORG, Kan.—WDAD.
LITTLE ROCK, Ark.—WCAV.
LITTLE ROCK, Ark.—KFLQ.
LOCKPORT, N. Y.—WMAK.
LONG BEACH, Cal.—KSS.
LOS ANGELES, Cal.—KDZF.
LOS ANGELES, Cal.—KFI.
LOS ANGELES, Cal.—KHJ.
LOS ANGELES, Cal.—KJS.
LOS ANGELES, Cal.—KNR.
LOS ANGELES, Cal.—KNV.
LOS ANGELES, Cal.—KNX.
LOS ANGELES, Cal.—KUS.
LOS ANGELES, Cal.—KWH.
LOS GATOS, Cal.—KFHQ.
LOUISBURG, Kan.—KFIL.
LOUISVILLE, Ky.—WHAS.
LOUISVILLE, Kan.—WLAP.
LOWELL, Mass.—WQAS.

MACON, Ga.—WMAZ.
MADISON, Wis.—WGAY.
MADISON, Wis.—WHA.
MANHATTAN, Kan.—WTG.
MARIETTA, Ohio—WBAW.
MARIETTA, Ohio—WSAA.
MARION, Ind.—WIAQ.
MARION, Kan.—WRAD.
MARSHALL, Mo.—WJAT.
MARSHALLTOWN, Iowa—KFJB.
MATTOON, Ill.—WQAL.
MAYVILLE, N. D.—KFHU.
McKEESPORT, Pa.—WIK.
McLEANSBORO, Ill.—WRAS.
MEDFORD, Ore.—KFAY.
MEDFORD HILLSIDE, Mass.—WGI.
MEMPHIS, Tenn.—WMC.
MIAMI, Fla.—WQAM.
MENOMINEE, Mich.—KFLB.
MIDDLEPORT, Ohio—WSAK.
MIDDLETOWN, Conn.—WOAS.
MILWAUKEE, Wis.—WAAK.
MILWAUKEE, Wis.—WCAY.
MILWAUKEE, Wis.—WHAD.
MILWAUKEE, Wis.—WIAO.
MINNEAPOLIS, Minn.—KFDZ.
MINNEAPOLIS, Minn.—KFEX.
MINNEAPOLIS, Minn.—WBAD.
MINNEAPOLIS, Minn.—WBAH.
MINNEAPOLIS, Minn.—WCAS.
MINNEAPOLIS, Minn.—WCE.
MINNEAPOLIS, Minn.—WLAG.
MINNEAPOLIS, Minn.—WLB.
MISHAWAKA, Ind.—WOAO.
MOBERLY, Mo.—KFFP.
MOBILE, Ala—WEAP.
MODESTO, Cal.—KXD.
MONTEREY, Cal.—KLN.
MONTGOMERY, Ala—WKAN.
MOORESTOWN, N. J.—WBAF.
MOOREHEAD, Minn.—WPAU.
MORGANTOWN, W. Va.—WHD.
MOSCOW, Idaho—KFAN.
MOUNT VERNON, Ill.—WABF.
MUNCIE, Ind.—WJAF.

NEAH BAY, Wash.—KFHH.
NEENAH, Wis.—WIAJ.
NEWARK, N. J.—WAAM.
NEWARK, N. J.—WBS.
NEWARK, N. J.—WOR.
NEWARK, N. J.—WRAZ.
NEWARK, Ohio—WBBA.
NEW BEDFORD, Mass.—WDAU.
NEW HAVEN, Conn.—WPAJ.
NEW LEBANON, Ohio—WPG.
NEW ORLEANS, La.—WAAB.
NEW ORLEANS, La.—WAAC.
NEW ORLEANS, La—WCAG.
NEW ORLEANS, La—WGV.
NEW ORLEANS, La—WIAF.
NEW ORLEANS, La.—WWL.
NEWTON, Iowa—WIAH.
NEW YORK, N. Y.—WBAY.
NEW YORK, N. Y.—WEAF.
NEW YORK, N. Y.—WJX.
NEW YORK, N. Y.—WJY.
NEW YORK, N. Y.—WJZ.
NEW YORK, N. Y.—WLAW.
NEW YORK, N. Y.—WQAO.
NEW YORK, N. Y.—WSAP.
NEW YORK, N. Y.—WWZ.
NORFOLG, Neb.—WJAG.
NORMAN, Okla.—WNAD.
NORTHFIELD, Minn.—WCAL.
NORTH PLAINFIELD, N. J.—WEAM.

OAK, Neb.—KFEQ.
OAKLAND, Cal.—KLS.
OAKLAND, Cal.—KLX.
OAKLAND, Cal.—KZM.
OCEAN CITY, N. J.—WIAD.
OGDEN, Utah—KFCP.
OKLAHOMA CITY, Okla.—WMAB.
OKLAHOMA CITY, Okla.—WKY.
OKMULGEE, Okla.—WPAC.
OMAHA, Neb.—KFCZ.
OMAHA, Neb.—KFFX.
OMAHA, Neb.—WAAW.
OMAHA, Neb.—WIAK.
OMAHA, Neb.—WNAL.
OMAHA, Neb.—WOAW.
ORANGE, Texas—KFGX.
OSKALOOSA, Iowa—KFHL.

PADUCAH, Ky.—WIAR.
PARKERSBURG, Pa.—WQAA.
PARSONS, Kan.—WOAJ.
PATERSON, N. J.—WBAN.
PENDLETON, Ore.—KFFE.
PENSACOLA, Fla.—WGAN.
PENSACOLA, Fla.—WLAV.
PEORIA, Ill.—WJAN.
PEORIA, Ill.—WQAX.
PHILADELPHIA, Pa.—WCAU.
PHILADELPHIA, Pa.—WDAR.
PHILADELPHIA, Pa.—WFI.
PHILADELPHIA, Pa.—WGL.
PHILADELPHIA, Pa.—WIP.
PHILADELPHIA, Pa.—WNAT.
PHILADELPHIA, Pa.—WOO.
PHILADELPHIA, Pa.—WWAD.
PHOENIX, Ariz.—KDYW.
PHOENIX, Ariz.—KFAD.
PINE BLUFF, Ark.—WOK.
PITTSBURG, Kan.—KFIV.
PITTSBURG, Pa.—KQV.
PITTSBURG, Pa.—WCAE.
PITTSBURG, Pa.—WJAS.
PLAINVIEW, Texas—WSAT.
PLATTE, S. D.—KFIJ.
PORT ARTHUR, Texas—WFAH.
PORTLAND, Ore.—KDYQ.
PORTLAND, Ore.—KFEC.
PORTLAND, Ore.—KFIF.
PORTLAND, Ore.—KGG.
PORTLAND, Ore.—KGN.
PORTLAND, Ore.—KGW.
PORTSMOUTH, Va.—WOAQ.
POUGHKEEPSIE, N. Y.—WFAF.
PROVIDENCE, R. I.—WEAN.
PROVIDENCE, R. I.—WJAR.
PROVIDENCE, R. I.—WRAH.
PROVIDENCE, R. I.—WSAD.
PROVIDENCE, R. I.—WTAG.
PULLMAN, Wash.—KFAE.

RALEIGH, N. C.—WLAC.
RAPID CITY, S. D.—WCAT.
READING, Pa.—WBBD.
READING, Pa.—WRAW.
REEDLEY, Cal.—KMC.
RENO, Nev.—KDZK.
RICHMOND, Cal.—KFCM.
RICHMOND, Va.—WQAT.
RIDGEWOOD, N. Y.—WHN.
ROCHESTER, N. Y.—WABO.
ROCHESTER, N. Y.—WHAM.
ROCKFORD, Ill.—WIAB.
ROCKPORT, Mo.—WMAD.
ROSWELL, N. M.—KNJ.

SACRAMENTO, Cal.—KFBK.
SAGINAW, Mich.—WABM.
SAGINAW, Mich.—WIAW.
ST. CLOUD, Minn.—WFAM.
ST. CROIX FALLS, Wis.—KFHD.
ST. JOSEPH, Mo.—KFHD.
ST. JOSEPH, Mo.—WEAK.
ST. LOUIS, Mo.—KFEZ.
ST. LOUIS, Mo.—KFGJ.
ST. LOUIS, Mo.—KFIB.
ST. LOUIS, Mo.—KSD.
ST. LOUIS, Mo.—WCK.
ST. LOUIS, Mo.—WEB.
ST. LOUIS, Mo.—WEW.
ST. LOUIS, Mo.—WMAY.
ST. LOUIS, Mo.—WRAO.
ST. Paul, Minn.—WAAH.
ST. PETERSBURG, Fla.—WSAG.
SALEM, Ore.—KFCD.
SALT LAKE CITY, Utah—KDYL.
SALT LAKE CITY, Utah—KZN.
SAN ANTONIO, Cal.—KFCI.
SAN ANTONIO, Texas—WCAR.
SAN ANTONIO, Texas—WOAI.
SAN DIEGO, Cal.—KDPT.
SAN DIEGO, Cal.—KDYM.
SAN DIEGO, Cal.—KFBC.
SAN DIEGO, Cal.—KFFA.
SANDUSKY, Ohio—WABH.
SANDUSKY, Ohio—WQAF.
SAN FRANCISCO, Cal.—KFDB.
SAN FRANCISCO, Cal.—KPO.
SAN FRANCISCO, Cal.—KUO.
SAN JOSE, Cal.—KFAQ.
SAN JOSE, Cal.—KQW.
SAN JOSE, Cal.—KSC.
SAN JUAN, P. R.—WKAQ.
SAN LUIS OBISPO, Cal.—KFBE.
SANTA ANA, Cal.—KFAW.
SANTA BARBARA, Cal.—KFHJ.
SCHENECTADY, N. Y.—WGY.
SCHENECTADY, N. Y.—WRL.
SCRANTON, Pa.—WQAN.
SCRANTON, Pa.—WRAY.
SEATTLE, Wash.—KDZE.
SEATTLE, Wash.—KDZT.
SEATTLE, Wash.—KFIY.
SEATTLE, Wash.—KFJC.
SEATTLE, Wash.—KHQ.
SEATTLE, Wash.—KJR.
SEATTLE, Wash.—KTW.
SELMA, Cal.—KFJH.
SHREVEPORT, La.—KFDX.
SHREVEPORT, La.—KFHP.
SHREVEPORT, La.—WGAQ.
SIOUX CITY, Iowa—WEAD.
SIOUX FALLS, S. D.—WFAT.
SOUTH BEND, Ind.—WABJ.
SOUTH BEND, Ind.—WGAZ.
SPARKS, Neb.—KFFR.
SPOKANE, Wash.—KFAO.
SPRINGFIELD, Mass.—WBZ.
SPRINGFIELD, Mo.—WIAI.
SPRINGFIELD, Mo.—WKAS.
SPRINGFIELD, Ohio—WNAP.
SPRINGFIELD, Mo.—WQAB.
STANFORD UNIVERSITY, Cal.—KFGH.
STANFORD, Texas—WOAZ.
STAPLETON, N. Y.—WDT.
STATE COLLEGE, Pa.—WPAB.
STERLING, Ill.—WBBC.
STEVENSVILLE, Mont.—KFJR.
STOCKTON, Cal.—KJQ.
STOCKTON, Cal.—KWG.
STOVES, Conn.—WABL.
STREATOR, Ill.—WTAX.
SYRACUSE, N. Y.—WDAI.
SYRACUSE, N. Y.—WGAB.
SYRACUSE, N. Y.—WEAH.
SYRACUSE, N. Y.—WNAV.

TACOMA, Wash.—KFBG.
TACOMA, Wash.—KFEJ.
TACOMA, Wash.—KGB.
TACOMA, Wash.—KMO.
TAMPA, Fla.—WDAE.
TARKIO, Mo.—WIAT.
TARRYTOWN, N. Y.—WRW.
TOLEDO, Ohio—WTAL.
TOPEKA, Kan.—WJAQ.
TOPEKA, Kan.—WPAM.
TOWANDA, Kan.—KFJW.
TRENTON, N. J.—WMAL.
TRENTON, N. J.—WOAX.
TRENTON, N. J.—WWAB.
TRINIDAD, Colo.—KFBS.
TROY, N. Y.—WHAZ.
TUCUMINCH—WTAU.
TULSA, Okla.—WLAL.
TUSCOLA, Ill.—WSZ.
TYLER, Texas—WOAF.

UNIVERSITY PLACE, Neb.—WCAJ.
URBANA, Ill.—WRN.
UTICA, Neb.—KFGV.
UTICA, N. Y.—WSL.
VENICE, Cal.—KFAV.
VERMILION, S. D.—WEAJ.
VILLANOVA, Pa.—WCAM.

WACO, Texas—WJAD.
WACO, Texas—WLAJ.
WACO, Texas—WWAC.
WALLA WALLA, Wash.—KFCF.
WASHINGTON, D. C.—WABE.
WASHINGTON, D. C.—WCAP.
WASHINGTON, D. C.—WDM.
WASHINGTON, D. C.—WEAS.
WASHINGTON, D. C.—WIL.
WASHINGTON, D. C.—WJH.
WASHINGTON, D. C.—WMC.
WASHINGTON, D. C.—WQAW.
WASHINGTON, D. C.—WRC.
WATERBURRY, Conn.—WQAD.
WATERLOO, Iowa, WHAC.
WATERLOO, Iowa—WRAN.
WAUPACA, Wis.—WRAH.
WEBSTER GROVE, Mo.—WOAL.
WENATCHEE, Wash.—KDZI.
WENATCHEE, Wash.—KZY.
WEST LAFAYETTE, Ind.—WBAA.
WICHITA, Kan.—WEAH.
WICHITA FALLS, Texas—WKAF.
WILKESBARRE, Pa.—WBAX.
WILMINGTON, Del.—WHAV.
WILMINGTON, Del.—WOAT.
WINCHESTER, Ky.—WPAP.
WINTER PARK, Ala.—WRAP.
WORCESTER, Mass.—WBAF.
WOOSTER, Ohio.—WGAV.

YAKIMA, Wash.—KFIQ.
YANKTON, S. D.—WNAX.
YELLOW SPRINGS, Ohio—WRAY.
YORK, Neb.—KFBD.
YOUNGSTOWN, Ohio—WDBF.

Broadcasting Stations and Schedule of Programs

Continued from Page 2.

WDAK—Hartford, Conn., the Courant, 261 meters.
WDAL—Jacksonville, Fla., Florida Times-Union, 360 meters.
WDAO—Dallas, Texas, Automotive Electric company, 360 meters.
WDAP—Chicago, Ill., Board of Trade, 300 meters.
WDAR—Philadelphia, Pa., Lit Brothers, 395 meters.
WDAS—Worcester, Mass., 692a Main street, Samuel A. Waite, 360 meters.
WDAU—New Bedford, Mass., Slocum Kilburn, 360 meters.
WDAX—Centerville, Iowa, First National bank, 360 meters.
WDAY—Fargo, N. D., Radio Equipment Corporation, 244 meters; director, L. W. Hamm; daily, 9:30 a. m., weather; Tuesday, Thursday, Saturday, 7:30 to 8:30 p. m., music; Sunday, 4 to 5 p. m., orchestra.
WDBC—Lancaster, Pa., Kirk, Johnson & Co., 258 meters.
WDBF—Youngstown, Ohio, 254 West Federal street, Robert G. Phillips, 261 meters.
WDM—Washington, D. C., Church of the Covenant, 360 meters.
WDT—Stapleton, N. Y., Ship Owners Radio Service, 405 meters.
WDZ—Tuscola, Ill., Star Store building, James L. Bush, 278 meters.
WEAA—Flint, Mich, Fallain & Lathrop, 280 meters.
WEAB—Fort Dodge, Iowa, Standard Radio Equipment company, 360 meters.
WEAF—New York, N. Y., American Telephone and Telegraph company, 492 meters.
WEAG—Edgewood, R. I., Nicholas-Hineline-Bassett Laboratory, 231 meters.
WEAH—Wichita, Kan., Wichita Board of Trade, 244 meters.
WEAI—Ithaca, N. Y., Cornell university, 286 meters.
WEAJ—Vermillion, S. D., University of South Dakota, 360 meters.
WEAM—North Plainfield, N. J., Borough of North Plainfield (W. Gibson Buttfield), 250 meters.
WEAN—Providence, R. I., Shepard company, 273 meters.
WEAO—Columbus, Ohio, Ohio State university, 360 meters.
WEAP—Mobile, Ala., Mobile Radio company, 360 meters.
WEAR—Baltimore, Md., Baltimore American and News Publishing company, 360 meters.
WEAS—Washington, D. C., Hecht company, 360 meters.
WEAU—Sioux City, Iowa, Davidson Brothers company, 360 meters.
WEAY—Houston, Texas, Iris theater (Will Horowitz Jr.), 360 meters.
WEB—St. Louis, Mo., Benwood company, 360 meters.
WEV—Houston, Texas, Hurlburt-Still Electrical company, 360 meters.
WEW—St. Louis, Mo., St. Louis university, 261 meters: 9 a. m., estimated receipts of live stock at public stockyards; opening trend of hog market; opening futures, wheat for St. Louis and Kansas City; opening trend of market; Liverpool cables; 10 a. m., official weather reports, river stages; 2 p. m., closing market quotations, live stock, grain markets, fruits and vegetables, eggs and poultry; 5 p. m., special weather and river bulletins, agrigrams, etc.; other special musical program will be announced previously.
WFAA—Dallas, Texas, Dallas News and Dallas Journal, 476 meters.
WFAB—Syracuse, N. Y., 802 McBride street, Carl F. Woese, 234 meters.
WFAF—Poughkeepsie, N. Y., H. C. Spratley Radio company, 360 meters.
WFAH—Port Arthur, Texas, Electric Supply company, 360 meters.
WFAJ—Asherville, N. C., Hi-Grade Wireless Instrument company, 360 meters.
WFAM—St. Cloud, Minn., Times Publishing company, 360 meters.
WFAN—Hutchinson, Minn., Hutchinson Electric Service company, 360 meters, 100 watts; daily 12 noon to 12:05 p. m., Twin City radio programs; 12:05 to 12:20 p. m., long distance radio discussion; 12:20 to 12:25 p. m., markets; 12:25 to 12:30 p. m., news; Tuesdays, 8:10 p. m., entertainment.
WFAQ—Cameron, Mo., Missouri Wesleyan college, 360 meters.
WFAT—Sioux Falls, S. D., Daily Argus-Leader, 360 meters.
WFAV—Lincoln, Neb., University of Nebraska, department of electrical engineering, 360 meters.
WFI—Philadelphia, Pa., Strawbridge & Clothier, 395 meters; 9:15 a. m., produce market and live stock reports; 12 m., Meyer Davis Bellevue Stratford hotel concert orchestra; 12:50 p. m., agricultural report; 1 p. m., concert by Louisa Knowlton, cellist; Strawbridge & Clothier male quartet; John Owens, tenor; Edayfed Lewis, tenor; Harold Simonds, barytone; John Vandersloot, bass; Loretta Kerk, pianist and accompanist; 5:30 p. m., Meyer Davis Bellevue Stratford Hotel concert orchestra; 6 p. m., "Snowball" talks to the children.
WGAL—Lancaster, Pa., Lancaster Electric Supply and Construction company, 248 meters.
WGAN—Pensacola, Fla., 216 West Romana street, Cecil E. Lloyd, 360 meters.
WGAQ—Shreveport, La., Glenwood Radio corporation (W. G. Patterson), 360 meters.
WGAR—Fort Smith, Ark., Southwest American, 360 meters.
WGAU—Wooster, Ohio, Radio Monufacturing and Service company (Marcus G. Limb), 226 meters.
WGAW—Altoona, Pa., 1918 West Chestnut street, Ernest C. Albright, 261 meters.
WGAY—Madison, Wis., Northwestern Radio company, 360 meters; daily, 1 to 4:30 p. m., concert and tests; 7:30 p. m. concert; Sunday, 7:30 p. m., radio chapel, sacred music.
WGAZ—South Bend, Ind., South Bend Tribune, 360 meters.
WGI—Medford Hillside, Mass., American Radio and Research corporation, 360 meters.
WGL—Philadelphia, Pa., 2303 North Broad street, Thomas F. Y. Howlett, 360 meters.
WGR—Buffalo, N. Y., Federal Telephone and Telegraph company, 319 meters.
WGV—New Orleans, La., Interstate Electric company, 360 meters.
WGY—Schenectady, N. Y., General Electric company, 380 meters.
WHA—Madison, Wis., University of Wisconsin, 360 meters.
WHAA—Iowa City, Iowa, State University of Iowa, 283 meters.
WHAB—Galveston, Texas, Clark W. Thompson, 360 meters.
WHAC—Waterloo, Iowa, Cole Brothers Electric company, 360 meters.
WHAD—Milwaukee, Wis., Marquette university, 280 meters; J. B. Kremer, program director; L. E. Coodes, H. P. Warring, Wednesday, 7:30 p. m.
WHAG—Cincinnati, Ohio, University of Cincinnati, 222 meters.
WHAH—Joplin, Mo., Hafer Supply company, 360 meters.
WHAI—Davenport, Iowa, Radio Equipment and Manufacturing company, 360 meters.
WHAK—Clarksburg, W. Va., Roberts Hardware company, 360 meters.
WHAL—Lansing, Mich., Lansing Capital News, 248 meters.
WHAM—Rochester, N. Y., University of Rochester (Eastman School of Music), 360 meters.
WHAP—Decature, Ill., Otta & Kahn, 360 meters.
WHAQ—Washington, D. C., Semmes Motor company, 360 meters.
WHAR—Atlantic City, N. J., Paramount Radio and Electric company (W. H. A. Paulus), 231 meters.
WHAS—Louisville, Ky., Courier-Journal and Louisville Times, 300 meters; silent Monday night; daily, 4 to 6 p. m., music; 5 p. m., news; 7:30 to 9 p. m., music, lectures.
WHAV—Wilmington, Del., Wilmington Electrical Special company, 360 meters.
WHAZ—Troy, N. Y., Rensselaer Polytechnic Institute, 380 meters.
WHB—Kansas City, Mo., Sweeney School company, 411 meters.
WHD—Morgantown, W. Va., West Virginia University, 360 meters.
WHK—Cleveland, Ohio, Radiovox company (Warren R. Cox), 360 meters.
WHN—Ridgewood, N. Y., George Schubel, 360 meters.
WIAB—Rockford, Ill., Joslyn Automobile company, 252 meters. Monday and Friday, 8 to 9:30 p. m.
WIAC—Galveston, Texas, Galveston Tribune, 360 meters.
WIAD—Ocean City, N. J., Ocean City Yacht club (Howard R. Miller), 254 meters.
WIAF—New Orleans, La., 139 North Alexander street, Gustav A. DeCortin, 234 meters.
WIAH—Newton, Iowa, Continental Radio and Manufacturing company, 258 meters.
WIAI—Springfield, Mo., Heer Stores company, 360 meters.
WIAJ—Neenah, Wis., Fox River Valley Radio Supply company (Quinn Brothers), 224 meters.
WIAK—Omaha, Neb., Journal-Stockman company, 278 meters.
WIAO—Milwaukee, Wis., School of Engineering of Milwaukee, 360 meters.
WIAQ—Marion, Ind., Chronicle Publishing company, 226 meters.
WIAR—Paducah, Ky., Paducah Evening Sun, 360 meters.
WIAS—Burlington, Iowa, Home Electric company, 360 meters.
WIAT—Tarkio, Mo., Leon T. Noel, 360 meters.
WIAU—Le Mars, Iowa, American Trust and Savings bank, 360 meters.
WIK—McKeesport, Pa., K. & L. Electric company (Herbert F. Kelso and Hunter J. Lohman), 360 meters.
WIL—Washington, D. C., Continental Electric Supply company, 360 meters.
WIP—Philadelphia, Pa., Gimbel Brothers, 509 meters.
WJAB—Lincoln, Neb., American Electric company, 360 meters.
WJAD—Waco, Texas, Jackson's Radio Engineering laboratories, 360 meters.
WJAF—Muncie, Ind., Press Publishing company, 360 meters.
WJAG—Norfolk, Neb., Norfolk Daily News (Huse Publishing company), 360 meters.
WJAK—Greentown, Ind., Clifford L. White, 254 meters.
WJAM—Cedar Rapids, Iowa, 302 3d Avenue West, D. M. Perham, 268 meters.
WJAN—Peoria, Ill., Peoria Star, 280 meters.
WJAQ—Topeka, Kan., Capper Publications, 360 meters, 100 watts; director, J. A. Machél; weather, news, roads, etc.; daily, 9 to 9:45 a. m., bond gossip, financial news and grain markets; 10 to 10:45 a. m., quotations upon foreign exchange, live stock, grain, bonds and stocks, financial news bulletins and weather reports; 2 to 2:45 p. m., quotations upon grain, stock, butter, eggs, poultry, foreign exchange and bonds, financial news bulletins and weather reports; 3 to 3:45 p. m., quotations upon fruits and vegetables, butter, eggs and poultry, live stock, hay and grain, flour and feed, foreign exchange, bonds and stocks, weather reports.
WJAR—Providence, R. I., The Outlet company (J. Samuels and Brother), 360 meters.
WJAS—Pittsburg, Pa., Pittsburg Radio Supply House, 360 meters.
WJAT—Marshall, Mo., Kelly-Vawter Jewelry company, 360 meters.
WJAX—Cleveland, Ohio, Union Trust company, 360 meters.
WJAZ—Chicago, Ill., Chicago Radio laboratory, 448 meters.
WJD—Granville, Ohio, Richard H. Howe, 229 meters.
WJH—Washington, D. C., White & Boyer company, 273 meters.
WJX—New York, N. Y., Deforest Radio Telephone and Telegraph company, 360 meters.
WJY—New York, N. Y., R. C. A., 405 meters.
WJZ—New York, N. Y., R. C. A., 455 meters.
WKAA—Cedar Rapids, Iowa, 1444 2d avenue, East, H. F. Paar, 268 meters.
WKAD—East Providence, R. I., Charles Loof (Cresent park), 240 meters.
WKAF—Wichita Falls, Texas, W. S. Radio Supply company, 360 meters.
WKAN—Montgomery, Ala., United Battery Service company, 226 meters.
WKAP—Cranston, R. I., Dutee W. Flint, 360 meters.

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BROADCASTING STATIONS AND SCHEDULE OF PROGRAMS

Continued from Page 14.

WKAQ—San Juan, P. R., Radio Corporation of Porto Rico, 360 meters.
WKAR—East Lansing, Mich., Michigan Agricultural college, 280 meters.
WKAS—Springfield, Mo., L. E. Lines Music company, 360 meters.
WKAV—Laconia, N. H., Laconia Radio club, 254 meters.
WKAW—Beloit, Wis., Turner Cycle company, 242 meters.
WKAX—Bridgeport, Conn., 1789 Park avenue, William A. MacFarlane, 231 meters.
WKAY—Gainesville, Ga., Brenau college, 280 meters.
WKC—Baltimore, Md., Joseph M. Zamoiski company, 360 meters.
WKY—Oklahoma City, Okla., WKY Radio shop, 360 meters.
WLAC—Raleigh, N. C., North Carolina State college, 360 meters.
WLAG—Minneapolis, Minn., Cutting and Washington Radio corporation, 417 meters.
WLAH—Syracuse, N. Y., 425 Brownell street, Samuel Woodworth, 234 meters.
WLAJ—Waco, Texas, Waco Electrical Supply company, 360 meters.
WLAK—Bellows Falls, Vt., Vermont Farm Machine corporation, 360 meters.
WLAL—Tulsa, Okla., Naylor Electric company, 360 meters.
WLAN—Houlton, Maine, Putnam Hardware company, 283 meters.
WLAP—Louisville, Ky., 306 West Breckenridge street, W. V. Jordan, 360 meters.
WLAQ—Kalamazoo, Mich., 108 Elm street, Arthur E. Schilling, 360 meters.
WLAT—Burlington, Iowa, Radio and Specialty company, 360 meters.
WLAV—Pensacola, Fla., Electric Shop, 254 meters.
WLAW—New York, N. Y., police department, City of New York, 360 meters.
WLAX—Greencastle, Ind., Putnam Electric company (Greencastle Community Broadcasting station), 231 meters.
WLB—Minneapolis, Minn., University of Minnesota, 360 meters.
WLW—Cincinnati, Ohio, Crosley Manufacturing company, 309 meters.
WMAB—Oklahoma City, Okla., Radio Supply company, 360 meters.
WMAC—Cazenova, N. Y., Fernwood street, J. Edw. Page (Olive B. Meredith), 261 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WMAH—Lincoln, Neb., General Supply company, 254 meters; H. C. Harvey, station director; Monday and Friday, 9 to 10:30 p. m., dance music.
WMAJ—Kansas City, Mo., Drovers Telegram company, 275 meters; J. E. Cook, operator; daily, 8:15 a. m., to 2:25 p. m., markets and news.
WMAK—Lockport, N. Y., Norton Laboratories, 360 meters.
WMAL—Trenton, N. J., Trenton Hardware company, 256 meters.
WMAM—Beaumont, Texas, Beaumont Radio Equipment company, 360 meters.
WMAP—Easton, Pa., Utility Battery service, 246 meters.
WMAQ—Chicago, Ill., Chicago Daily News, 448 meters; Miss Judith C. Waller, director; program announced daily.
WMAV—Auburn, Ala., Alabama Polytechnic institute, 250 meters; Sunday morning and afternoon church services; evening, lectures.
WMAY—St. Louis, Mo., Kingshighway Presbyterian church, 280 meters.
WMAZ—Macon, Ga., Mercer university, 268 meters.
WMC—Memphis, Tenn., "Commercial Appeal" (Commercial Publishing company), 500 meters, George D. Hay, announcer; F. Y. Root, operator.
WMH—Cincinnati, Ohio, Precision Equipment company, 248 meters.
WMC—Washington, D. C., Doubleday-Hill Electric company, 261 meters.
WNAC—Boston, Mass., Shepard stores, 278 meters.
WNAD—Norman, Okla., University of Oklahoma, 360 meters.
WNAL—Omaha, Neb., 5019 Capitol avenue, R. J. Rockwell, 242 meters.
WNAM—Evansville, Ind., Ideal Apparatus company, 360 meters.
WNAN—Syracuse, N. Y., Syracuse Radio Telephone company, 286 meters.
WNAP—Springfield, Ohio, Wittenberg college, 231 meters.
WNAQ—Charleston, S. C., Charleston Radio Electric company, 360 meters.
WNAR—Butler, Mo., C. C. Rhodes, 231 meters.
WNAS—Austin, Texas, Texas Radio Corporation and Austin Statesman, 360 meters.
WNAT—Philadelphia, Pa., Lenmig Brothers company (Frederick Lemmig), 360 meters.
WNAV—Knoxville, Tenn., Peoples Telephone and Telegraph company, 236 meters.
WNAW—Fort Monroe, Va., Peninsular Radio club (Henry Kunzmann), 360 meters.
WNAX—Yankton, S. D., Dakota Radio Apparatus company, 244 meters.
WNJ—Albany, N. Y., Shotton Radio Manufacturing company, 360 meters.
WOAA—Ardmore, Okla., Dr. Walter Hardy, 360 meters.
WOAC—Lima, Ohio, Maus Radio company, 266 meters.
WOAD—Sigourney, Iowa, Friday Battery and Electric corporation, 360 meters.
WOAE—Fremont, Neb., Midland college, 360 meters.
WOAF—Tyler, Texas, Tyler Commercial college, 360 meters; Director, A. B. Chenier; a. m., markets; afternoon, music; evening service Sunday.
WOAG—Belvidere, Ill., Apollo theater (Belvidere Amusement company), 224 meters.
WOAH—Charleston, S. C., Palmetto Radio corporation, 360 meters.
WOAI—San Antonio, Texas, Southern Equipment company, 385 meters.
WOAJ—Parsons, Kan., Ervins Electrical company, 258 meters.
WOAK—Frankfort, Ky., Collins Hardware company, 240 meters.
WOAL—Webster Groves, Mo., 4 Jefferson road, William E. Woods, 229 meters.
WOAN—Lawrenceburg, Tenn., Vaughn Conservatory of Music (James D. Vaughn), 360 meters; 8 p. m., music.
WOAO—Mishawaka, Ind., Lyradion Manufacturing company, 360 meters.
WOAP—Kalamazoo, Mich., Kalamazoo college, 240 meters.
WOAQ—Portsmouth, Va., Portsmouth Kiwanis club, 360 meters.
WOAR—Philadelphia, Pa., 360 meters; director, J. E. Lit; program director, C. Stephens.
WOAT—Wilmington, Del., 215 Market street, Boyd M. Hamp, 360 meters.
WOAV—Erie, Pa., Pennsylvania National Guard, 2d Battalion, 112th Infantry, 242 meters.
WOAW—Omaha, Neb., Woodmen of the World, 526 meters; evening entertainment every night.
WOAX—Trenton, N. J., 600 Ingham avenue, Franklyn J. Wolff, 240 meters.
WOAZ—Stamford, Texas, Penick Hughes company, 360 meters.
WOC—Davenport, Iowa, Palmer School of Chiropractic, 484 meters.
WOI—Ames, Iowa, Iowa State college, 360 meters.
WOK—Pine Bluff, Ark., Pine Bluff company, 360 meters.
WOO—Philadelphia, Pa., 13th and Market streets, John Wanamaker, 509 meters; director, Gordon H. Cullen.
WOQ—Kansas City, Mo., Western Radio company, 360 meters.
WOR—Newark, N. J., L. Bamberger & Co., 405 meters.
WOS—Jefferson City, Mo., Missouri State Marketing bureau, 441 meters.
WPAB—State College, Pa., Pennsylvania State college, 360 meters.
WPAC—Okmulgee, Okla., Donaldson Radio company, 360 meters.
WPAD—Chicago, Ill., W. A. Weiboldt & Co., 360 meters.
WPAH—Waupaca, Wis., Wisconsin department of markets, 360 meters.
WPAJ—New Haven, Conn., Doolittle Radio corporation, 268 meters.
WPAK—Agricultural College, N. D., North Dakota Agricultural college, 360 meters.
WPAL—Columbus, Ohio, Superior Radio and Telegraph Equipment company, 286 meters.
WPAM—Topeka, Kan., Auerbach & Guettal, 360 meters, 100 watts; W. A. Beasley, director; markets; special programs, 6:15 p. m.; [illegible] Kansas avenue, Theodore B. Palmer, 360 meters.
WPAQ—Frostburg, Md., General Sales and Engineering company, 360 meters.
WPAR—Beloit, Kan., Ward Battery and Radio company, 360 meters.
WPAT—El Paso, Texas, St. Patrick's cathedral, 360 meters.
WPAU—Moorhead, Minn., Concordia college, 360 meters.
WPAZ—Charleston, W. Va., Dr. John R. Koch, 273 meters.
WPG—New Lebanon, Ohio, Nushawg Poultry farm, 243 meters.
WQAA—Parkesburg, Pa., Horace A. Beale Jr., 360 meters.
WQAB—Springfield, Mo., Southwest Missouri State Teachers' college, 236 meters.
WQAC—Amarillo, Texas, 108 East 8th street, E. B. Gish, 360 meters.
WQAD—Waterbury, Conn., Whitall Electric company, 242 meters; 6:30 to 7:45 p. m., Monday, Wednesday and Friday.
WQAE—Springfield, Vt., Moore Radio News station (Edmund B. Moore), 275 meters.
WQAF—Sandusky, Ohio, Sandusky Register, 240 meters.
WQAH—Lexington, Ky., Brock-Anderson Electrical Engineering company, 254 meters.
WQAL—Mattoon, Ill., Coles County Telephone and Telegraph company, 258 meters.
WQAM—Miami, Fla., Electrical Equipment company, 300 meters. Director, R. H. Horning. Tuesday, 7 to 8 a. m., 9 to 10 a. m., Sunday.
WQAN—Scranton, Pa., Scranton Times, 280 meters.
WQAO—New York, N. Y., Calvary Baptist church, 360 meters.
WQAQ—Abilene, Texas, West Texas Radio company, 360 meters.
WQAS—Lowell, Mass., Prince-Walter company, 266 meters.
WQAV—Greenville, S. C., Huntington and Guerry (Inc.), 258 meters.
WQAW—Washington, D. C., Catholic university, 236 meters.
WQAX—Peoria, Ill., Radio Equipment company, 360 meters.
WQAZ—Greensboro, N. C., Greensboro Daily News, 360 meters.
WHAA—Houston, Texas, Rice institute, 360 meters.
WRAD—Marion, Kan., Taylor Radio shop (G. L. Taylor), 360 meters.
WRAF—Laporte, Ind., The Radio club (Inc.), 224 meters.
WRAH—Providence, R. I., Stanley N. Read, 231 meters.
WRAL—St. Croix Falls, Wis., Northern States Power company, 248 meters.
WRAN—Waterloo, Iowa, Black Hawk Electrical company, 236 meters. Director, H. R. Plowman; 5 to 6 p. m. week days; 8:15 to 9:15 p. m. Monday, concert.
WRAO—St. Louis, Mo., Radio Service company, 360 meters.
WRAP—Winter Park, Fla., Winter Park Electrical Construction company, 360 meters.
WRAU—Amarillo, Texas, Amarillo Daily News, 360 meters.
WRAV—Yellow Springs, Ohio, Antioch college, 360 meters.
WRAW—Reading, Pa., Avenue Radio shop (Horace D. Good), 238 meters.
WRAX—Gloucester City, N. J., Flaxon's garage, 268 meters.
WRAY—Scranton, Pa., Radio Sales corporation, 280 meters.
WRAZ—Newark, N. J., Radio Shop of Newark (Herman Lubinsky), 233 meters.
WRC—Washington, D. C., Radio Corporation of America.
WRK—Hamilton, Ohio, Doron Bros. Electric company, 360 meters.
WRL—Schenectady, N. Y., Union college, 360 meters.
WRM—Urbana, Ill., University of Illinois, 360 meters.
WRR—Dallas, Texas, City of Dallas (police and fire signal department), 360 meters.
WRW—Tarrytown, N. Y., Tarrytown Radio Research laboratory, 273 meters.
WSAB—Cape Girardeau, Mo., Southeast Missouri State Teachers' college, 360 meters.
WSAC—Clemson College, S. C., Clemson Agricultural college, 360 meters.
WSAD—Providence, R. I., J. A. Foster company, 261 meters.
WSAG—St. Petersburg, Fla., City of St. Petersburg (Loren V. Davis), 244 meters.
WSAH—Chicago, Ill., 4801 Woodlawn avenue, A. J. Leonard, Jr., 248 meters.
WSAI—Cincinnati, Ohio, United States Playing Cards company, 309 meters.
WSAJ—Grove City, Pa., Grove City college, 360 meters.
WSAK—Middleport, Ohio, Foster Egner (Daily News, Pomeroy, Ohio), 258 meters.
WSAL—Brookville, Ind., Franklin Electric company, 360 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WSB—Atlanta, Ga., Atlanta Journal company, 429 meters. No silent night. Day schedule 12:1 p. m., musical program; 2:30 p. m., weather; 5-5:30 p. m., bedtime story. Evening—8-9 p. m., popular concert.
WSL—Utica, N. Y., J. & M. Electric company, 360 meters.
WSY—Birmingham, Ala., Alabama Power company, 360 meters.
WTAC—Johnstown, Pa., Pennsylvania Traffic company, 360 meters.
WTAS—Elgin, Ill., Charles E. Erbstein, 275 meters. Evening schedule—7:30 p. m., musical program.
WTAU—Tecumseh, Neb., Ruegy Battery and Electric company, 360 meters.
WTAW—College Station, Texas, Agricultural and Mechanical college, 360 meters.
WTG—Manhattan, Kan., Kansas State Agricultural college, 485 meters.
WWAD—Philadelphia, Pa., Wright & Wright, 360 meters.
WWAX—Laredo, Texas, Wormser Brothers, 360 meters.
WWB—Canton, Ohio, Daily News Printing company, 360 meters.
WWI—Dearborn, Mich., Ford Motor company, 360 meters.
WWJ—Detroit, Mich., Detroit News, 580 meters. Silent Saturday. Day schedule—8:30 a. m., household hints and talks for women; 9:25 a. m., weather; 10:55 a. m., time signals; 2 p. m., concert. Evening schedule—8:30 p. m., concert.
WWL—New Orleans, La., Loyola university, 360 meters.
WWT—Buffalo, N. Y., McCarthy Brothers & Ford, 360 meters.
WWZ—New York city, Wannamaker's department store, 360 meters.

Irish Boy Hears KDKA on One-Tube Home-Made Set

KDKA (East Pittsburg) has again made a remarkable record in the field of broadcasting. Recently a number of letters have been received from listeners-in of England, Ireland, Scotland, South Wales, South America and other distant points.

In each case the programs broadcast from Pittsburg Post studio and at East Pittsburg have been received on one and two stage receiving sets, but according to word received, here's the experience of a schoolboy in Belfast, Ireland, who received KDKA on a one-tube homemade set:

"Belfast, Ireland—While experimenting with a one-tube homemade wireless set, Edward C. Medaw, a Belfast schoolboy, picked up a concert broadcast from the Westinghouse company station at East Pittsburg at 5 o'clock this morning, Dec. 21, 1923. (Midnight eastern standard time.)"

Russia to Make Radio

Ratification has been made of the contract between the French Compagnie General de Telegraphie Sans Fil and the Russian Radio Electric Trust, according to cable advices from Trade Commissioner Butler, at Paris. The agreement provides for the installation of wireless stations and manufacture of apparatus in Russia.

Long-Distant Hounds Smash Records

THE WEEK'S PACE SETTER.

The following DX record comes in sworn to and attested by a notary public. It's the week's pace setter:

RADIO EDITOR: The following stations were picked up by me in forty-eight hours and about 95 per cent came in on the loud speaker. The set is a five-tube neutrodyne: KDKA, Pittsburg, Pa.; KFI, Los Angeles, Cal.; KFKX, Hastings, Neb.; KHJ, Los Angeles, Cal.; KOP, Detroit, Mich.; KPO, San Francisco, Cal.; KSD, St. Louis, Mo.; WABN, La Crosse, Wis.; WBAD, Minneapolis, Minn.; WBAH, Minneapolis, Minn.; WBAP, Fort Worth, Texas; WSB, Newark, N. J.; WBZ, Springfield, Mass.; WCBD, Zion, Ill.; WCM, Austin, Texas; WCY, Detroit, Mich.; WDAF, Kansas City, Mo.; WDAU, New Bedford, Mass.; WEAF, New York, N. Y.; WEAH, Witchita, Kas.; WEAO, Columbus, Ohio; WFAA, Dallas, Texas; WGR, Buffalo, N. Y.; WGY, Schenectady, N. Y.; WHA, Madison, Wis.; WHAZ, Troy, N. Y.; WHAS, Louisville, Ky.; WHB, Kansas City, Mo.; WIAO, Milwaukee, Wis.; WJAR, Providence, R. I.; WJAX, Cleveland, Ohio; WLAG, Minneapolis, Minn.; WLW, Cincinnati, Ohio; WMAB, Oklahoma, Okla.; WMAN, Columbus, Ohio; WMC, Memphis, Tenn.; WOAI, San Antonio, Texas; WOAW, Omaha, Neb.; WOO, Philadelphia, Pa.; WOR, Newark, N. J.; WOS, Jefferson City, Mo.; WPAH, Waupaca, Wis.; WOC, Davenport, Iowa; WRC, Washington, D. C.; WRM, Urbana, Ill.; WRR, Dallas, Texas; WSB, Atlanta, Ga.; WTAM, Cleveland, Ohio; WWJ, Detroit, Mich.; CFCN, Calgary, Alberta; CFCA, Toronto, Canada; and all local stations.—W. A. WARTENBE, 5222 Belle Plaine Avenue, Chicago. (Subscribed and sworn to before me by the said W. A. Wartenbe, this 28th day of December, 1923. Robert E. O'Keefe, Notary Public.)

HEARS HAVANA IN DAY TIME.

RADIO EDITOR: Last Thursday I bought The Post and I enjoyed it so much that I am determined to get in on it. I have a two-stage standard regenerative Armstrong set but I have a 23-plate vernier variable condenser across the secondary of the variocoupler.

Every night is silent night for me, and I am pleased because I never can find a good program in Chicago.

Wednesday night, Dec. 26, I was tuning in until 11:30 and I tuned in the following stations: KYW, WMAQ, WDAP, WOC, WWJ, KDKA, WGY, WOR, WHB, WMC, WOAW, WPA, WPG, WSY, WTAS, until 10:30. After 10:30 WDAP, WJAZ, WRC, KFAF, KQV, KHJ, KGG. This is a total of twenty-two stations but four of these are Chicago stations.

On Sunday, Dec. 23, I received the following stations: 11:05, KYW, Chicago, Ill., church services; 2:10, WOK, organ music; 2:31, WSY, Birmingham, Ala., orchestra; 3:54, WCBD, Zion, Ill., church services; 4:37, WTAS, Elgin, Ill., music; 6:02, WJAZ, Chicago, Ill., Marine dining-room orchestra; 6:47, KYW, Chicago, Ill., Sunday Evening club; 7:10, WBZ, Springfield, Mass., music; 7:32, KDKA, East Pittsburg, orchestra, ("Chinese Rag Doll"); 10:31, 9BA, testing; 10:35, WDAP, Chicago, orchestra; 11:15, KFI, Los Angeles, Cal., orchestra; 11:28, KHJ, Los Angeles, Cal., music; 11:33, KFCL, Los Angeles, Cal., Christmas music; and early morning at 12 to 12:30, WHB, Sweeney Auto school, Kansas City, orchestra.

This is a total of fifteen stations. I would be pleased to demonstrate my set at any time.

Last night (Dec. 28) I added two potentiometers on my set, one for the return on the variocoupler and one in the "B." This afternoon (Dec. 29) at 3:29 I tuned in PWX, Havana, Cuba. Two persons were listening beside me.—CLARK ANDERSON, 808 West 14th place, Chicago.

SOME GOOD WORK HERE.

RADIO EDITOR—I am sending in a list received on Wednesday, Jan 2. I received twenty-nine stations. I got Havana, Cuba, and Regina, Canada, and three different places in New York city. I received these stations on a new 3-tube set I received for Christmas. This set will not go below 345 meters because it is not adjusted yet. I got Cincinnati, which is on 309 meters, but it was the broadness of the station and was very faint. My list is: WIAO, Milwaukee, Wis., Victrola music; WGY, Schenectady, N. Y., stock reports; WSB, Atlanta, Ga., news bulletins from Atlanta Journal; WCX, Detroit, Mich., dinner concert; WOC, Davenport, Iowa, teaching the code by radio; WCAE, Pittsburg, Pa., dinner concert from William Penn hotel; KDKA, East Pittsburg, Pa., KDKA Little Symphony; School of the Air program; WEAF, New York, N. Y., vocal solo; WLAG, St. Paul and Minneapolis, dinner concert from Athletic club; WJAR, Providence, R. I., orchestra, "Last Night on the Back Porch"; WOAI, San Antonio, Texas, news bulletins; WHN, New York, N. Y., Jack Fox's orchestra; WJZ, New York, N. Y., dinner concert from Hotel Adelphia; WDAR, Philadelphia, Pa., bedtime stories; WOR, Newark, N. J., dancing lesson; KSD, St. Louis, Mo., Aberglh's concert ensemble; WOO, Philadelphia, Pa., WOC orchestra; WRC, Washington, D. C., orchestra; WBAP, Fort Worth, Texas, ukulele music; WWJ, Detroit, Mich., WWJ orchestra; WHB, Kansas City, Mo., WHB orchestra; WHAS, Louisville, Ky., Barney Rapp and his orchestra; WTAM, Cleveland, Ohio WTAM orchestra; PWX, Havana, Cuba, baseball poem, the ticking of a clock, very plain; WHA, Madison, Wis., signing off a 8:30; WLW, Cincinnati, Ohio, special program; WOS, Jefferson City, Mo., The Trio CKCK, Regina, Canada, orchestra, later "lost" bulletins.

At about 7 o'clock I heard somebody announcing in Italian and then give a speech in Italian. I would like very much to find out where it was.—JOHN SHELDON, 241 South Avenue, Glencoe, Ill.

IT IS HERE PRINTED.

RADIO EDITOR: I would like to know if WJZ, New York; KDKA, Pittsburg; KSD St. Louis; WWJ, Detroit, on a silent night with a Rothschild $5 crystal set with a Gruwol (fixed) condenser, is any so-called DX record? I also hear WTAS, Elgin, every night in the week with no interference from Chicago. If this is o. k., would like to see it printed. This is the double control receiver.—EARL J. LEENEY, 8625 South Union avenue, Chicago.

CHICAGO'S GREATEST RADIO BARGAINS!

SPECIAL NOTICE!
These most important sales will continue every day of this week—and next week up to and including Thursday, January 17.

January Clearance Sale

Offering opportunities that every radio fan will find profitable. Come tomorrow, if you can—but in any event—don't fail to come before the sale ends—Thursday, Jan. 17.

VARIABLE CONDENSERS

	Regular Price	Our Price
43-Plate Vernier	$7.00	$3.48
23-Plate Vernier	6.00	3.15
14-Plate Vernier	5.50	2.98
3-Plate Vernier	2.00	.98

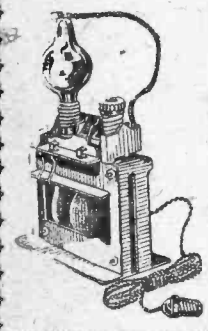
PLAIN STYLE

	Regular Price	Our Price
43-Plate Plain	$4.00	$1.69
23-Plate Plain	3.50	1.39
11-Plate Plain	3.00	1.25
5-Plate Plain	2.50	1.15

LOUD SPEAKER

Beautifully finished. Stands 22 inches high. Guaranteed workmanship. With Edsh Unit,
$8.49
With Baldwin Unit,
$9.69

BATTERY CHARGER



An Unusual BARGAIN
With genuine Tungar bulbs; charges 2 amperes per hour. List price $18. Our special price,
$8.69

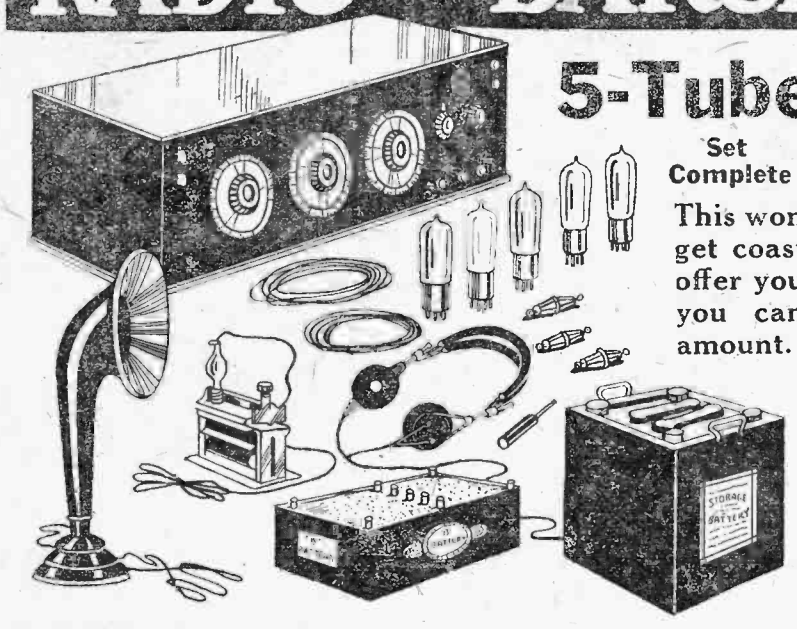
COMPLETE PARTS for COCKADAY CIRCUIT

Special for This Week's Sale
$10.98

ANTENELLA or DUCON AERIAL PLUG—Does away with outside aerial **98c**
KLOSNER VERNIER RHEOSTATS—Special **79c**

Aerial Wire
Stranded Aerial Wire, used by U. S. Signal Corps. 100 ft. for **29c**

Hercules, 4-Way Plugs, Each, 65c. Two for $1.19
V. T. Sockets, each 19c
Molded V. T. Sockets, Each, 35c. Three for 95c
Enclosed Crystal Detector 49c
Phone Jacks, up from 19c
Phone Cords, special at 33c
Raven Hygrade Variometer, $2.19
Jefferson Transformer $2.48



5-Tube Set Complete NEUTRODYNE

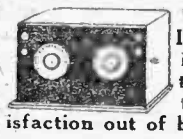
This wonderful set guaranteed to get coast to coast. We couldn't offer you anything better even if you came in with twice the amount. There is no better. We offer you this set COMPLETE—NO EXTRAS. It consists of a very high-grade Cabinet, all parts assembled—including

$151.49

Five Radiotron Tubes	B Batteries	Insulators
Loud Speaker	Head Set	Phone Plugs and
Storage Battery	Aerial Wire	Ground Clamp
Battery Charger	Ground Wire	

Each Set with a Guarantee or Money Refunded. Complete with all listed parts, as above, for $151.49.

WAVE TRAPS



Will tune out all Interference. This is an essential to the fan who wants to get utmost satisfaction out of his set.

PARTS ONLY—Our special price **$4.98**
COMPLETE—Highly Polished Cabinet, **$7.95**

We Carry All Parts and Prints for Making These Sets

SETS IN CABINETS COMPLETE

Each Set Complete at the Price Quoted, Less Accessories	Prices Assembled Complete in Cabinet	Prices Unassembled
5-Tube Neutrodyne Set	$76.25	$61.00
4-Tube Neutrodyne Set	66.25	53.00
3-Tube Neutrodyne Set	36.66	29.33

CABINETS

EXTRA SPECIALS
Solid Oak and Mahogany Finish. Note the Prices:—

6x10½	$2.10
6x21	2.75

We have all others in stock.

Radio Corporation Cabinets
Genuine Veneer Finish Mahogany. 9¼x13¼. $10.00 value. Each **$2.69**

Every Article Described Herein Is GUARANTEED

By Us to be exactly as represented or your money CHEERFULLY refunded. We have built up our business on the sound basis of MERIT, HONESTY and SATISFACTION. Our sale is never completed until our customer is fully satisfied: We install Radio Sets ON APPROVAL. Leave—or send us—YOUR NAME AND ADDRESS.

IF IT'S RADIO—WE HAVE IT

TUBES

CUNNINGHAM and RADIOTRON TUBES at special cut prices for this week only:—

200-DETECTOR. Our Special Price	$3.95
201A, 199, WD12 or WD11—all $6.00 list. Our Price	$4.98

HEAD SETS

The Famous Baldwin Head Sets, listed at $12.00 a pair, offered in this six-day sale at an unusually low price **$6.69**

OTHER SPECIAL VALUES	LIST PRICE	SALE PRICE
Roller-Smith	$8.00	$3.68
Edsh	7.50	4.25
Berwick 3000 ohm	7.00	2.98
Berwick 2000 ohm	6.00	2.68
Manhattan 3000 ohm	6.00	3.68
Manhattan 2000 ohm	5.00	3.25
Brandes	6.50	4.95

SPECIAL We have 200 pairs of Kilborne-Clark guaranteed Head Sets which we are offering at a very special price—actually the best value in Chicago **$2.48**

REINARTZ 1-Tube Set

Complete, assembled. All parts in mahogany finished cabinet. Specially priced for this week's sale at
$15.95
PARTS ONLY—Unassembled. Price **$11.45**

Panels High-grade. Polished. Sq. inch 1½c

WESTINGHOUSE WR-21 TUBES

Detector or Amplifier, for use with 3 dry cells, does away with storage batteries. Specially priced at
$2.89
Two for $5.49

Complete Parts for ERLA REFLEX

1 Variocoupler.
23-Plate Variable Condenser.
2 Erla Sockets.
1 Erla Reflex No. 1 Transformer.
1 Erla A. F. Transformer.
1 Erla .002 Mica Condenser.
1 Erla .001 Mica Condenser.
1 Erla .00025 Mica Condenser.
1 Erla Fixed Crystal Detector.
1 Howard Rheostat.
2 Bakelite Dials.
8 Binding Posts.
1 Dozen Switch Points and 4 Stops.
2 Switch Levers.
1 6½x14x⅛-inch Panel.

VERY SPECIAL AT
$20.79

Complete Parts for POWER AMPLIFIER

1 Set of Push and Pull Thordarson or All-American Power Transformers.
2 V. T. Sockets.
1 Howard Power Rheostat.
8 Binding Posts.
5 Switch Points and Stops.
1 Switch Lever.
1 Cutler-Hammer Filament Switch.
1 7x9 Panel.
Baseboard and instructions for assembling and mounting.

USUALLY SOLD AT $25.00
OUR SPECIAL PRICE
$16.69

Complete Parts for 2-STAGE AMPLIFIER

Can be used on any long or short wave V. T. receiver or crystal receiving set; will operate any loud speaker or loud speaking unit attachment.

1 7x9 Panel.
1 High-Ratio All-American or Thordarson Transformer.
1 Low-Ratio All-American or Thordarson Transformer.
1 Howard Rheostat.
2 Bakelite Sockets.
3 Double Jacks.
13 Binding Posts.

USUALLY SOLD AT $20.00
OUR SPECIAL PRICE
$12.69

STORAGE BATTERIES

We guarantee each battery for TWO YEARS. If you have any trouble at all return for cash refund. Special prices for this sale:—

60-Ampere Hours $10.48
80-Ampere Hours 11.75
100-Ampere Hours 14.25

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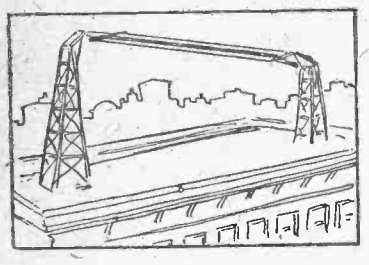

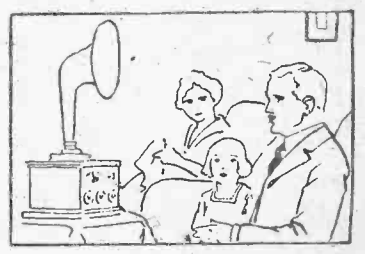

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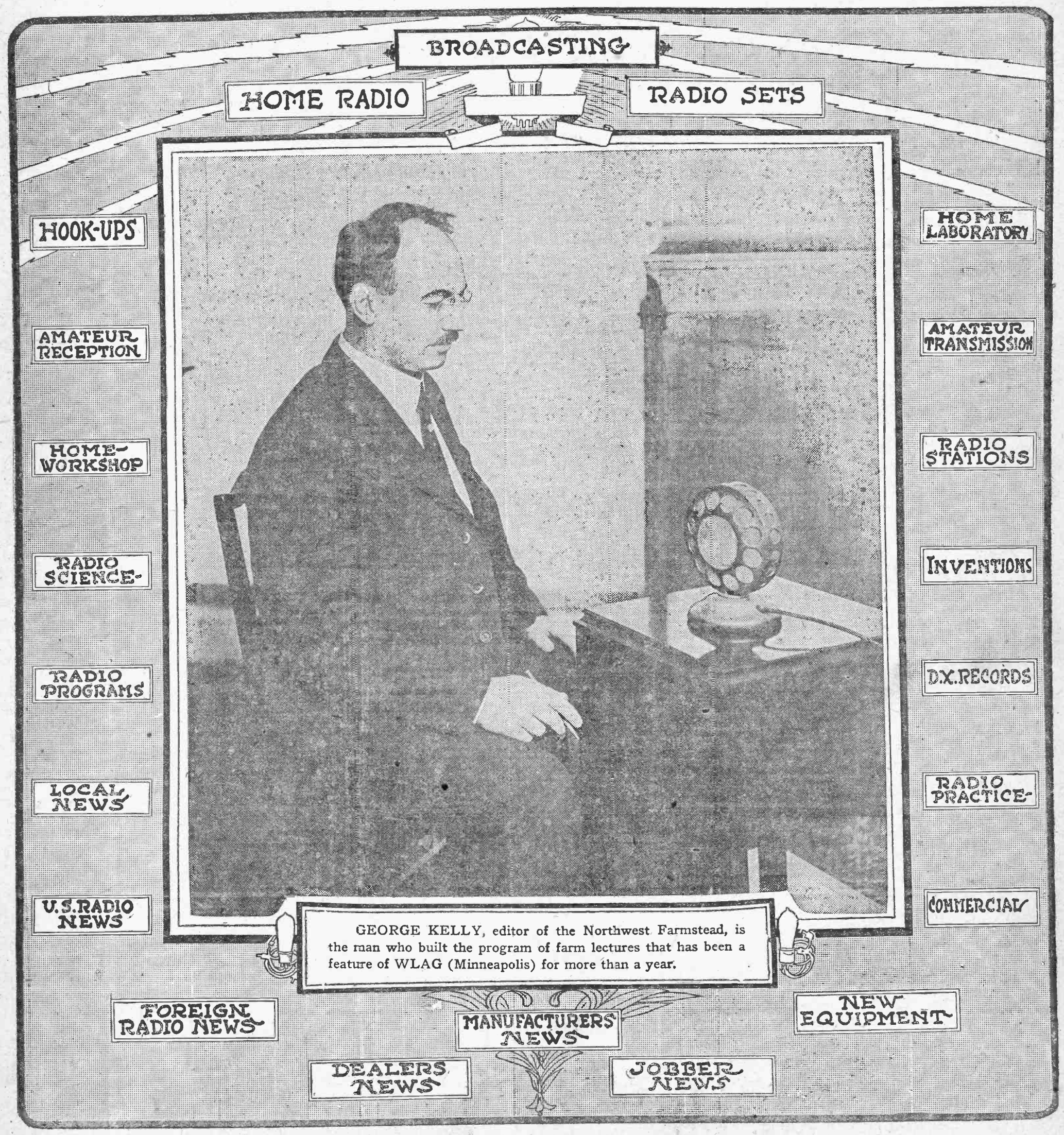

GEORGE KELLY, editor of the Northwest Farmstead, is the man who built the program of farm lectures that has been a feature of WLAG (Minneapolis) for more than a year.

IN THIS ISSUE

Turning the Universal Panel Into a Reinartz Receiver—Some Notes on the Superduc Circuit—The Armstrong Flivver, a Super Set That Works Loud Speaker on Two Tubes—Pictures That Make You Acquainted with Zion City Broadcasting Station.

Broadcasting Stations and Schedules

Central, or Chicago time, is shown on all stations. If necessary to ascertain local time on any station deduct two hours from time shown for Pacific coast stations, one hour from time shown for the Rocky mountain stations and add one hour to those stations using eastern time. Hawaiian island time is four hours and a half slower than Chicago time. In the list the call number of the station is first given, followed by the location, the owner's name, wave length used and broadcasting schedule in order named. THE POST is making a thoro canvass of all stations in order that this directory may be complete and accurate. Changes are so frequent in stations and schedules that no list can be satisfactory which is not corrected frequently. Corrections and additions to this list will be made from week to week. Stations are urged to co-operate by sending information of changes in schedule to Radio Editor, The Chicago Evening Post.

CFAC—Calgary Herald, Calgary, Canada; 430 meters; Fred Carleton, director and operator; silent Monday, Wednesday and Thursday; Tuesday, day, 1 to 1:30, night, 7:45 to 7:55; Friday, day, 1 to 1:30, night, 7:45 to 8:45 and 11 to 12.

CKAC—La Presse, Montreal, Canada; 430 meters; J. M. Carter, announcer and director; day, 4, music; 4:30, weather and stock reports; special Tuesday, Thursday and Saturday, night, 7, kiddies stories in French and English; 7:30 to 10 lectures in French and English, music; Sunday, day, 4, sacred music.

CKOC—Wentworth Radio Supply company, Hamilton, Ont.; 410 meters H. Slach, operator; silent nights, Tuesday, Thursday; Saturday, night, 7:30 to 9; special Sunday night church exercises, 7 to 8.

KDKA—East Pittsburg, Westinghouse Electric and Manufacturing company, 326 meters.

KDPM—Cleveland, Ohio, Westinghouse Electric and Manufacturing company, 270 meters.

KDPT—San Diego, Calif., Southern Electrical company, 244 meters.

KDYL—Salt Lake City, Utah, Telegram Publishing company, 244 meters.

KDYM—San Diego, Calif., Savoy theater, 252 meters.

KDYQ—Oregon Institute of Technology, Portland, Ore., 360 meters; program director, L. E. Simson.

KDYQ—Portland, Ore., Oregon Institute of Technology, 360 meters.

KDYS—Great Falls, Mont., The Tribune, 360 meters.

KDYW—Phoenix, Ariz., Smith Hughes & Co., 360 meters.

KDYX—Honolulu, Hawaii, Star Bulletin, 360 meters.

KDZB—Bakersfield, Calif., 1402 20th street, Frank E. Seifert, 240 meters.

KDZE—Seattle, Wash., The Rhodes company, 455 meters.

KDZF—Los Angeles, Calif., Automobile Club of Southern California, 278 meters.

KDZI—Wenatchee, Wash., Electric Supply company, 360 meters.

KDZK—Reno, Nev., Nevada Machinery and Electric company, 360 meters.

KDZQ—Denver, Colo., Nichols Academy of Music, 360 meters.

KDZR—Bellingham Publishing company; Bellingham, Wash., 261 meters; 50 watts; operator and announcer, A. M. Brown; silent Thursday; night, 9 to 10, local talent, phonograph music.

KDZT—Seattle, Wash., Seattle Radio association, 360 meters.

KFAD—Phoenix, Ariz., McArthur Bros. Mercantile company, 360 meters.

KFAE—Pullman, Wash., State College of Washington, 360 meters; director, H. V. Carpenter; program manager, A. J. Kralowse; silent Tuesday, Thursday, Saturday, Sunday, night, 9:30 to 11; educational lectures.

KFAF—Western Radio corporation, Denver, Colo., 360 meters. Silent nights, Sunday and Wednesday. Nights, 9 to 10.

KFAJ—Boulder, Colo., University of Colorado, 360 meters.

KFAN—Moscow, Idaho, The Electric shop, 360 meters.

KFAP—Butte, Mont., Standard Publishing company, 360 meters.

KFAR—Hollywood, Calif., Studio Lighting Service company (O. K. Olsen), 280 meters.

KFAU—Boise, Idaho, Independent School District of Boise City, Boise High school, 270 meters.

KFAV—Venice, Calif. Abbot Kinney company, 224 meters.

KFAW—Santa Ana Calif., The Radio Den (W. B. Ashford and H. T. White), 280 meters.

KFAY—Medford, Ore., Virgin's Radio service, 283 meters.

KFBB—Havre, Mont., F. A. Buttrey & Co., 360 meters.

KFBC—San Diego, Calif., W. K. Azbill, 278 meters.

KFBE—San Luis Obispo, Calif., Reuben H. Horn, 360 meters.

KFBG—Tacoma, Wash., First Presbyterian church, 360 meters.

KFBK—Sacramento, Calif., Kimball-Upson company, 283 meters.

KFBL—Everett, Wash., Leese Bros., 224 meters.

KFBS—Trinidad, Colo., Trinidad Gas and Electric Supply company and the Chronicle News, 360 meters.

KFBU—Laramie, Wyo., The Cathedral (Bishop N. S. Thomas), 283 meters.

KFCB—Phoenix, Ariz., Nielsou Radio Supply company, 238 meters.

KFCD—Salem, Ore., Salem Electric company, 360 meters.

KFCF—Walla Walla, Wash., 707 Baker building, Frank A. Moore, 360 meters.

KFCH—Billings, Mont., Electric Service station (Inc.), 360 meters.

KFCK—Colorado Springs, Colo., Colorado Springs Radio company, 258 meters.

KFCL—San Antonio, Calif., Los Angeles Union Stock yards, 360 meters.

KFCM—Richmond, Calif., Richmond Radio shop (Frank T. Doeing), 360 meters.

KFCP—Ogden, Utah, 2421 Jefferson avenue, Ralph W. Flygare, 360 meters.

KFCY—Houston, Texas, Fred Mahaffey, Jr., 360 meters.

KFCY—Le Mars, Iowa, Western Union college, 252 meters.

KFCZ—Omaha, Neb., Omaha Central High school, 258 meters.

KFDA—Baker, Ore., Adler's Music store, 360 meters.

KFDD—Boise, Idaho, St. Michael's cathedral, 252 meters.

KFDH—Tuscon, Ariz., University of Arizona, 360 meters.

KFDJ—Corvallis, Ore., Oregon Agricultural college, 360 meters.

KFDL—Denver, Colo., Knight-Campbell Music company, 360 meters, 50 watts.

KFDO—Bozeman, Mont., 420 West Koch street, H. Everett Cutting, 248 meters.

KFDP—Des Moines, Iowa, Hawkeye Radio and Supply company, 278 meters.

KFDR—York, Neb., Bullock's Hardware and Sporting Goods (Robert G. Bullock), 360 meters.

KFDU—Lincoln, Neb., Nebraska Radio Electric company, 240 meters.

KFDV—Fayetteville, Ark., Gilbrech & Stinson, 360 meters.

KFDX—Shreveport, La., First Baptist church, 360 meters.

KFDY—Brookings, S. D., South Dakota State College of Agriculture and Mechanic Arts, 360 meters.

KFDZ—Minneapolis, Minn., 2510 South Thomas avenue, Harry O. Iverson, 360 meters.

KFEC—Portland, Ore., Meier & Frank company, 360 meters.

KFEJ—Tacoma, Wash., 1724 South Jay street, Guy Greason, 360 meters.

KFEL—Denver, Colo., Winner Radio corporation, 360 meters.

KFEP—Denver, Colo., Radio Equipment company (Joseph L. Turre), 240 meters.

KFEQ—Oak, Neb., J. L. Scroggin, 360 meters.

KFER—Fort Dodge, Iowa, Auto Electric Service company, 231 meters.

KFEV—Douglas, Wyo., Radio Electric Shop, 263 meters.

KFEX—Minneapolis, Minn., Augsburg Seminary, 261 meters.

KFEY—Kellogg, Idaho, Bunker Hill and Sullivan Mining and Concentrating company, 360 meters.

KFEZ—St. Louis, Mo., American Society of Mechanical Engineers (F. H. Schubert), 360 meters.

KFFB—Boise, Idaho, Jenkins Furniture company, 240 meters.

KFFE—Pendleton, Ore., Eastern Oregon Radio company, 360 meters.

KFFO—Hillsboro, Ore., Dr. E. S. Smith, 229 meters.

KFFP—Moberly, Mo., First Baptist church, 275 meters.

KFFQ—Colorado Springs, Colo., Marksheffel Motor company, 360 meters.

KFFR—Sparks, Nev., Nevada State Journal (Jim Kirk), 226 meters.

KFFV—Lamoni, Iowa, Graceland college, 360 meters.

KFFX—Omaha, Neb., McGraw company, 278 meters.

KFFY—Alexandria, La., Pincus & Murphy, 275 meters.

KFFZ—Dallas, Texas (portable), Al. G. Barnes Amusement company, 226 meters.

KFG—Baton Rouge, La., Louisiana State university, 254 meters.

KFGD—Chickasha, Okla., Chickasha Radio and Electric company, 248 meters.

KFGH—Standard University, Cal., Leland Stanford university, 360 meters.

KFGJ—St. Louis, Mo., Missouri National guard 138th infantry, 266 meters.

KFGL—Arlington, Ore., Arlington garage, 234 meters.

KFGP—Cheney, Kan., Cheney Radio company, 239 meters.

KFGQ—Boone, Iowa, Crary Hardware company, 226 meters.

KFGV—Utica, Neb., Heidbreder Radio Supply company, 224 meters.

KFGX—Orange, Texas, First Presbyterian church, 250 meters.

KFGZ—Berrien Springs, Mich., Emmanuel Missionary college, 268 meters.

KFHA—Gunnison, Colo., Colorado State Normal school, 252 meters.

KFHB—Hood River, Ore., Rialto theater (P. L. Beardwell), 280 meters.

KFHD—St. Joseph, Mo., Utz Electric Shop company, 226 meters.

KFJH—Selma, Cal., The Sugar Bowl (H. R. Shaw), 273 meters.

KFJI—Astoria, Ore., Liberty theater (E. E. Marsh), 252 meters.

KFJJ—Carrollton, Mo., Carrollton Radio shop, 236 meters.

KFJK—Bristow, Okla., Delano Radio and Electric company, 233 meters.

KFJI—Ottumwa, Iowa, Hardsacg Manufacturing company, 242 meters.

KFJM—Grand Forks, N. D., University of North Dakota, 229 meters.

KFJQ—Grand Forks, N. D., Electric Construction company (portable), 252 meters.

KFJR—Stevensville, Mont., Ashley C. Dixon and Son, 258 meters.

KFJV—Dexter, Iowa, Thomas H. Warren, 224 meters.

KFJW—Towanda, Kan., Le Grand Radio company, 22½ meters.

KFJX—Cedar Falls, Iowa, State Teachers' college, 229 meters.

KFJY—Fort Dodge, Iowa, Tunwall Radio company, 246 meters.

KFJZ—Fort Worth, Texas, Texas National Guard, 112th Cavalry, 254 meters.

KFKA—Greeley, Colo., Colorado State Teachers' college, 248 meters.

KFKB—Milford, Kan., Brinkley-Jones Hospital association, 286 meters.

KFKH—Lakeside, Colo., Denver Park and Amusement company, 248 meters.

KFKQ—Conway, Ark., Conway Radio laboratories, 224 meters.

KFKV—Butte, Mont., F. F. Gray, 283 meters.

KFKX—Hastings, Neb., Westinghouse Electric and Manufacturing company, 286 meters.

KFKZ—Colorado Springs, Colo., Nassour Bros. Radio company, 234 meters.

KFLA—Butte, Mont., Abner R. Wilson, 283 meters.

evenings, 9, news bulletins; 9:30, weather; 10, studio programs, lectures, entertainment.

KLZ—Denver, Colo., Reynolds Radio company, 360 meters.

KMJ—Fresno, Calif., San Joaquin Light and Power corporation, 273 meters, 50 watts; R. C. Denny, operator and director; Wayne Freund, announcer; Tuesday, Friday and Sunday night, 10 to 11.

KMO—Tacoma, Wash., Love Electric company, 360 meters.

KNJ—Roswell, New Mexico, Roswell Public Service company, 250 meters.

KNT—Aberdeen, Wash., Grays Harbor Radio company (Walter Hemrich), 263 meters.

KNV—Los Angeles, Cal., Radio Supply company, 360 meters.

KNX—Los Angeles, Cal., Electric Lighting Supply company, 360 meters.

KOB—State College, New Mexico, New Mexico College of Agriculture and Mechanic Arts, 360 meters. Daily, time signals, weather, news, crop reports; Monday, Wednesday, Friday night, 8:30 to 9:30, concerts.

KOP—Detroit Police department, Detroit, Mich., 286 meters; daily except Sunday; 1 p. m., to 6:30 p. m.

KPO—San Francisco, Cal., Hale Brothers 423 meters; silent Friday; Sunday night, 10:30 to 12, concert; Monday, 10 to 11, organ, 11 to 12, dance music; Tuesday, Wednesday, Thursday nights, 10 to 11, studio program, 11 to 12, dance music; Saturday night, 10 to 2 a. m., dance music.

KQI—Berkeley, Cal., University of California, 360 meters.

KQP—Hood River, Ore., Apple City Radio club, 360 meters.

KQV—Pittsburg, Pa., Doubleday-Hill Electric company, 360 meters.

KQW—San Jose, Cal., Berkeley Daily Gazette, 278 meters.

WAAM—Newark, N. J., I. R. Nelson company, 263 meters.

WAAN—Columbia, Mo., University of Missouri, 254 meters.

WAAW—Omaha, Neb., Omaha Grain Exchange, 360 meters, 500 watts; Daily except Sunday, 9:45, 10:45, 11:45, 12:45, 1:15 and 8, world markets; final report Saturday at 12:45 p. m.

WAAZ—Emporia, Kan., Hollister-Miller Motor company, 360 meters.

WAAB—Harrisburg, Pa., Dr. John B. Lawrence, 266 meters.

WABC—Anderson, Ind., Fulwider-Grimes Battery company, 229 meters.

WABD—Dayton, Ohio, Parker high school, 283 meters.

WABE—Washington, D. C., Young Men's Christian association, 283 meters.

WABF—Mount Vernon, Ill., Mount Vernon Register-News company, 234 meters.

WABG—Jacksonville, Fla., Arnold Edwards Piano company, 248 meters.

WABH—Sandusky, Ohio, Lake Shore Tire company, 240 meters.

WABI—Bangor, Me., Bangor Railway and Electric company, 240 meters.

WABA—Lake Forest, Ill., Lake Forest college, 266 meters.

WABJ—South Bend, Ind., The Radio Laboratories, 240 meters.

WABK—Worcester, Mass., First Baptist church, 252 meters.

WABL—Storrs, Conn., Connecticut Agricultural college, 283 meters.

WABM—Saginaw, Mich., F. E. Doherty Automotive and Radio Supply company, 254 meters.

WABN—La Crosse, Wis., Waldo C. Grover, 234 meters.

WABO—Rochester, N. Y., Lake Avenue Baptist church, 252 meters.

WBAA—West Lafayette, Ind., Purdue university, 360 meters.

WBAD—Minneapolis, Minn., Sterling Electric company, 360 meters.

WBAH—Minneapolis, Minn., The Dayton company, 360 meters.

WBAN—Paterson, N. J., Wireless Phone corporation, 244 meters.

WBAO—Decatur, Ill., James Millikin university, 360 meters.

WBAP—Fort Worth, Texas, Wortham-Carter Publishing company (Star-Telegram), 476 meters, 750 watts; Silent Saturday and Sunday nights. Operator, E. L. Olds; supervisor, H. W. Hough; announcer, "The Hired Hand." Daily program, 11 a. m., markets, aviation, weather; 12 noon, 1, 2, 4 p. m., markets and information; 5 p. m., financial news; 8:30 to 11:45 p. m., concert.

WBAV—Columbus, Ohio, Einer and Hupliins company, 390 meters, 500 watts. Director, R. S. Bohannan; program director Miss Helen Mears; announcer, H. E. Day. Daily except Sunday, 12:30 to 1, markets and news. Monday evening, 8 to 10, music.

WBAW—Marietta, Ohio, Marietta college, 246 meters.

WBAX—Wilkesbarre, Pa., 66 Gildersleeve street, John H. Stenger, Jr., 360 meters.

WBAY—New York, N. Y., Western Electric company, 492 meters.

WBBA—Newark, Ohio, Newark Radio Laboratories, 240 meters.

WBBC—Sterling, Ill., Sterling Radio Equipment company, 229 meters.

WBBD—Reading, Pa., Barbey Battery Service, 234 meters.

WBL—Anthony, Kan., T. & H. Radio company, 261 meters.

WBS—Newark, N. J., D. W. May, Inc., 360 meters.

WBT—Charlotte, N. C., Southern Radio corporation, 360 meters.

WBU—Chicago, Ill., City of Chicago, 286 meters.

WBZ—Springfield, Mass., Westinghouse Electric and Manufacturing company, 337 meters.

WCAD—Canton, N. Y., St. Lawrence university, 280 meters.

WCAE—Pittsburg, Pa., Kaufmann & Baer company, 462 meters; daily, 11:30, weather; 2:30, news 3:30, stocks; 5:30, dinner music; 6:30, children's stories; 7:30, music; Sunday, 2 p. m., people's radio church service, Rev. Dr. George W. Sheltou; 6:30, music.

WCAG—New Orleans, La., 2813 Calhoun street, Clyde R. Randall, 268 meters.

WCAR—Columbus, Ohio, Entrekin Electric company, 286 meters.

WCAJ—University Place, Neb., Nebraska Wesleyan university, 360 meters; station director and announcer, J. C. Jensen; daily, 10:30 a. m., weather; Tuesday, 6 p. m., children's stories; Thursday, 8 p. m., lectures and music.

WCAK—Houston Texas, 2504 Bagby street, Alfred P. Daniel, 360 meters.

WCAL—Northfield, Minn., St. Olaf college, 360 meters.

WCAM—Villanova, Pa., Villanova college, 360 meters.

WCAO—Baltimore, Md., Sanders & Stayman company, 360 meters; daily, 10:55, time signals; 11 a. m., weather; 11:05, music; Monday and Wednesday, 7 p. m., music.

WCAP—Washington, D. C., Chesapeake & Potomac Telephone company, 469 meters.

WCAR—San Antonio, Texas, Alamo Radio Electric company, 360 meters.

WCAS—Minneapolis, Minn., William Hood Dunwoodie Industrial institute, 246 meters; director, M. R. Bass; operator and announcer, F. P. Upton; Monday, 7 to 7:30 p. m., music; Tuesday, 8:15 to 9:30 p. m., music and educational programs (9:30 to 10:45 on alternate weeks); Wednesday, 6:30 to 7, music and technical lectures; Thursday, 7 to 7:30 p. m., notes on radio and code practice.

WCAT—Rapid City, S. D., South Dakota State School of Mines, 240 meters.

WCAU—Philadelphia, Pa., Durham & Co., 286 meters.

WCAV—Little Rock, Ark., J. C. Dice Electric company, 360 meters.

WCAX—Burlington, Vt., University of Belmont, 360 meters.

WCAY—Milwaukee, Wis., Kesselman O'Driscoll company, 261 meters.

WCAZ—Carthage, Ill., Carthage college, 246 meters.

WCBA—Allentown, Pa., 1015 Allen street, Charles W. Heimbach, 280 meters.

WCBB—Greenville, Ohio, K. & K. Radio Supply company (Charles H. Katzenberger), 240 meters.

WSBD—Zion, Ill., Wilbur G. Voliva, 345 meters.

WCE—Minneapolis, Minn., Findley Electric company, 360 meters.

WCK—St. Louis, Mo., Stix, Baer & Fuller Dry Goods company, 360 meters.

WCM—Austin, Texas, University of Texas, 360 meters.

WCX—Detroit, Mich., Detroit Free Press, 517 meters.

WDAD—Lindsborg, Kans., Central Kansas Radio Supply company (Wm. L. Harrison), 360 meters.

WDAE—Tampa, Fla., Tampa Daily Times, 360 meters.

WDAF—Kansas City, Mo., Kansas City Star, 411 meters.

WDAG—Amarillo, Texas, J. Laurance Martin, 360 meters; J. L. Martin, director and operator; broadcast Tuesday and Thursday at 8 p. m.

WDAH—El Paso, Texas, Trinity Methodist church (South), 268 meters; station director, A. C. Arnold; announcer, John Burke; Sunday, 8:30 a. m., and 12 midnight; Thursday, 8:30 p. m., concert.

WDAI—Syracuse, N. Y., Hughes Radio corporation, 246 meters.

THE CHICAGO EVENING POST TABLOID RADIO SCHEDULES

These stations are those most commonly tuned in evenings by the Chicago broadcast listeners. The time given is central standard. Pacific coast time is two hours earlier than that shown here. Mountain time is one hour earlier, and eastern time one hour later. Evening program schedules only are given. This list was compiled by The Chicago Evening Post Radio Department and is protected by copyright.

STATION	Miles	Met	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Chicago—									
KYW, Comm. Edison Bldg		536		6:30- 9:30	6:30-12:00	6:30- 9:30	6:30- 9:30	6:30-12 m.	6:30- 9:30
WAAF, Union Stock Yards		286	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00		
WMAQ, Hotel La Salle		536		7:00- 9:55	7:00- 9:55	7:00- 9:55	7:00- 9:55	8:00-10:00	
WDAP, Drake Hotel		360		7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	9:15-10:30
WJAZ, Edgewater Beach Hotel		448		10:00-12:30	10:00-12:30	10:00-12:30	10:00-12:30	10:00- 2:00	6:00- 9:00
Suburban—									
WCBD, Zion, Ill.	39	345	8:00- 9:00				8:00- 9:00		
WIAB, Rockford, Ill.	77	252			8:00- 9:00				
WRM, Urbana, Ill.	120	360			8:50- 9:30				
WTAS, Elgin, Ill.	37	275			7:30-10:00				
Eastern—									
KDKA, East Pittsburg	430	326	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WBZ, Springfield, Mass.	802	337	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	
WEAF, New York City	733	495	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00
WGI, Medford Hillside, Mass.	875	360	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	7:30- 9:00
WHAZ, Troy, N. Y.	748	380	8:00- 9:30						
WGY, Schenectady, N. Y.	698	280	6:45-11:30	6:45- 9:00	6:45- 9:00	6:45- 9:00	6:45-11:30	6:45- 9:00	
WGR, Buffalo	472	319	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	
WHN, New York City	912	360	1:15-11:00	1:15-11:00	1:15-11:00	1:15-11:00	1:15-11:00	1:15-11:00	
WJY, New York City	733	405							2:30- 6:60
WJZ, New York City	733	455	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	
WOO, Philadelphia	677	509	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	
WRC, Washington, D. C.	612	469	8:00-10:00		8:00-10:00		8:00-10:00		
Midwest—									
WCX, Detroit	245	517	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00		
WJAX, Cleveland	323	390		7:30- 9:30		8:00-10:30			
WLAG, Minneapolis	358	417	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	
WLW, Cincinnati	262	309	8:00-10:00	10:00-12:00	8:00-10:00	10:00-12:00			
WOC, Davenport	105	484	7:00-11:00		7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WTAM, Cleveland	323	300	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30
WWJ, Detroit	245	517	8:30-10:00	8:30-10:00	8:30-10:00	8:30-12 m.	8:30-10:00		
Southern—									
KSD, St. Louis	270	546	8:00-11:00	8:00-11:00	8:00-11:00		8:00-11:00	8:00-11:00	
WBAP, Fort Worth, Texas	855	476	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00		
WDAF, Kansas City, Mo.	430	411	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	
WFAA, Dallas, Texas	853	476	6:45- 9:30	6:45- 9:30	6:45- 9:30	6:45- 7:30	6:45- 9:30	6:45- 9:30	9:30-11:00
WGV, New Orleans	868	350	7:00- 8:00		7:00- 8:00			7:00- 8:00	
WHAS, Louisville	271	400			7:30- 9:00				4:00- 5:00
WHB, Kansas City, Mo.	430	411		7:00- 9:00		7:00- 9:00	7:00- 9:00		8:00-10:00
WMC, Memphis	480	500		11:00-12:00			11:00-12:00	8:00-10:00	8:00-10:00
WOAI, San Antonio, Texas	1,080	385		9:30-10:30				9:30-10:30	
WOS, Jefferson City, Mo.	337	441	8:00- 9:30		8:00- 9:30		8:00- 9:30		
WSB, Atlanta, Ga.	605	428	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	7:30- 9:00
Pacific Coast—									
KFDB, San Francisco	1,010	500	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30
KGW, Portland, Ore.	1,895	492	1:00-1 a.m.	10:00-11:00	10:00-11:00	10:00-11:00	1:00-2 a.m.	10:00-11:00	9:00-10:00
KHJ, Los Angeles	1,795	395	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	10:00-12:00
KPO, San Francisco	1,910	423	6:30-12 m.	6:30-12 m.	7:30-12:00	6:30-12 m.		6:30-12 m.	10:30-12 m.

KFHF—Shreveport, La., Central Christian church, 266 meters.

KFHH—Neah Bay, Wis., Ambrose A. McCue, 283 meters.

KFHJ—Santa Barbara, Cal., Fallon & Co., 360 meters. Manager, S. Haskings. Evening—8 to 8:40 p. m., news bulletins, bed-time story; 11 to 12, music.

KFBQ—Los Gatos, Cal., Curtis Brothers Hardware store, 242 meters.

KHR—Seattle, Wash., Star Electric and Radio company, 270 meters.

KFHS—Lihue, Hawaii, Clifford J. Dow, 275 meters.

KFHU—Mayville, N. D., M. G. Stereo, 261 meters.

KFHX—Hutchinson, Kan., 407 East 1st street, Robert W. Nelson, 229 meters.

KFI—Los Angeles, Cal., Earle C. Anthony (Inc.), 469 meters.

KFIB—St. Louis, Mo., 5666 Vernon avenue, Franklin W. Jenkins, 244 meters.

KFID—Iola, Kan., Ross Arbuckle's garage, 246 meters.

KFIF—Portland, Ore., Benson Polytechnic institute, 360 meters.

KFIK—Gladbrook, Iowa, Gladbrook Electric company, 234 meters.

KFIL—Louisburg, Kan., Windisch Electric Farm Equipment company, 234 meters.

KFIO—Spokane, Wash., North Central high school, 252 meters.

KFIQ—Yakima, Wash., Yakima Valley Radio Broadcasting association, 224 meters.

KFIU—Juneau, Alaska, Alaska Electric Light and Power company, 226 meters.

KFIV—Pittsburg, Kan., 706 East 10th street, V. H. Broyles, 240 meters.

KFIX — Independence, Mo., Reorganized Church of Jesus Christ of Latter Day Saints, 240 meters.

KFIY—Seattle, Wash., Brott laboratories, 236 meters.

KFIZ—Fond du Lac, Wis., Daily Commonwealth, 237 meters.

KFJA—Grand Island, Neb., Central Power company, 244 meters.

KFJB—Marshalltown, Iowa, Marshalltown Electrical company, 248 meters.

KFJC—Seattle, Wash., Post Intelligencer, 233 meters.

KFJD—Greeley, Colo., Weld County Printing and Publishing company, 236 meters.

KFJF—Oklahoma City, Okla., National Radio Manufacturing company, 252 meters.

KFLB—Menominee, Mich., Signal Electric Manufacturing company, 248 meters.

KFLD—Franklinton, La., Paul E. Greenlaw, 234 meters.

KFLE—Denver, Colo., National Educational Service, 268 meters.

KFLH—Salt Lake City, Utah, Erickson Radio company, 261 meters.

KFLP—Cedar Rapids, Ohio, Everette M. Foster, 240 meters.

KFLQ—Little Rock, Ark., Bizzell Radio shop, 261 meters.

KFLR—Albuquerque, N. M., University of New Mexico, 254 meters.

KGB—Tacoma, Wash., Wm. A. Mullins Electric company, 360 meters.

KGG—Hallack & Watson Radio Service, Portland, Ore., 460 meters, 50 watts. Day—2:45 to 3, news. Evening—7:30 to 8, phonograph and sporting news; 9:30 to 10, press and police reports; special Wednesday and Sunday, 11 to 12 midnight, singing concert.

KGN—Portland, Ore., Northwestern Radio Manufacturing company, 360 meters.

KGU—Honolulu, Hawaii, Waiwiwi Beach, Marion A. Mulrony, 360 meters.

KGW—Portland, Ore., Portland Oregonian; 492 meters: Day—1:30, weather; 5:30, lectures and children's hour. Evening—10, music; 11, lecture; 12, music.

KGY—Lacy, Wash., St. Martin's college 258 meters; 10 watts; evening, 10 to 11:30.

KHJ—Los Angeles, Cal., Times-Mirror company, 395 meters.

KHQ—Seattle, Wash., 419 13th avenue, Louis Wasmer, 360 meters.

KJQ—Stockton, Cal., 615 East Main street, C. O. Gould, 360 meters.

KJR—Seattle, Wash., Northwest Radio Service company, 270 meters.

KJS—Los Angeles, Cal., Bible Institute of Los Angeles, 360 meters.

KLN—Monterey, Cal., Monterey Electric Shop, 360 meters.

KLS—Oakland, Cal., 2201 Telegraph avenue, Warner Brother 360 meters; director, Miss A. Warner announcer, S. Warner. Week days, 1:30 to 3; Friday evening, 10 to 11; Sunday afternoon, 2 to 3.

KLX—Oakland, Calif., The Oakland Tribune, 509 meters, 500 watts; silent Sunday

KSD—St. Louis, Mo., Post Dispatch (Pulitzer Publishing company), 546 meters.

KSS—Long Beach, Cal., Prest & Dean Radio company and Radio Research Society of Long Beach, Cal., 229 meters; 10 watt; Boy Scout news.

KTW—Seattle, Wash., First Presbyterian church, 360 meters.

KUO—San Francisco, Cal., Examiner Printing company, 360 meters.

KUS—Los Angeles, Cal., City Dye Works and Laundry company, 360 meters.

KUY—El Monte, Cal., Coast Radio company, 360 meters.

KWG—Stockton, Cal., Portable Wireless Telephone company, 360 meters.

KWH—Los Angeles, Cal., Los Angeles Examiner, 360 meters.

KXD—Modesto, Cal., Modesto Herald Publishing company, 360 meters.

KYQ—Honolulu, Hawaii, Electric Shop, 360 meters.

KYW—Chicago, Ill., Westinghouse Electric and Manufacturing company, 345 meters.

KZM—Oakland, Cal., 13th and Harrison streets, Preston D. Allen, 360 meters.

KZN—Salt Lake City, Utah, The Deseret News, 360 meters; daily except Sunday 9 to 10:30 p. m., music, addresses, stories, news.

KZV—Wenatchee, Wash., Wenatchee Battery and Motor company, 360 meters.

NAA—Arlington, Va., U. S. Navy dept., 435 meters; daily except Sunday, 8:45 to 9:40 a. m., markets; 11:25 to 11:40, markets; 12:45 to 1:20 p. m., markets; 2:25 to 3:40 p. m., markets; 9:05 to 9:20 p. m., weather.

WAAB—New Orleans, La., 137 South St. Patrick street, Valdemar Jensen, 268 meters.

WAAC—New Orleans, La., Tulane university, 360 meters.

WAAD—Cincinnati, Ohio, Ohio Mechanics institute, 360 meters, 25 watts, range, 50 miles.

WAAF—Chicago, Ill., Chicago Daily Drovers Journal, 286 meters; Daily except Sundays and holidays, 8:10, 10:45, 12:40, 3, 4:30 p. m., markets; 10:30, 12:30 p. m., weather.

WAAH—St. Paul, Minn., Commonwealth Electric company, 360 meters.

WAAK—Milwaukee, Wis., Gimbel Brothers, 280 meters.

Continued on Page 14.

Edited by a Staff of Regular and Special Contributing Writers.

The RADIO MAGAZINE Section is edited with the view of giving authentic news of the radio broadcasting field and authoritative information on the subjects of home construction of receiving and transmission sets, of the operation and maintenance of apparatus, and as an exchange of opinion for its readers.

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THURSDAY, JANUARY 17, 1924.

Weekly Subscription $1.35 Per Year.

These are some of the stars featured by local broadcasting stations the coming week. Fig. 1 at top, left, is Florence Roe, pianist and reader. She sings Jan. 19 at KYW. Fig. 2 at top, right, is Dorothy E. Vicaji, who talks thru WDAP this evening, Jan. 17, on her experiences as a portrait painter to nobility. Helen Smith is in the oval at the bottom. She is a soprano who will sing at WJAZ this week.

Today's Radio Programs

Radio Programs

Below are given the complete schedules of all the Chicago and suburban broadcasting stations and those of the out-of-town stations which are most commonly tuned by local radiophans.

These schedules are a regular daily feature in The Chicago Evening Post.

On Thursday of each week a complete list and schedule of every broadcasting station in the United States is published in The Chicago Evening Post's sixteen-page Radio Magazine section.

CHICAGO STATIONS

(Central Time Is Shown.)

KYW—Located in Commonwealth Edison building, 536 meters; Wilson J. Wetherbee, director.

Day—9:30 a. m., news and markets; 10 a. m., market reports; 10:30 a. m., financial news and comment; 10:58 a. m., naval observatory time signals; 11 a. m., market reports; 11:05 a. m., weather report; 11:30 a. m., news and comment of the financial and commercial market; 11:35 a. m., table talk by Mrs. Anna J. Peterson.

Evening—6:50 p. m., children's bedtime story; 8 to 8:20 p. m., twenty minutes of good reading by Rev. C. J. Pernin, S. J., head of department of English, Loyola university; 8:30 p. m., program furnished thru the courtesy of the Chicago, Rock Island and Pacific Railroad company; Herbie Mintz, pianist; Sallie Menkes, accompanist; 9:15 p. m., program furnished by the National Live Stock and Meat board; speaker of the evening will be Thomas E. Wilson, vice chairman of the board. His subject will be "Preparation of Live Stock for Human Consumption."

WAAF—Located at Union stock yards; 286 meters.

Day—Live stock reports at 8:40, 10:30, 10:45 a. m., 12:30, 12:45, 4:30 p. m.

Evening—No schedule.

WMAQ—Located on Hotel LaSalle; 447.5 meters. Miss Judith C. Waller, station director.

Day—4:30, the Dayton choir.

Evening—7, weekly talk to Boy Scouts; Illinois Nurserymen's banquet; 8:30, WMAQ orchestra; 9:15, Marie Sidenius Zendt, soprano, and James J. Donnelly, tenor.

WFAZ—Located on Edgewater Beach hotel; 447.5 meters; E. Warren Howe, program director.

Day—This station has no regular day schedule.

Evening—10 p. m., Alice Cunradi, soprano; Max Rosner, barytone; Isabelle Cuny, pianist, and Oriole orchestra: "Susie," "Twentieth-Century Blues," by Oriole orchestra; "Just for Remembrance" (Young), "Until" (Sanderson), by Alice Cunradi; "Alt Wien" (Godowsky), "Terpsichorean Vindobona"" (Godowsky), by Isabelle Cuny; "Forgetful Blues," "Sunshine of Mine," by Oriole orchestra; barytone solos (selected), by Max Rosner; "Two Etudes (Chopin), by Isabelle Cuny; barytone solos (selected), by Max Rosner; "Unfortunate Blues," "My Dream Moon," by Oriole orchestra; "The Lotus Flower" (Schumann), "Sing Me to Sleep" (Green), by Alice Cunradi; "To a Wild Rose" (MacDowell), "Polichinelle" (Rachmaninoff), by Isabelle Cuny; "Love's Communion" (Smith), "The False Prophet" (Scott), by Alice Cunradi; "Sobbing Blues," "Wonderland of Dreams," by Oriole orchestra.

WDAP—Chicago Board of Trade, located at Drake hotel; 390 meters.

Day—9:30 a. m., 10 a. m., 10:30 a. m., 11 a. m., 11:30 a. m., 12 noon, 12:30 p. m., 1 p. m., 1:30 p. m., quotations and market reports direct from the Chicago Board of Trade.

Evening—10 p. m., Northwestern School of Music, Jack Chapman's orchestra.

WPAD—Formerly on W. A. Wieboldt & Co.'s, School street and Ashland avenue.

Notice—This station has closed and is being moved to Armour Institute where it will be operated by the radio department of that institution.

WSAH—Located at 4801 Woodlawn avenue; 248 meters.

WSAX—Located on Chicago Radio laboratory; 268 meters.

SUBURBAN STATIONS

Central Time Is Shown.)

WCBD—Zion, Ill.; 345 meters; J. H. Depew, station manager.

Day—2:30 p. m. to 3:45 p. m., sacred solos and duets, and an address either by Wilbur Glenn Voliva, general overseer of the Christian Catholic Apostolic church in Zion, or one of his representatives.

WCAY—Milwaukee, Wis.; 261 meters: No silent nights.

Day—1 p. m. to 4:30 p. m., special concert; novelty and test programs as announced.

Evening—7:30 p. m., regular concert program.

WHAD—Marquette university, Milwaukee, Wis.; 280 meters;

Wednesdays—At 7:30 p. m. only.

WIAB—Rockford, Ill.; 252 meters: Monday and Friday evenings: Monday evening, 9 p. m., MacDonald's Melody orchestra, in latest hits; Friday evening, 8 p. m., vocal and instrumental selections; Sunday, 12:30 p. m., religious services by the Rev Toykmann and choir of the Mission Tabernacle church.

WJAN—Peoria, Ill.; 280 meters; Daily except Sunday.

Day—9 a. m., live stock market; 9:15 a. m., weather; 11:30 a. m., Chicago, Peoria and St. Louis live stock and grain markets; 1:30 p. m., Chicago and Peoria grain and produce markets; United States agriograms.

Evening—Tuesday and Thursday, special musical program to be announced by radiophone.

WRM—Urbana, Ill., University of Illinois; 360 meters: 8:50 to 9:30 p. m., lectures and news.

WTAS—Elgin, Ill.; 286 meters.

FOREIGN STATIONS

CKAC—Montreal, Canada; 430 meters:

Day—3 p. m., news, weather and stock reports; 3:15 p. m., studio entertainment.

Evening—6 p. m., kiddies' stories in French and English; 6:30 p. m., Rex Battle and his Mount Royal hotel concert orchestra. 7:30 p. m., studio specials; 8:15 p. m., silent; 9:30 p. m., Joseph C. Smith and his Mount Royal hotel dance orchestra; 10:30 p. m., news.

CYL—Mexico City, D. F. "El Universal"; 500 meters: Reul Azcarraga, director; G. Obregon Jr., announcer (Spanish); Sendel Hodges, announcer (English).

Daily, 12:54 p. m., news and weather; 8:24 p. m., war bulletins from the war and navy departments; Tuesday and Fridays, 8:24 to 8:54 p. m., music. Sunday, 7:24 p. m., war bulletins.

PWX—Havana, Cuba; 400 meters: Jose Isquierdo, chief operator; Urbano del Castila, program director; Remberto O'Farril, announcer; regular broadcasting nights, Wednesday and Saturday, 7:30 to 10 p. m., central standard time.

TSF—Paris, France; French Post and Telegraph department. 103 Rue de Grenelle. Director, M. G. Valensi; assistant, M. Chanton; 490 meters; 500 watts.

Daily except Tuesday at 2:21 p. m., Tuesday at 1:51 p. m., music, classical theater and a course in English literature; Tuesdays, a course in the Morse code. Every ten days, scientific lectures.

OUT-OF-TOWN STATIONS

Eastern Programs.

(Central Time Is Shown.)

KDKA—East Pittsburg; 326 meters:

Day—8:45 a. m., Union live stock market reports furnished by the National Stockman and Farmer; 10:55 a. m., Arlington time signals; 11 a. m., weather forecast, United States bureau of market reports furnished by the National Stockman and Farmer; 11:10 a. m., noonday concert; 5:15, dinner concert.

Evening—6:30 p. m., weekly chat with the farmers, by Frank E. Mullen, radio editor National Stockman and Farmer; 6:45 p. m., the children's period; 7 p. m., National Stockman and Farmer market report; 7:15 p. m., farm program continued; 7:30 p. m., "Budget Day," A. C. Robinson, president Peoples Savings and Trust company, second in the series of "Thrift Week" talks; 7:40 p. m., concert by the KDKA Little Symphony orchestra, Victor Saudek conductor, assisted by Lillian Camuti, soprano, and Frank M. Johnston Jr., bass, from the studio of Wil-

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The Post Suggests Air Jam Solution

By Iverson C. Wells.
(Radio Editor The Chicago Post.)

THERE is a lot of argument about local interference. As this publication, repeatedly, has said, this is due chiefly to ignorance.

Broadcasting stations strive to please. Their existence depends upon the pleasure of their "patrons."

I am not defending, nor am I criticizing. I believe there is a way out of it all.

Some of the letters we receive are so heated they are unprintable.

The Post wants to have the reputation of being "the Champion of the Masses." That's a laudable ambition. To achieve that, we must court popular favor—up to a certain point. Then we must be destructive—then constructive.

Being constructive and at the risk of courting popular disfavor, I want to make these two declarations:

FIRST—The local broadcasting stations are striving to please the majority.

SECOND—The majority does not know enough about the fundamentals of broadcasting reception to judge if they or the other fellow is wrong.

No Stop Here, Fellows.

Now, listen, fellows. That's putting it pretty strong, but you are not keeping pace with the march of the times.

As the stations improve, also you must improve.

A few months ago a Reinartz receiver almost was an ideal receiver, because broadcasting was done on short waves.

Reinartz is striving to meet present-day conditions and, probably, will, but, as he stands, the old-time Reinartz won't work today.

That same assertion goes for most of the old-time reliable circuits.

What's wrong? Here it is: The local stations are developing. They are reaching out. They are striving to do what you ask of WEAF, KPO, PWX, and all the rest to do.

To give the distant fellows a chance to hear them.

Isn't that what you want? I ask you that question, right off the reel.

All right. Now listen. For these stations to achieve these points, they must decrease your selectivity.

Therefore, to satisfy the majority, you and I must rearrange ourselves.

We must choose better. We must build better. We must tune better.

I have been printing the kicks and complaints of radiophans—not because I wanted to take a "dig" at the stations, but because I felt a free and open discussion would arrive at something.

Criticism without a constructive policy behind it is poor criticism.

I believe that the stations, as long as you are in ignorance, must be considerate. This they are not.

They should ease down on their high-power stuff and give it to us in broken doses.

That's where both are wrong. Here we have an ignorant crowd that doesn't know how to build. How to tune, and we expect superman possibilities!

Never Knows the Crowd.

Then we come along with a broadcasting station that doesn't know the limitations of the public and messes up the works!

I want to show both the local broadcasters and the radiophans that conditions here are not exceptional. Let us read this from the New York Times on situation that exists in Gotham:

"Station WEAF introduced a powerful transmitter on New Year's eve. Many auditors, intercepting WEAF'S request for reports relative to reception of the new set, have praised the increased volume. Hundreds of others, especially the audience favoring WJZ and WHN, have registered about 200 complaints a day that WEAF'S new waves 'wash other signals from the air.'

"It is claimed by managers of other stations that if they increase their power in an effort to compete with the strength of the Broadway station, further interference would result. One program director said such action would 'degenerate into a war for supremacy of the ether.'

"One correspondent stated: 'Why

Continued on Page 4.

The Post Suggests Air Jam Solution

Continued from Page 3.

should stations use power in excess of 500 watts? Everybody was happy and enjoyed the lack of interference since the new wave lengths were assigned by the department of commerce last May.

"'Now, if stations increase to higher power, interference will be at a maximum again and we will only be able to hear the most powerful station nearest to our antenna. Apparently Secretary Hoover will have another job on his hands, because if stations start to battle for supremacy of the air, government restrictions may become necessary in order to establish peace in the ether.'

Transmitter Plan Hit.

"Listeners living in the upper part of Manhattan are pleased with the new transmtter because it pierces the 'dead spot' over that section. Those in the downtown section and in Brooklyn report it is now impossible to exclude WEAF"S waves.

"One listener, not knowing that WEAF had increased its power, believed his receiver was at fault because the music could be heard 'all over the dials.' He took the receiver apart and rewired it four times before he heard the announcer tell about the new equipment.

"Others defending WEAF point out that it is entirely up to the receiver to tune out broadcasting stations despite their power. As a practical illustration they relate how the United States steamship Colorado flashed high-power signals from off the Virginia Capes to San Francisco, and while the transmission was taking place messages were received on board from five different stations operating on different wave lengths.

The transmitting aerial, with approximately 45 amperes in-put, was located only a few feet from the receiving antennae. Then why should a broadcast listener one block or a mile away from WEAF have trouble in tuning out the waves?

"It must be remembered that to accomplish such results the transmitter must radiate an absolutely pure wave, free of harmonics, and the receivers must be extremely selective.

Opens Up New Problem.

"Some believe that the installation of WEAF's new equipment has opened up a new problem in broadcasting, chiefly, whether it will become necessary to limit the power of a broadcasting station, similar to the way amateur stations are restricted, to prevent interference.

"If other stations increase their power it may lead to the development of an extremely selective receiver, since 'necessity is the mother of invention.' It is evident that present receiving sets are not selective enough to successfully handle high-power broadcasting.

"In the tests, WEAF has used as high as four kilowatts, or 4,000 watts. The old transmitter radiated one-half kilowatt, or 500 watts.

"An analysis of more than 3,000 letters received by the program director from all sections of the country indicate, approximately, that 90 per cent are highly pleased with the change in equipment. The remainder, or 10 per cent, divides as follows:

Sets Overloaded.

"Five per cent have trouble because the receiving sets are overloaded and too many stages of amplification are used. About 2 per cent complained of noisy transmission. This gradually will be eliminated as the adjustment of generators and associated instruments more perfectly are regulated. Approximately 3 per cent reported blanketing of other stations.

"The increase of power was adopted because of insistent demands by radio listeners for reception of louder signals. Experiments will continue until a satisfactory level is determined.

"It is claimed that the excellent reception in New York of Chicago, Pittsburg and Schenectady stations is caused by the use of high power transmitters such as WEAF has installed. Clear reception of WEAF has been reported over a wide area during the last week A cablegram from Buenos Aires, 5,000 miles air line from New York, reported consistent reception for an hour and a half."

Here's A Promise.

Now, you see, someone, in addition to ourselves, is in trouble.

But, do you see the intelligent way The New York Times handles the subject?

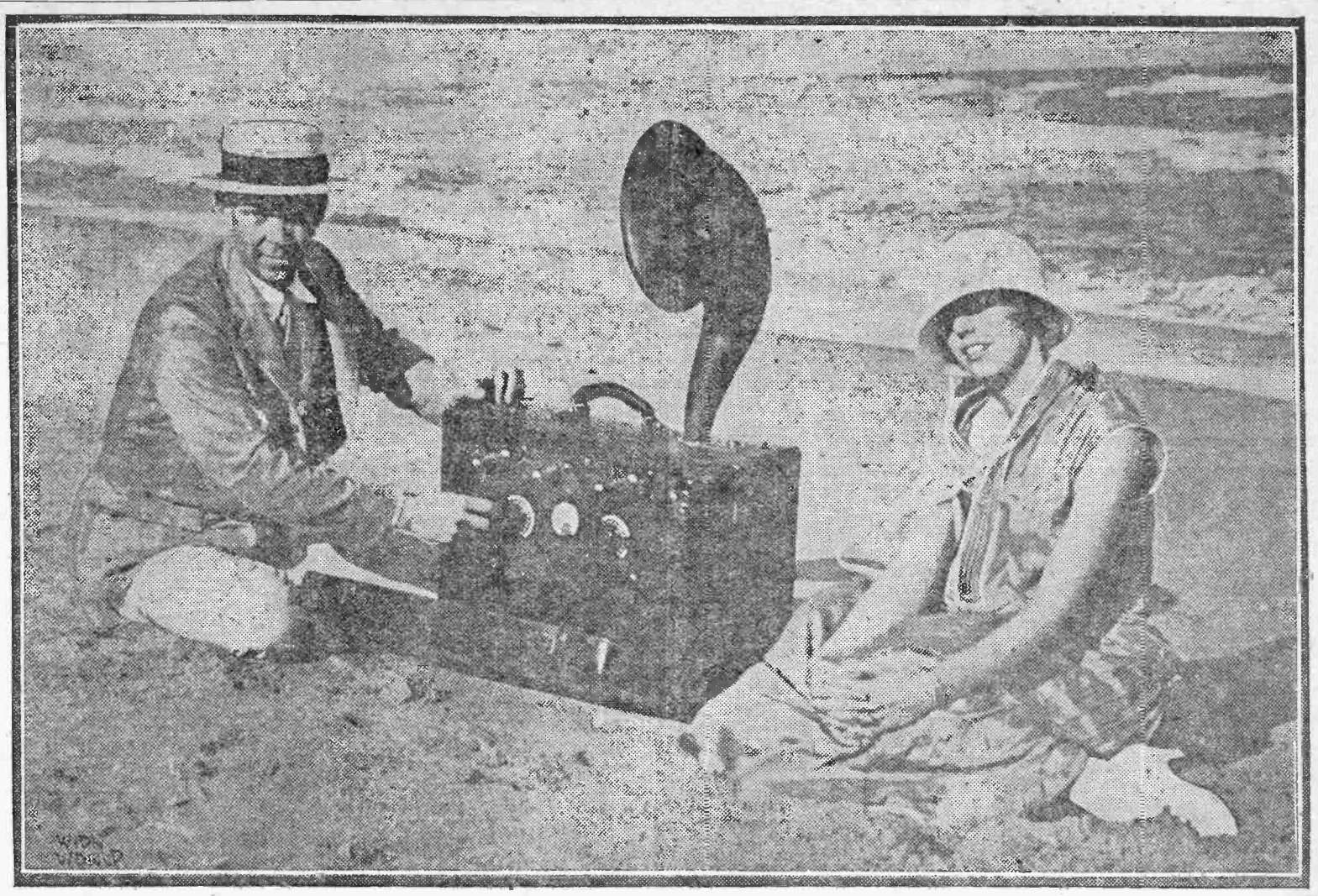
I promise you, as editor of a magazine that is pledged to go after the real facts, irrespective of where they may fall, to do what I can, in a constructive way, to settle this problem.

In succeeding issues I promise to publish a series of articles that are helps—for both the broadcasters and the listeners.

In the articles for the broadcasters I promise the best the technical department of The Post can do.

In the articles for the broadcasters, I invite the technicians of the stations to contribute.

By these two means may we hope to achieve something.



Maj. Armstrong of radio fame pictured on the sands of Palm Beach with his wife and their portable radio. These folks, who are sojourning at the popular winter resort, have gained many new friends from among the bathers on the beach, as they are always ready to "pass the phones" and let them in on the many radio features. Mr. Armstrong makes his portable radio work to a nicety without the use of any aerial or "ground."

Some Spots in Your Set Where Trouble Stalks

FREQUENTLY where a tandem of audio-frequency amplifiers is graft ed onto a single tube outfit pecul ar squeals are emitted, together with a rattling noise which makes the se sound as tho something was radically wrong.

Probably the question arises where by one is trying to sacrifice quantity or quality, but trying to produce both of these in a receiving outfit is more of a problem than by simply looking at them traced out in diagram form upon a sheet of white paper.

It often happens that the cause of such noises is due to some connections which have been broken by excessive strain. Other faults may be bad "B" batteries or noisy "A" batteries.

Arranging the Parts.

In arranging parts in their proper sequence precautions should be taken to see that the connections are made as short as possible. This should be done especially when connecting the leads to the grid posts of the vacuum tube sockets.

To avoid capacity effects the con nections should be kept at least three quarters of an inch apart and, where feasible, the wires should be crossed rather than run parallel so that only small portions of the neighboring con ductors are close together. This holds true also for plate leads.

Too frequently a trouble man looks into a set only to find that most o the trouble is due to the closeness and parallelism of these lead wires.

Make Connections Rigid.

Rigid connections should be used wherever adaptable so that accidental displacement is not likely. The con nections also should firmly be clamped and the junction of the wires tinned over. A good soldering connection should be made rather than a twisted connection unsoldered. The latter wil not remain permanent.

Undesirable sounds in a radio set develop from faulty connections which are amplified in the subsequent stages until their volume seriously affects the music and speech which is produced in the head telephones or the loud speaker.

Another important item that should be followed very closely is that of the "B" batteries. One bad "B" battery when connected in series with other "B" batteries is often the cause of disturbances. Erratic discharge within the battery itself is the source and the only remedy is to take out the battery and replace it with a new one This holds true also with the "A" bat tery, altho it is less liable to happen here than with the "B" battery Proper care, however, should be taken of the batteries as a whole.

Too much "B" battery current be ing supplied to the plates of the vacuum tubes is another source of troublesome noise. This trouble may be remedied by decreasing the "B" battery voltage.

Go Over Coil Wires.

Where coils of the duo-lateral type are employed, it sometimes happens that the fine wires leading to them or within the coils of transformers are common sources of trouble. The insulation sometimes holds the cut ends together, thereby creating a more or less continuous path for the high frequency resistance.

When such a break occurs it is best to separate the ends and apply a voltmeter to the windings. If there is no reading on the voltmeter it is a sure indication that the conductor under suspicion is broken.

Where lead wires are fastened to the base of a coil or transformer one should look at these places for broken connections, since here they are subjected to their greatest strain. It may be possible that if a voltmeter be applied it may show that the path is complete in spite of the broken con nection, but if the set is jarred slight ly, a deflection of the needle will be noticed.

A Simpler Test.

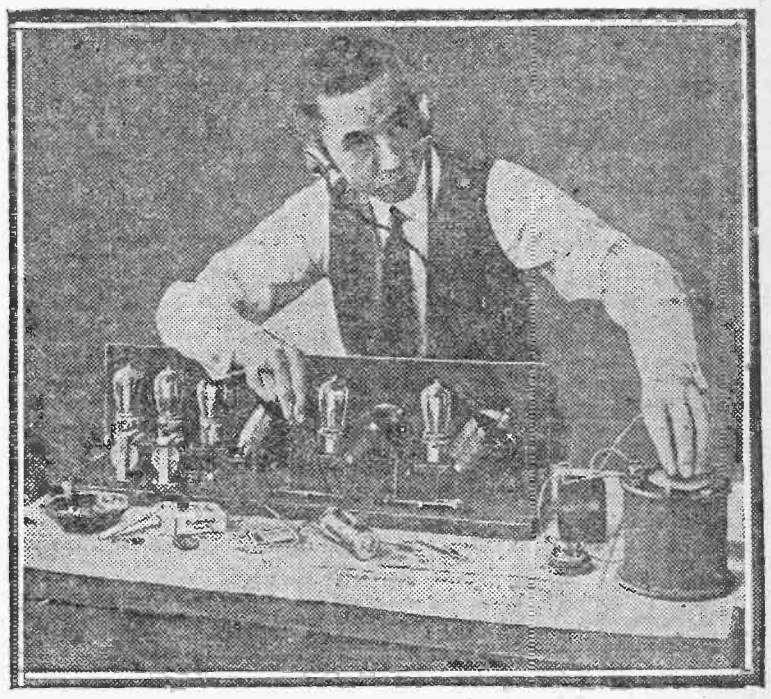
For a much simpler test which will at least detect a complete break in a coil or transformer one can employ a standard flashlight bulk and its battery. Connections to the bulk should be made to the conductor under ex amination, with the bulb in series with the circuit. The bulb will light if the connection is not broken. Bulbs of large current capacity must not be used for test purposes, as excessive flow of current thru the delicate wires of a transformer is apt to overload them.

The above test, however, may be applied with safety to such instruments as condensers and sockets, the latter, of course, without the vacuum tubes in place.

Common Trouble Spots in Radio Sets

1 DISTORTION—Too much regeneration; too much filament voltage; too much plate voltage; imperfectly balanced transformers; faulty amplifying circuit; loud speaker unit overtaxed.

2 NOISY SETS—Poor connections in wiring leads; radio frequency parallel or too close; broken coil windings; faulty "B" batteries; grid leak not adjusted; faulty tubes; faulty phones.



There is the way neutrodyne receivers are neutralized. Note the condenser in the picture. It is by this device the squeal is taken out of the tubes.

An Aerial Jolter

Ice, sleet and snow not only impair the efficiency of an aerial, but, also, endanger it, as the slender wire will break under a heavy load. If an insulator is connected at the center of the aerial and a fishline is made fast to this with the other end fastened to some object convenient to the hand, one may give the line a jerk and shake off or jar loose the crust of ice or snow.

Hunts Flat by Radio

A Schenectady woman, wife of a school-teacher, asked WGY to broadcast a request for a flat. She described and specified the number of rooms she desired and the rent it was possible for her to pay and also mentioned the streets she preferred.

GOOD LEAK ESSENTIAL.

A grid leak is the heart of your set. Never use a poorly constructed fixed leak and paper condenser if you wish to obtain the maximum results from your set.

New Toronto Station Opens with Chicago Test

A new broadcasting station listed as CFCA went on the air last week. The new station is located at Toronto, Canada.

Earlier experiments had seemed to indicate that a wave length of 410 was necessary, but some difficulty was experienced by receiving sets in Chicago on these experimental trials.

Thru the suggestion of Clair Haig, general manager of Canadian Universal Film exchange, a novel test was arranged. Mr. Haig was a delegate to the convention of motion picture sales managers, which was held for three days at the Congress hotel.

The station arranged to broadcast the orchestral number of "The Hunchback of Notre Dame," playing at the Tivoli theater. Arrangements were made in the Congress hotel, thru C. G. Vlahoe, or a Reliance radio telephone, specially installed, so the convention could listen in on "The Hunchback of Notre Dame" program, as broadcast in Toronto. The difficulty probably was due to atmospheric conditions on Lake Michigan, but last night no obstruction seemed to be offered.

TEST EAR PHONES.

Ear phones should be tested by comparing with others at least once a year. As their magnets are not permanent, they might become demagnetized. The result of this would be loss of volume and sensitivity of your set.

DON'T WIND YOUR OWN.

It does not pay to wind your own variometer and variocouplers, as this work must be done with a degree of accuracy that is impossible to obtain without the use of a lathe and other proper manufacturing equipment.

GOOD POLICY.

"Good apparatus pays." This is the motto of one of the local radio stores. We thoroly agree with them. Many an expensive set has been spoiled by the use of one piece of defective apparatus.

You will find the classified advertisement section interesting. See Page 15.

Zion Station Is Largest Broadcasting Activities of Church Organization

THE broadcasting station selected this week for illustration is WCBD, Zion, Ill. While Zion is located fully forty miles away from Chicago, this station is looked upon as a local one. The pictures prove that it is well equipped.—The Editor.

PROBABLY one of the best-known broadcasting stations in the central west is WCBD, Zion, Ill. It is owned and operated by Wilbur Glenn Voliva, general overseer of the Zion Christian Catholic Apostolic church.

WCBD is operated for the purpose of giving publicity to the church activities and is said to be the largest radio broadcasting station owned and operated exclusively by a church organization.

The station has been heard in every state in the union and in many provinces of Canada, and even in South and Central America. And, because of this wide audience, it is doubtful if there is a pastor anywhere who is listened to each and every Sunday by as many millions as is Mr. Voliva.

Schedule on Four Days.

The regular schedule for WCBD takes in but four days in the week—Sundays, Mondays, Wednesdays and Fridays. The first Sunday schedule runs from 9 a. m. to 10:45 a. m., when Bible school services are put on the air. The Zion orchestra, which has become famous over the radio, plays the first thirty minutes of this period.

In the afternoon at 2:30 to 5:30 o'clock the principal services of the day is broadcast. At this time there is special music by the Zion band and the white-robed choir, which consists of 300 voices.

Concerts are broadcast Monday and Friday evenings. These go on the air at 8 o'clock. They are of exceptional high class and those who enjoy good music get a feast. Every Wednesday and Friday afternoon at 2:30 to 3:45 o'clock sacred solos and duets are rendered and a short address delivered by Mr. Voliva.

The wave length of the station is 870 kilocycles, or 345 meters.

The personnel of the station includes J. H. Depew, manager, chief announcer and publicity director; John D. Thomas, program director and conductor of the white-robed choir; P. B. Newcomber, conductor of Zion band; L. J. Hire, conductor of Zion orchestra; Fred Faassen, organist.

Is 500-Watt Station.

WCBD is of Class B type and was erected by the Western Electric company of Chicago, the equipment being the standard Western Electric 500-watt radio telephone set, using Heising constant current method of modulation.

It has one 50-watt amplifying tube, two modulating tubes of 250 watts each, and two oscillating tubes of 250 watts each.

The steel towers are 150 feet high and stand at an elevation of 80 feet above Lake Michigan. The aerial is 95 feet in horizontal length, four-wire, T type, and is at an elevation of 125 feet.

Zion City has as its chief radio operator a former navy broadcaster, who a few years ago ranked as one of the most capable members of the marine radio force. Henry H. Albrecht, who now controls the ethereal shooting from Zion City, was in charge of the Cape Cod radio station during the war.

Nothing is left to chance in the broadcasting of the Zion programs. A special control room has been built into the rear of the tabernacle. From it, by means of a carefully shaded window, Mr. Depew has perfect control over the broadcasting of the various features followed by the Zion radio performers. The window shown in front of Mr. Depew in the illustration looks out over the congregation in the tabernacle and covers a full vision of the pulpit, the famous Zion organ and the radio choir.

Wilbur Glenn Voliva, overseer of Zion City and well-known evangelist, is one of the foremost boosters of radio telephony. Since installing the station next to his tabernacle at Zion a year ago Mr. Voliva claims he has been able to reach ten times as many listeners as he did during the preceding ten years of his clerical career.

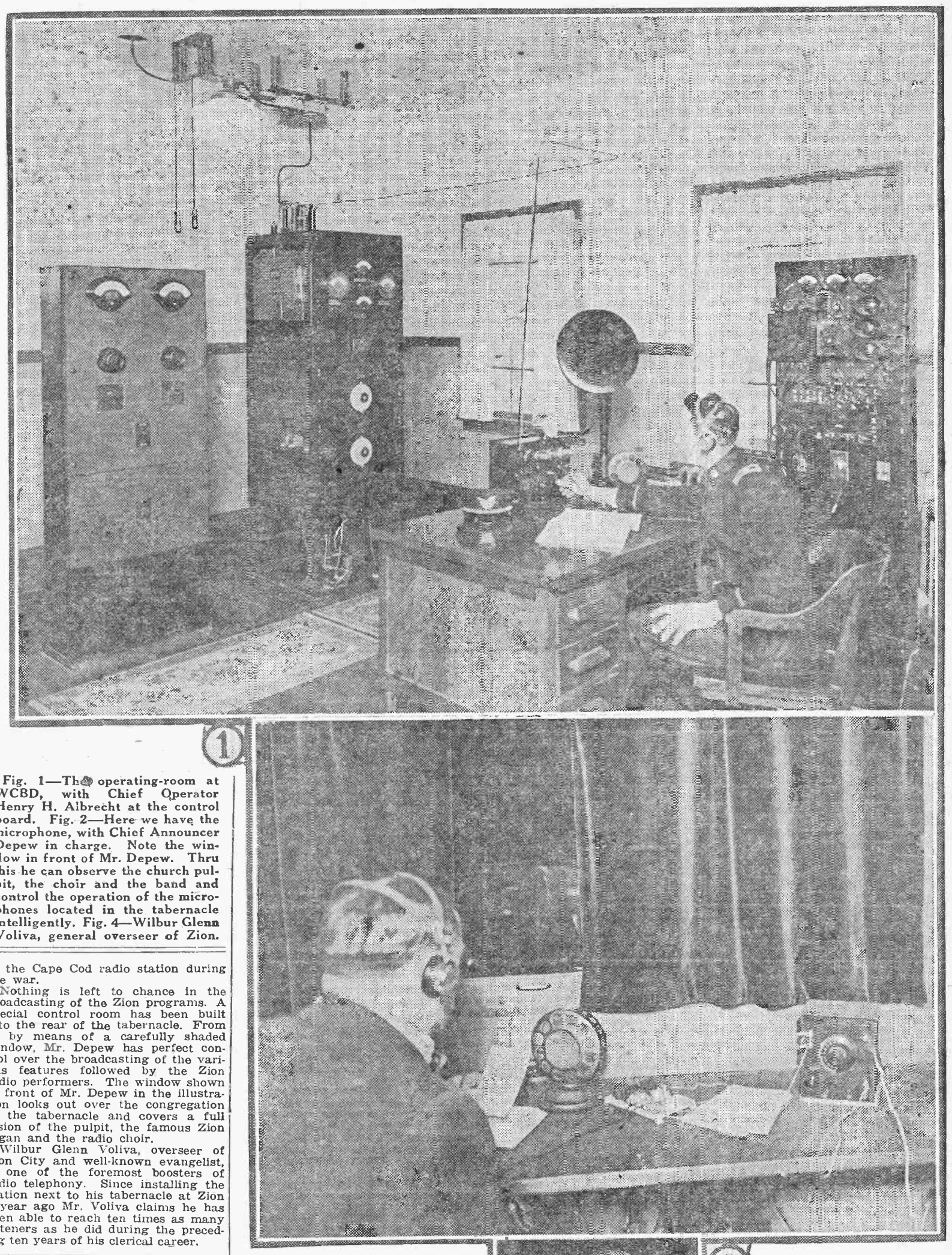


Fig. 1—The operating-room at WCBD, with Chief Operator Henry H. Albrecht at the control board. Fig. 2—Here we have the microphone, with Chief Announcer Depew in charge. Note the window in front of Mr. Depew. Thru this he can observe the church pulpit, the choir and the band and control the operation of the microphones located in the tabernacle intelligently. Fig. 4—Wilbur Glenn Voliva, general overseer of Zion.

Learn Code and Become Air Sleuth for Government

Some listeners-in complain that amateurs interfere with broadcasting. In truth, they do not actually know who is interfering, but simply that some one transmitting code is interfering with their reception.

Half the time the interference comes from a ship which is sending or a shore station handling regular commercial work.

What these "knocking listeners-in should do, department of commerce officials say, is to learn to read code so they can identify the senders and report the offending stations if violations are found.

Here is a real service those who own receiving-sets can render by simply learning the code and reporting infractions of regulations to the district radio supervisor or the department proper. Present regulations make the air free to amateurs on 150 to 200 meter waves, except between 8 and 10:30 p. m. Amateurs have the right to use spark or tube sets; those owning tube sets can communicate by either code or voice. Broadcasting as such is forbidden amateurs; that is, music and entertainment cannot be sent out, but two station owners may converse, except in the evening broadcasting period. Special amateurs have the privilege of using wave lengths as high as 220 meters.

International Morse is the code used by amateurs, and its rudiments should be mastered within a few days' practice.

You will find the classified advertisement section interesting. See Page 15.

Sparkers Draw Criticism from Eastern Listeners

Increasing interference from spark stations is being noted by radiophone listeners, especially in the New York area. Evening after evening the spark stations break into the excellent musical programs of the broadcasters and mess things up for the listeners.

During the most exciting moments of the short but thrilling Dempsey-Firpo bout, the spark stations broke in with the most aggravating racket. The writer of these lines has listened to spark stations sending the test letter, "V," minute after minute during the height of the evening broadcasting entertainment.

Of course, the stock excuse on the part of spark operators is that broadcasters are either using inefficient receiving apparatus, which cannot be tuned sharply enough to eliminate undesired waves, or that the broadcasters lack the necessary skill to tune properly—or most likely both.

To which we hasten to reply that even with the sharpest kind of tuners, such as the Reinartz circuit, we have time and again been unable to eliminate the intense interference from spark stations. Obviously, the radio inspectors have a job ahead of them. The majority rules, does it not?—Scientific American.

WAVE TRAPS DO NOT FUNCTION ON SOME SETS.

Wave traps do not work on every type set. There are several circuits in use today that have a wave trap incorporated in their construction. Two of these are the Cockaday and Miloplex. Be sure it is adaptable to your set before purchasing a wave trap.

ENGRAVING FILLER.

Oftentimes the white material used to fill engravings and markings on dials is chipped out. This spoils the appearance of a set. To replace it, rub a piece of common school chalk over the surface of the panel or dial and wipe off with soft cloth. This will leave a deposit in the engraving which can hardly be told from the original.

Uses WGY as Wave Tester

The bureau of standards has announced that the transmission frequency of WGY so constantly is maintained that the station may serve as a frequency standard for the purpose of standardizing wave meters. The percentage of deviation of WGY from assigned frequency on sixteen tests made by the bureau of standards was two-tenths of 1 per cent.

Radio's Tremendous Possibilities as Agent for Transmitting Public's Information

By M. P. RICE.
(Director of Broadcasting, General Electric Company.)

HAVE you not often in fancy transported the implements of modern science back to scenes of ancient history? One takes delight in the thought of a motion-picture camera at the signing of Magna Charta, the landing of Columbus, the charge of the Light Brigade or the coronation of Napoleon. In imagination one sees the giants of history, from Socrates to Lincoln, recording, in their actual speech, words rich in wisdom for the benefit of future generations.

Can we doubt that Paul Revere's urgent message would have been broadcast had the radio art then existed? To be sure, we would have lost a thrilling scene from our national history, but Paul Revere was less interested in future glory than in a present emergency.

The lack of any effective means of disseminating knowledge was the weakness of all past time and, without doubt, retarded the intellectual and material progress which at a later day received a new impulse from more adequate forms of publicity.

Primitive Means Limit Papers.

It was long after the invention of printing that the newspaper took its place as an important method of spreading information. Its influence was for a long time limited by primitive presses, poor typographical facilities, and inadequate channels of distribution. Literary magazines reached only a few, and it is a question whether the utterances of the pulpit did not secure a wider hearing and a more general influence than the newspapers and the periodical press. In any event, it is safe to say that except among those of cultivated literary taste there were few other means of acquiring knowledge.

Contrast this condition, existing within the memories of our grandparents, with the picture of publicity as furthered by the power and metal of a modern newspaper press and the keen minds that use it in the daily service of millions.

From every part of the world, the telegraph and telephone flash news to alert men of broad thinking who select and combine the many items into lucid, informative phrase. Swift, chattering machines set the type, and thundering presses print and fold hundreds of thousands of copies in an hour. Some of these are carried into local homes while others start on quick journeys to distant cities, small towns and scattered hamlets.

Stupendous Circulation of Press.

Including daily and weekly issues, there is, in the United States, a newspaper circulation of 34,500,000—one for every third man, woman and child—and the newspaper that is read by only one person may be considered an exception. In the field of periodical magazines, both literary and technical, there is a total circulation of about 185,000,000.

One likes to think of Benjamin Franklin's delight in the contemplation of such heroic publicity—of an organization that not only distributes the world's news in an hour, but adds to it the judgment of mature minds for the guidance of a people's thought.

Another important form of publicity has grown up with this generation in the form of motion-picture photography. Few other forms have achieved a wider popularity in our day or exercised a wider range of influence.

The realism of the events which it portrays makes a visual appeal to the fundamental emotions. Day by day throngs, which include a large proportion of children, come within the influence of the motion picture, and many of them find in it a keener stimulus than in any class of reading. The appeal is the stronger because it is to the heart rather than to the intellect.

It is estimated that from 10,000,000 to 11,000,000 people sit under the spell of the screen every day. This estimate is conclusive evidence as to its popularity and its force in molding public opinion. Undoubtedly many of our people derive their impressions of life and their knowledge of current events almost exclusively in the motion-picture theater.

Now Comes Along Radio.

Within the last three years still another form of publicity—radio broadcasting—fairly has leaped upon the stage and has seized the attention of the world audience. It appeals to mind and emotion. Its part is to teach, to inspire and to hold up worthy ideals of musical and dramatic art. In lighter moments it is a prince of entertainers. Its voice rides on the air and sounds in the ears of all who will listen.

No other art or system can thus speak simultaneously to everyone whether close at hand or a thousand miles away. No other method of publicity can send abroad the living voices of great men—statesmen, educators, philanthropists, scientists, authors and industrial leaders—for the information and inspiration of whole populations. It is only thru radio broadcasting that the snowbound farm can learn the world's happenings of the same day; that listeners can, without leaving their rooms, hear good plays well rendered, good music well performed and instructive addresses on topics of intimate interest. It is only thru radio broadcasting that the services of churches can be attended in every home by those who cannot be physically present at common worship.

More and more it is evident that the broadcasting station is able to do things in the way of publicity that other agencies cannot do as well or at all. No other agency can speak with a single voice to 10,000,000 people. It is a transmitter of national events and its scope bids fair to be at least as wide as the nation thru the erection of stations in positions that will cover the whole country.

What Radio Faces in Future.

The possible scope of radio publicity may even become world-wide. Its highest service will be in a comprehensive educational program, in the popularizing of the best music and of a fine form of dramatic art and in the broadcasting of religious services. Its average daily audiences have been estimated at 8,000,000 and this audience is growing every day, for there is no physical limitation to its numbers.

Radio, in its service of information, is not intended to supplant the press, but rather to supplement it with a speed of transmission that is equal to that of light, with an intimacy of human speech that must needs be absent from the printed page, and with a completeness of distribution that is peculiar to itself.

If publicity, in the broad sense of giving general distribution to knowledge, be essential to national progress and personal culture the art of radio must be regarded as the finest and farthest advance that publicity has yet attained. Not displacing, but in many ways transcending, the established methods, it invites the world to a free participation in the benefits with which science has crowned this new and wonderful achievement of electricity.

This is WMAQ's new orchestra, of which Rhea Dorothy Lynch is the leader. It plays every evening from the Hotel LaSalle studio and is making good music become popular hereabouts.

This Phan Sits in Icy Garage to Hear Drama

So realistic was one of the recent radio dramas broadcast by WGY (Schenectady), that up in Caledonia, Ontario, Reginald Todd, one of the continent-wide radio audience, sat thru an early winter freeze-up, out in his garage, without realizing the temperature until the last word had been spoken in the last act.

Mr. Todd has his radio set in the garage, in order to utilize the battery in his car. Usually he has the garage at a comfortable temperature for a radio listening evening, but on this occasion the cold weather came up unexpectedly after he had tuned in and got WGY. He describes the way the rendering of "The Green Goddess," by the WGY players appealed to him in the following passage from his letter to the station

"Speaking of your play, 'The Green Goddess,' it was wonderful, but to explain why, you must know the conditions under which I receive radio broadcasting. I have my set in the garage, so as to use the battery in the car. My aerial is between two trees.

"When I tuned in your station, it was freezing ice along side of me, but I did not know it until the play was over. I must have believed I was in India and quite warm. There I sat, with a pair of receivers on my head, in the dark, with the wind howling outside and a fairly heavy snowfall coming down.

"I was unaware of all that was going on without. Everything was like a real story in life, and I appeared to be a looker-on. The wireless sending was wonderful, and when the hum of the airplane came, I believe I heard it before the people in the play did. And when the bombs dropped! I did not mind the first two, but when that third one went off, I left my seat. That third bomb nearly took my head off. It sounded like a quiet morning in France.

"Yes, it all seemed like a pleasant dream, but when it ended, and I came to, my feet were like a couple of cakes of ice."

WPAB Resumes Broadcast Work Three Nights a Week

Station WPAB, State College, Pa., resumed broadcasting during the last week. The schedule of programs will be confined to about one hour on Monday, Wednesday and Friday nights of each week, starting at 8 o'clock. The Monday night program will be of special interest to farmers, as it will consist of information on agricultural topics. Student and faculty musicians will provide entertainment. WPAB uses the 283-meter wave length.

WSAI Operated by Battery

Station WSAI, Cincinnati, is now using storage batteries for supplying power to the transmitter. Batteries as a source of power in place of a motor generator eliminate the hum of the generator and makes the radio waves sharper. WSAI uses 800 cells of batteries, which furnish 1,600 volts to the transmitting equipment.

Big Brother Club of Radiophans Makes Hit East

Boy and girl radiophans all over the east are becoming greatly interested in the newest Amrad broadcasting feature conducted at WGI, Medford Hillside, under the name of "the Big Brother club." More than 200 boys and girls are enrolled as active members at the present time.

"The Big Brother club" is not unlike the Boy Scouts and Camp Fire Girls in purpose and principle. It appeals to boys and girls from 9 to 12 years old, and, according to the by-laws, "any boy or girl owning or listening-in regularly on any receiving set is eligible." The dues are one letter each week to "big brother." Meetings held nightly from 6 to 6:15. Each new member is issued a certificate of membership card, duly inscribed.

During these meetings by radio interesting letters from members are read and then "big brother" opens the discussion of especial interest to children, closing with friendly and timely advice.

For instance, at one of the recent meetings, "big brother" warned his listeners to be careful while coasting, and to be ever on the watch to prevent accidents, illustrating with concrete examples.

"The Big Brother club" is a new idea, and is receiving the enthusiastic support of mothers and fathers. It is planned to carry the educational possibilities still further and to conduct spelling bees, history lessons, simple problems in mathematics and geography. These radio lessons will be put out in simple story form so that the boys and girls will not be reminded they are being taught lessons, but rather listening to an interesting broadcast. The club has adopted the slogan "Be somebody's big brother every day."

It is expected that Big Brother clubs will be established at other broadcasting stations in the near future.

Tells How Wired Radio Messages Are Directed

A publication giving an introduction to wired wireless or line radio communcation has recently been prepared under the direction of the chief signal officer with the co-operation of the bureau of standards.

This pamphlet gives an explanation of how messages are carried to distant points by radio-frequency currents directed over wires such as ordinary telephone lines or power lines.

The fundamental principles of radio and its relations to line radio telegraphy and telephony are also discussed. This pamphlet is "Introduction to Line Radio Communication," Signal Corps Radio Communication Pamphlet No. 41, a copy of which may be obtained for 10 cents from the superintendent of Documents, government printing office, Washington, D. C.

H. C. COILS AS SUBSTITUTE FOR VARIOMETER.

A split variometer in a set may be replaced by two honeycomb coils of the proper windings. Oftentimes the results are even better in the variometer.

Vote Shows Radiophans Want Popular Programs

Three Chicago broadcasting stations, KYW, WJAZ and WDAP, polled a vote to determine what type of program the radio audience prefers.

A study of 122,974 replies out of 263,410 received indicates that half the radio listeners want popular music, and a little over 25 per cent desire classical selections.

Few seem to care for talks and speeches, and male quartets appear to be less popular than any other form of musical entertainment.

Old-time songs rated fourth in popularity. The greater number of voters were young people and two-thirds of the reports were from men.

This vote, when taken as a basis of estimating the total number of people listening in, indicates that there are about 25,000,000 radio auditors. This estimate is derived as follows:

Not more than one person in fifty who hears a radio program writes to the station. This shows a total audience for WJAZ, WDAP and KYW to be 13,170,500, during the ten-day period in which the vote was taken.

WJAZ alone received 170,699 votes, which indicated, on the 1 to 50 basis, an audience of 8,534,950. The returns in one day to WJAZ numbered 20,152 pieces of mail, representing an audience of 1,000,000 in one night.

If three stations in one city have an audience of more than 13,000,000 it is believed that a conservative estimate for the entire country would be 25,000,000 listeners.

This Two-Tube "Flivver" Is a Super That Will Operate Loud Speaker on a Loop

CONSIDERABLE interest has been manifested by Post readers in loop-operated receivers. Here is one that will work efficiently on a small loop, using only two tubes and yet will operate a loud speaker. An outside aerial, of course, would give greater distance and more volume.

By IVERSON C. WELLS.
(Radio Editor, The Chicago Post.)

THIS week we have the Radio Flivver—one of the best examples of simplified super-regeneration.

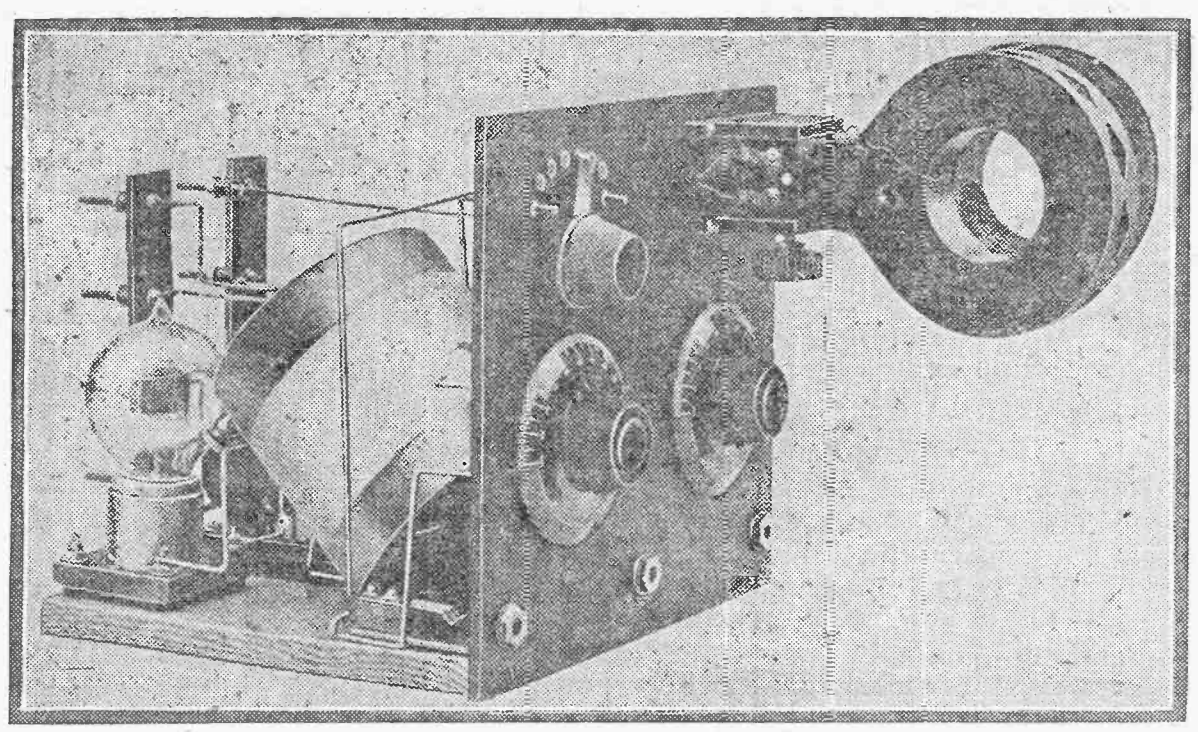
The circuit is not a new one, only in that it has not been exploited by Chicago publications. It is an adaptation of the Armstrong super-circuit by Kenneth Harkness of the Radio Guild and announced last winter.

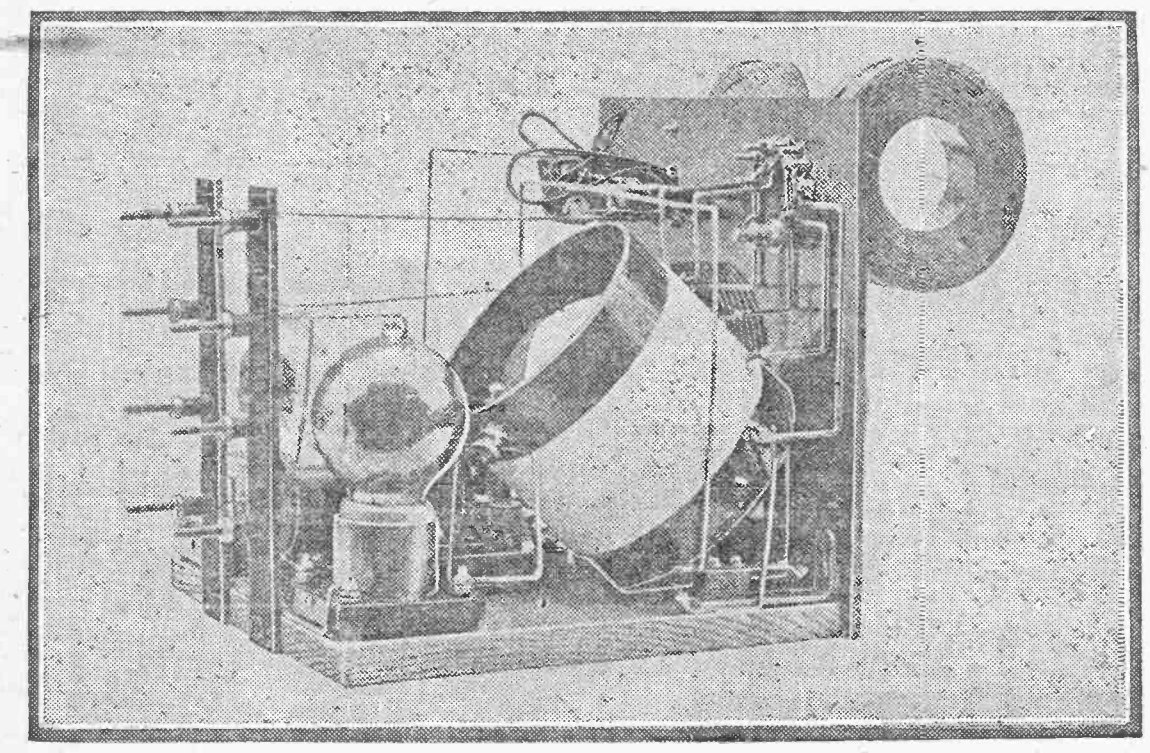
The outstanding features of the "Flivver" are:

The signal strength is marvelous.

It operates a loud speaker on a loop aerial and two tubes.

It has four controls, only two of which are not critical.





Courtesy Radio Guild, Inc.

Two views of Harkness radio "flivver" super receiver.

The set was designed to be a super-regenerative receiver occupying the smallest space practicable and using the fewest parts possible. You will note that even the rheostats are omitted. These are not really necessary since we are using five-watt tubes.

The following is the key to circuit shown in the accompanying schematic diagram, and also gives the list of parts used:

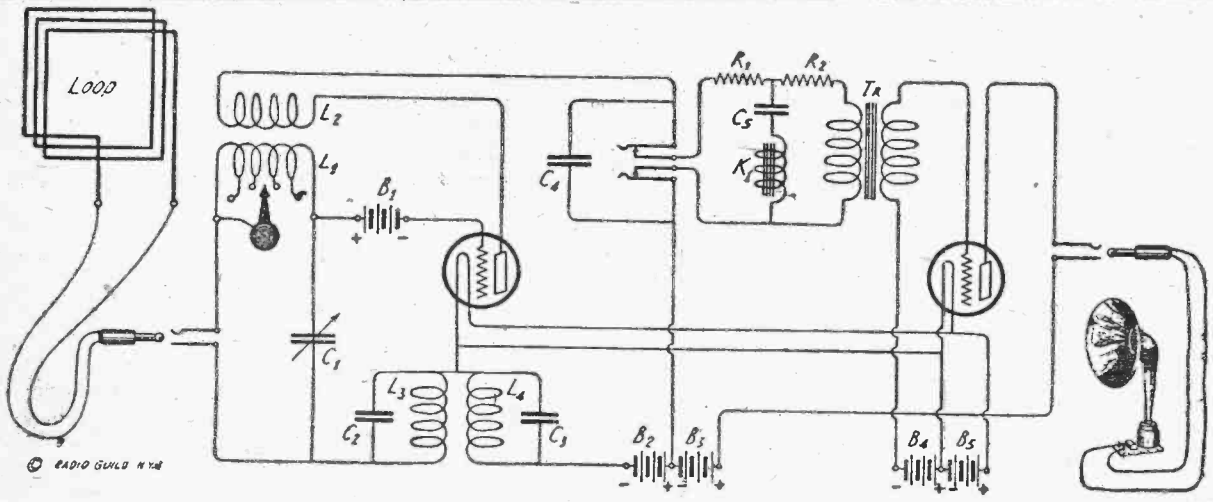
L1—Variocoupler primary. Fifty turns, tapped every tenth turn.
L2—Variocoupler secondary. One hundred turns.
L3—Duolateral coil, 1,250 turns.
L4—Duolateral coil, 1,500 turns.
C1—Variable condenser, .0005MFD.
C2—Fixed condenser, .002 MFD.
C3—Fixed condenser, .001 MFD.
C4—Fixed condenser, .005 MFD.
C5—Fixed condenser, .005 MFD.
R1-R2—Two 12,000-ohm noninductive resisters.
K1—Iron core choke coil (one Henries).
TR — Audio-frequency amplifying transformer.
B1—Variable grid battery, 3 to 15 volts.
B2—Plate battery, 150 volts.
B3—Plate battery, 45 volts.
B4—Grid battery, 22½ volts.
B5—Filament storage battery, 6 volts.

Loop aerial, bakelite panel, 8 by 9 inches; two bakelite post strips, 7 by 1 inches; two open circuit jacks; one double circuit jack; switch, lever, six contact points and two stops; two telephone plugs; two vacuum tube points. The rest of the apparatus now may be assembled on the panel and baseboard. The photographs show how these were located.

In wiring the audio-frequency transformer be sure you connect the right terminals of the transformer to the grid and filament of the second tube. If these terminals are reversed "howling" is caused.

The five-watt tubes give best results in this receiver, altho 201A were satisfactory. Smaller capacity tubes, such as the 199. WD-12 will not serve.

With the five-watt tubes use 150 to 175 volts on the plate of the first, or regenerative amplifying tube. Sufficient added voltage to apply 200 volts on the plate of the second, or audio-frequency amplifying tube is required.



Courtesy Radio Guild, Inc.

Schematic diagram of Harkness radio "flivver" super receiver.

Wooden base, 8½ by 8; duolateral coil mounting; cabinet to inclose receiver; two dials; loud speaker.

Details of Construction.

The panel, of course, is the first job to do. I have given the same panel layout which Mr. Harkness used himself. All the center holes are shown with their sizes indicated in the drawing. The two half-inch holes in the upper right corner are for passing the leads of the duolateral coils to the back of the panel.

With the panel made ready it should be screwed into place on the baseboard. Mount the varicoupler first, then the input jack and the inductance switch. Connect up the wiring from the tops of the primary side of the coupler to the switch sockets; two five-watt vacuum tubes; eight binding posts.

Do not overlook the grid battery requirements if you wish to get maximum service out of the receiver. Use from six to nine volts for the grid battery of the first tube, while a 22½-volt biasing battery is necessary in the grid circuit of the audio-frequency amplifying tube.

As to tuning. There are only four controls on the receiver. The switch lever controls the wave length. When this is adjusted properly for any particular wave-length it needs no further attention.

The dial below the switch lever operates the rotor of the variocoupler and thereby controls the feed-back of the regenerative amplifying system.

The variable coupling between the two duolateral coils mounted on the front of the panel is critical, and prop-

Continued on Page 8

Radio Keeps Kris Busy

Santa Claus at WGY (Schenectady, N. Y.) received 3,500 letters within a few days from children thruout the country. The names of most of the senders were read via radio and many of the children listened in patiently for four nights before they heard Santa call their names.

HOMEMADE BENCH VISE.

When drilling panels difficulty is sometimes experienced in holding the panel stationary. This can be accomplished by the use of two small clamps which can be purchased at any 10-cent store. Place the panel on the end of work bench or table, place clamps on both ends of panel and screw tight. In this manner pressure can be exerted on the drill without fear of the panel cracking.

Radio Supervisor Optimistic After Tour of Country

A good year is in prospect, according to Chief Radio Supervisor W. D. Terrell of the department of commerce, who has just returned to his office in Washington after a tour of all nine radio districts of the country.

Today very little radio interference is reported from amateurs during the silent evening periods. Radio sales are now much better than was anticipated by forecasters of this business a few months ago.

Demand Exceeds Supply.

Dealers with whom he talked during his trip find it difficult to keep enough stock to meet the sales and demands. Everyone connected with the industry with whom he came into contact is "tickled to death" with the prospects of continued good business, it is understood.

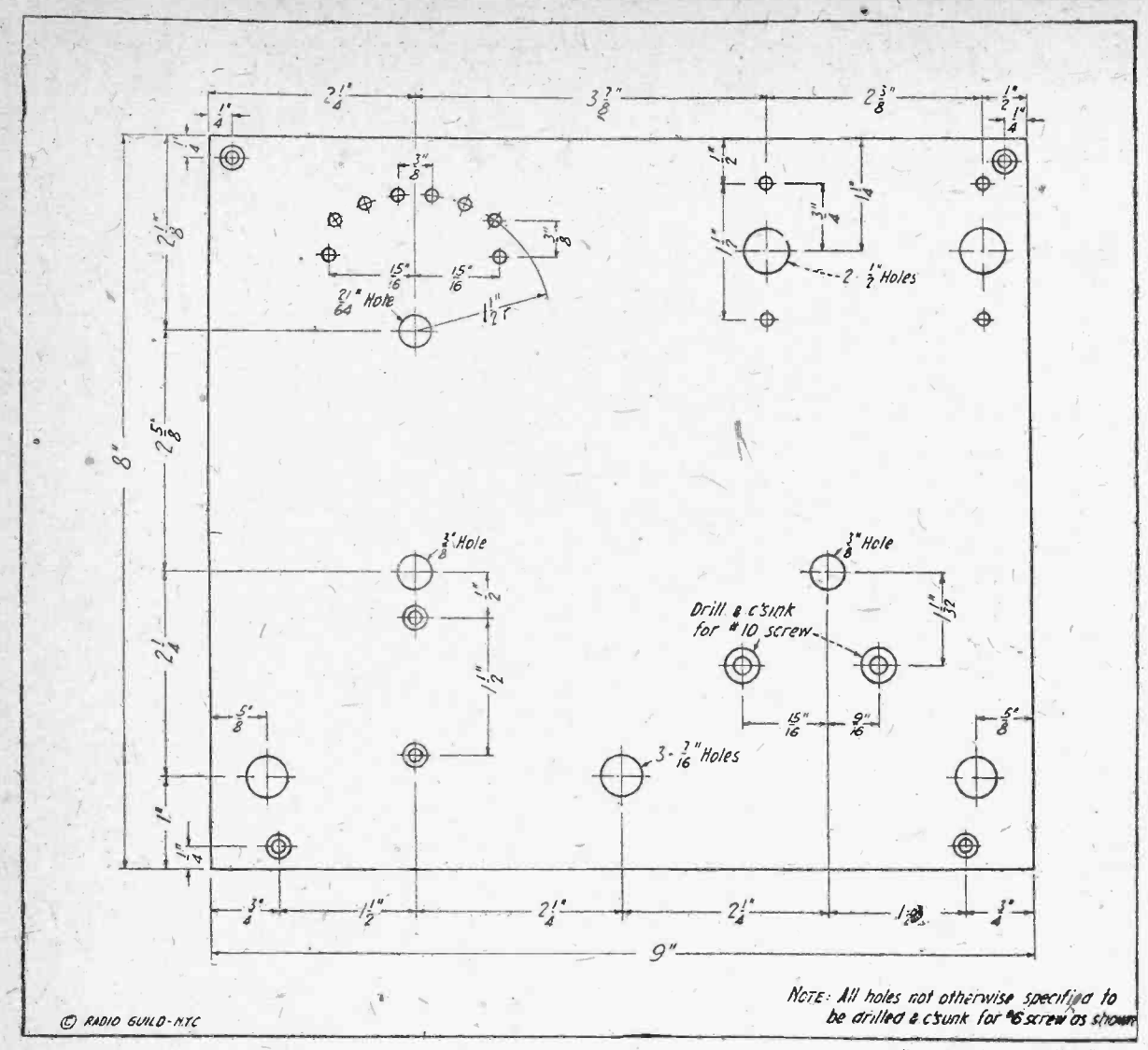
Reports from radio sales agents state that in many districts farmers are coming to town from near and far to buy themselves receiving sets. In some sections of the country reports state that practically all farmers living at considerable distance from news and market centers already have or are buying radio sets.

Enjoy Evening Program.

Besides the practical value of weather, market and stock reports, it is pointed out that the farmers and suburban residents take great delight in the excellent evening entertainments broadcast daily by over 500 stations.

The growing general interest in broadcasting is reported healthy, both among the broadcasting station owners and the listeners-in, due to the fact that the industry and art is getting on a stable basis. In general, Mr. Terrell believes that people have gotten to the point where they feel they cannot get along without radio.

Lead-in wire must always be insulated and of heavy gauge. Never use bare or small-gauge wire, as it will impair the efficiency of your set.



Courtesy Radio Guild, Inc.

Panel layout for the Harkness radio "flivver" super receiver.

This Two Tube Super Set Runs Loud Speaker

Continued from Page 7.

er adjustment, in connection with the rotor of the variocoupler, is essential.

Set the two duolateral coils at right angles to each other. With the batteries hooked up there should be a high-pitched continuous whistle in the phones. This is the evidence that the tube is oscillating. You may have to move the two coils slightly to produce this whistle.

Turn the lower left-hand dial controlling the rotor of the variocoupler until a click is heard in the phones. If this is not heard reverse the leads.

The coupling between the two duolateral coils should be loosened and at the same time that of the variocoupler should be decreased by moving the left-hand dial. Now turn the right-hand dial until the grid circuit is tuned to the frequency of the incoming signal. Increase coupling on variocoupler until the point of maximum signal is reached. Gradually draw the two duolateral coils together until a certain point is reached, which will be the highest point of amplication.

The Flivver is somewhat harder to tune than the usual receivers, but a little practice will bring results that easily repay one for his trouble.

UNNECESSARY PEEPHOLES.

Don't destroy the appearance of your set for peepholes unless it is convenient. There is no practical use for these, as you know that as long as your set works your tubes are lit, and when it does not work they are the first things you look at when you examine the set.

TYPE DETECTOR FOR CRYSTAL SETS.

Fixed detectors on crystal sets are highly impractical. Altho they may be very good for the first week or so the spot on which they are set will lose its sensitivity in time. A good multi-point or common cast whisker type are much more practical.

150 "Hams" Catch Waves from Oversea

HARTFORD, Conn, Jan. 17.—Near the close of the transatlantic radio receiving tests, organized by the American Radio Relay league, about 150 amateurs thruout North America had reported hearing signals from European transmitting stations and A. R. R. L. headquarters was still be sieged with letters and telegrams from every part of the country. With only part of the results obtainable, F. H. Schnell, traffic manager, announced that calls of thirty-five Europeans had been verified.

Of the several foreign countries in which zealous amateurs are casting their signals across the Atlantic on low power, Great Britain leads with a total of eighteen successful transoceanic transmitters. France comes next with a total of thirteen and Holland with four. So far the reception of Italian stations has not been reported. These tests are making transoceanic private communication commonplace.

The experience of the last three years of transatlantic amateur transmission was put into play during the tests, and officers of the league are confident that with the information thus gained many of the most trying technical obstacles will be overcome and the near future will see the use of fairly standarized low-power equipment.

Interest is now growing in the forthcoming announcement of the award of prizes for successful operators. This will be made as soon as the final reports have been received. Thousands of dollars worth of radio apparatus have been donated by prominent manufacturers.

For the first prize, a $1,100 Grebe transmitter, the amateur must figure the total mileage covered by his receiving set. Two amaeurs have reported about 300,000 air-line miles each. The distance between each foreign station and the receiver is counted once nightly.

Hastings Station Hears from Radio Phan in Hawaii

All the radio fans are not in the United States. To prove this, A. F. Costo, postmaster at Wailuku, in faraway Hawaii, and some 3,500 miles away from Hastings, writes in to tell station KFKX about it.

He reports that on the evening of Dec. 13 he picked up the Westinghouse experimental radiophone in Hastings, and received the entire program that evening. "You came in very good and clear," states the letter from the postmaster, "and your announcements were very distinct. You read telegrams received from New Jersey, Canada, Chicago and other cities and states commending you upon your splendid program."

Besides KFKX, Postmaster Costa has picked up several other stations in the United States, among which is KDKA, the mother station to KFKX in Hastings, located at the works of the Westinghouse Electric company in Pittsburg, Pa.

Letters have been received from radio enthusiasts in the eastern part of Canada, Cuba, Mexico and points far to the south. Station KFKX is fast becoming more than a national station. The time will come when it will reach out to every country where there is a receiving set to pick up its concerts.

Be sure to read the classified advertisements on Page 15.

Hospital Uses Radio in Cures

MINNEAPOLIS, Minn., Jan. 17.—Radio is a valuable adjunct to the treatment of tuberculosis and is "of great therapeutic value in treatment of other hospital cases," Dr. Walter K. Foley, chief of the medical service of the United States Veterans' Bureau Hospital No. 68 here, declared today.

Dr. Foley, who has been "prescribing" radio for two years, made his assertion in a letter to WLAG station here, telling the personnel how they are aiding toward recovery the ex-service men patients at the hospital. He revealed that more than 250 radio sets are being used in the hospital and that when a patient enters he is given the option of receiving a set as part of his hospital equipment.

"A radio set will do more to cure tuberculosis than any other apparatus yet devised," said Dr. Foley. "Our method is this: "A worried, unsettled state of mind is the biggest obstacle we have to fight in treatment of tuberculosis. The only way a patient may be cured is to put him to bed and give him absolute rest in mind and body. He may be in bed from several months to a year or two, and, naturally, when told this is discouraged.

"When newness of hospital routine wears off he begins to worry about himself, the folks at home, or his children. Even if he has no family, the sick man always can find something to worry about.

"One of our patients passed hours in mental agony wondering whether the United States would join the league of nations. Two years ago we had a patient who worked himself into a mental frenzy with imaginary grievances. He claimed his sheets were being starched and that the food, no matter how tasty, was not good. His condition was rapidly growing worse. One day I installed a radio set at his bedside. He became interested at once and before long his mind was entirely at rest under the radio's soothing effect. He quit complaining and started to recover. He was recently discharged as cured.

"This was the beginning of 'radio prescriptions' at Hospital 68, which resulted in the installation of the 250 or more sets we now use. The boys now 'forget their troubles' with radio, and often call me to their rooms to check on a hook-up. I think these radio calls do as much good as professional calls.

"I would rather give a patient suffering from tuberculosis, and other diseases as well, a radio set than a whole handful of pills. It does him more good."

Wire Wireless in Germany Proves Success in Tests

Experimental work in wired wireless is progressing in Germany, Consul Richardson advises the department of commerce.

Recently communication was effected between Berlin and Stolp on the Baltic coast over a 400-kilometer line. This high-frequency telephone line has been turned over to the federal post authorities by the firm of Lorenz A.-G.

Three calls at a time were put thru successfully; one on the normal wave length, another on a 45-kilometer wave and a third on a wave of 25 kilometers. Instead of cathode tubes, a special high frequency generator was used.

Issues Bulletin on Vapors in Vacuum Tubes

Bulletin No. 138, just issued by the engineering experiment station of the University of Illinois, discusses the effect of the use of alkali vapors in vacuum tubes used as detectors. Vapors of certain alkali metals, and also of certain alloys of these materials, have very low ionizing potentials. Notable among these is the alloy of potassium and sodium, the vapor of which has an ionizing potential of four volts or less. A small amount of this material was introduced into several vacuum tubes by methods which are described in the bulletin, and the following results were obtained:

Three-electrode tubes containing potassium-sodium alloy vapor were found to be very sensitive detectors in radio receiving circuits at low plate voltages. This sensitivity was due to the low ionizing potentials of these vapors, and probably also to other characteristics of such vapors, as photo-sensitivity, contact potential, etc. It was discovered that these were much less cortical than were gas-content detectors; they were steady in their action free from distortion and needed no frequent adjustment of filament, current or plate voltages.

Test data and curves submitted in the bulletin indicate that the use of potassium-sodium alloy in the conventional UV201 or UV200 three-electrode tubes gives them very desirable high-voltage amplifier characteristics, even tho the tubes are not thoroly outgassed during evacuation. This means a considerable saving in the cost of manufacture.

Copies of Bulletin No. 138 may be obtained without charge by addressing the engineering experiment station, Urbana, Illinois.

USE OF SPAGHETTI TUBING.

Spaghetti tubing should be used only where necessary. It has no property of conserving energy or eliminating interference from other wires, and, therefore, is of little use except where there is danger of battery leads shorting.

WGR Broadcasts Sarnoff's Speech at Big Banquet

The broadcasting department of the Federal Telephone and Telegraph company of Buffalo offered an unusual special program thru WGR (319 meters) Saturday evening, Jan. 12. The addresses and music provided at the Buffalo Chamber of Commerce's annual banquet given in the Hotel Statler ballroom were of unusual national interest because of the presence of David Sarnoff, United States Senator Pat Harrison and Dr. Charles A. Eaton.

Mr. Sarnoff, vice president of the Radio corporation, is renowned for his rapid rise from radio operator to his present executive position of a huge radio communication organization. He is an excellent speaker, and his talk on the present status of radio communication proved interesting to radio listeners within 2,500 miles of the federal station.

How to End Noise in Your Radio Set Told by Expert

With the possible exception of static, there is no reason why a properly made radio receiver should not function without noise or trouble, giving clear, distortionless signals from stations within its receiving range. All trouble usually can be traced to defective parts, poor construction or unskilled operation.

So writes Jack Binns in the February issue of Popular Science Monthly. Every noise has a meaning, he declares, and noises should not discourage the radio fan. If your set produces noises, you are much better off than the man who turns on the juice, plugs in the phones and hears—nothing.

Causes of Crackling.

A crackling noise can be traced to static, rundown batteries, poor wiring connections or defective rheostats and condensers. Listen in with aerial and ground disconnected, and, if that eliminates or cuts down the crackling, the trouble is due to static. If the noise persists, static is not the cause, and you must test the parts mentioned to locate the trouble.

A steady, regular staccato beat, like the patter of a machine gun, can often be traced to an improper value in the grid leak. The remedy is to try grid leaks of different values until the right one is obtained.

A steady humming noise usually is caused by near-by power lines or lighting circuits near the lead-in wire. The remedy is to erect your aerial as far as possible from such lines and as nearly as possible at right angles to them.

A loose connection or open circuit in the grid circuit of the detector stage often will cause a sharp drumming noise that can be eliminated by checking up the grid circuit connections.

Whistling Sounds in Phones.

Whistling or howling noises may be due to too much regeneration, too many turns in the ticker-coil winding, poorly designed transformers too close to each other, grid and plate wires running too closely parallel to each other, body capacity effects when the hand is brought near the controls, neglect to use a fixed condenser across the primary winding of the first stage transformer and overloading of tubes.

A whistling noise changing in pitch without any adjustment of the receiver is caused by a neighbor tuning in his single-circuit regenerative set, with the circuit in an oscillating condition. The only remedy is to convince the owner of a troublesome set that he should use a double-circuit outfit, or tune in his present set with the tube filament turned down as low as possible.

If you don't get results after testing your set and checking up your wiring you will find it an actual saving in time and temper to take the whole works apart and test each part separately.

Don't, tho, try to make the tests, wire up the receiver, and get good results all in one evening. It simply can't be done.

THE HOME WORKSHOP

How to Test Crystals with Buzzer Outfit

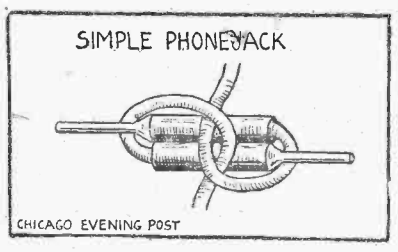
The best system for testing radio receiving crystals is to use a high-pitched buzzer. This buzzer should be placed in a box, and packed in with cotton, so as to reduce the amount of mechanical sound produced. Leads are brought out from the two binding posts of the buzzer and connected to a battery and switch, and a third lead is brought out from the contact point of the buzzer.

If a single circuit tuner is used, connect this third lead to the ground connection of the set.

If an inductively coupled tuner is used, connect the third lead directly to one post of the detector. Now, by turning on the switch, and adjusting the catwhisker over the surface of the mineral, a loud buzz will be heard when the catwhisker is on a sensitive spot.

Simple Phone Hook-up

Sometimes visitors come in unexpectedly or your loud speaker is not working. You have no multiple phone jacks. A way out is shown in the



illustration, which is self-explanatory. The cord tips are held in firm contact by an over-hand knot. Be sure to make the knot tight. If you do not you are apt to have poor reception.

A Simple Spirit Lamp

A new oil can with a wick of cotton string makes an excellent spirit lamp. For applying intense heat at a small joint it is only necessary to press the bottom of the can; the pressure will then force out a hot flame, making the lamp act as a blow-torch. On small work the lamp may be used sideways or at an angle, which is not possible with the ordinary kind of spirit lamp. For soldering small wires in radio work, or for light brazing, this lamp has few equals.

Low Wave Variometers

If you have a 400-meter variometer that refuses to bring in the new high-wave length stations, do not throw it away. Place a coil in series of an equal amount of turns. It is not necessary to have the coil inductively coupled to the variometer.

Prize Awards For Useful Suggestions

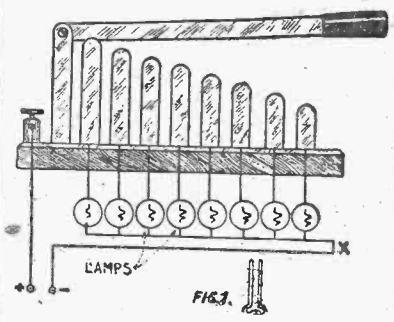
THE POST offers $1 for every accepted and published suggestion made by readers which will enable the home builder to improve his work.

A special prize of $3 each week is made for the best of these suggestions.

Send your entries to Workshop Editor, care Radio Dept., Chicago Evening Post. Inclose pencil sketch if necessary to convey idea.

This Switch Cuts In and Out Lamps in Bank

When employing the usual method of controlling a bank of lamps for battery, charging, etc., the switch



shown here is easy to construct and will give good results.

The metal parts may be made of any metal that is a good conductor. It is preferred that brass be used because of its springlike tendency. It will be noted that the blades which make contact with the long switch arm are of different heights, which is the reason any number of lamps may be cut in or out of the circuit. The diagram shows how it is connected. If a battery or other instrument is to be used in the circuit it is connected in at the point (X).

How to Solder in Place Loosened Phone Cord Tips

It happens often that the head phones' cords to which are attached the cord tips are pulled out of the tips. It is very difficult to solder the cords to the tips, as the fine wires of which the cord tip is composed are in danger of melting off. A better way is to take some No. 30 bare copper wire, strip off about a quarter of an inch of the insulation on the cord tip, and wrap the bare copper wire tightly around the stripped wires.

Tie the wire so it cannot untwist. Do not wrap too much wire on the cord, or you will not be able to get the cord tip into the regular tip. Take the tip and hold it in a pair of pliers in the flame of a torch or alcohol lamp. Melt a drop of solder into the tip, with some flux of noncorrosive type, then, still holding the tip in the flame, quickly push the wrapped cord into the tip.

The insulation on the phone cord will be only slightly charred, if at all, by this method, and the solder will be forced against the wire-wrapped end of the cord, and the cord tip, which will make a perfect connection and a neat one. The best way is to use cored solder containing flux in the center of the strip—so-called acid-core solder.

Some Notes on Neutrodyne Circuit and Its Operation

Fundamentally the neutrodyne circuit is tuned radio-frequency. Coupled coils are used between the tubes instead of transformers, and the coils are tuned by a variable condenser across the secondary. The neutrodyne principle requires neutralizing condensers, which are about ten times the value of the internal capacity of the tubes. Once these condensers are set they should not be changed unless different type tubes are used. Neutralizing condensers prevent oscillations caused by the plate or grid feedback. To balance a neutrodyne circuit tune in a strong signal, remove the first tube and put a paper on the filament prong. Then place the tube back in the socket. The first tube should not light, but all other tubes will light as usual. The dial settings should not be disturbed. Adjust the neutrodons until the signal disappears. Disappearance of the signal indicates that part of the set is balanced and that neutrodon should not be touched again unless a new tube is used. The second step is neutralized in the same manner.

Pipe Cleaners Make Handy Dust Mops for Condenser

It appears that dust and oil often accumulate on the plates of variable condensers. Any foreign material that may stick to their surface is apt to short circuit the entire condenser, thereby making it inoperative. Since the space between the plates is so small it is a difficult matter to clean the surface.

However, with the cleaner to be described, it becomes an easy matter. All are acquainted with the type of pipe cleaner that is composed of two wires twisted together with a quantity of fibrous material. By bending one of these so as to form a loop, and twisting the two ends that are so brought parallel to each other, both a handle and a cleaning surface are afforded.

These cleaners also are handy for wiping away accumulated dust and grit in corners of the receiving set.

Why Horns Aid Phones

The reason a horn increases the sounds emitted by a phone receiver or loud-speaker unit is because it concentrates a large volume of air in a small space and permits the receiver or unit therefore to move more air. Since the volume of sound depends upon the amount of air the diaphragm moves, signals are audible over a longer distance and with greater intensity.

In Buying Condensers

When buying a variable condenser get the higher capacity ones—43 plates preferably. You always can use them where small capacity is required in a hook-up, and they have the capacity ready for you when you want it.

Bad Contacts Are Causes of Trouble in Many Receivers

Many fans have searched in vain for trouble in their receiving sets, and failing to find it have torn the set apart and built one from some other hook-up. And the trouble has been all the time that one of the tube prongs has not been in perfect contact with the springs of the tube socket.

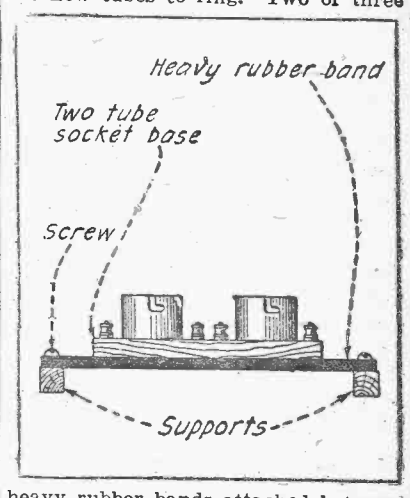
This is a small item, but one of the most vital elements of the receiving sets. In the case of contact of the filament prongs, it is easy to trace poor contact, because the filament will not light unless the contact is good, and if it is poor the filament will flicker in such manner as to give some guide to actual conditions.

But in the case of the contacts made by grid and plate prongs, the tracing of trouble back to this course is not so easy. But making sure that all contacts are good is a simple matter if the fan will only take this precaution before wiring his set.

Take the tube sockets to be used in the particular hook-up being built and insert the tube to be used in the socket for which it is intended. Unless the socket has a closed base, it will be an easy matter to ascertain by looking thru the bottom of the socket just how the tube springs are making contact with the socket springs.

Jarproof Socket Mounts

Jars and jolts to receiving sets cause the new tubes to ring. Two or three



heavy rubber bands attached between two wooden supports and fastened with clamps or screws make an excellent base for mounting tube sockets.

Ribbon Wiring in Hook-up Gives Surprising Results

The other night The Post experimental laboratory was hooking up two stages of tuned radio-frequency. It so happened there was not an inch of bus bar or hookup wire convenient. There were a few sheets of thin copper.

A sturdy pair of shears soon produced several lengths of narrow copper strips of the proper length and these were used in the hook-up. Surprising results were achieved.

Radio-frequency currents, or alternating currents, travel, as we know, by the "skin effect." Therefore the larger surface presented the least resistance. It is this same idea that has popularized the ribbon aerials.

The hook-up does not look quite so artistic, but it certainly is efficient. Try it—on the radio-frequency end of any circuit—that is, on the wiring that goes from the antenna to the detector.

Can't Get High Wave Lengths

One of the most common complaints is about like this: "We have difficulty in hearing stations above 450 meters. What shall we do?" The average radio technician would answer: "Add about fifty to sixty feet to your antenna."

Homemade Insulators

Olive or pickle bottles with a flange at each end make cheap and efficient antenna insulators. Bridles of insulated wire are fastened to each end. These insulators will stand quite a strain and at the same time furnish adequate insulation.

What Horns Do to Make Loud Speakers Loud

BY C. R. HANNA.
(Research Laboratory, Westinghouse Electric and Manufacturing Company.)

THE popular conception of the function of a horn on either a loud speaker or a phonograph is erroneous. We hear that a horn "resonates," or it "concentrates the sound," or it "amplifies," and many other explanations, all of which are vague and most of them incorrect.

It is true that a horn resonates at certain frequencies, and for that reason increases the amount of radiation at those frequencies. Any form of resonance, however, is undesirable because it is impossible to increase the amount of radiated energy uniformly at all frequencies within a wide range by this method.

If a horn is not to distort, its walls should be nonvibrating and its air column resonances, within the range of frequencies used, should be slight.

Horn Does Not Amplify.

If we think of the term "amplification" as meaning the increasing of any form of response by supplying energy from another source, we see at once that a horn cannot amplify because it cannot supply energy.

It should be evident, therefore, that a horn merely loads the diaphragm in such a way as to cause more sound energy to be radiated into the surrounding space from the diaphragm.

A simple analogy is found in the electric motor. When the motor has no load connected to it, all the energy supplied is used up as losses in the machine. If a load is coupled to the motor, it draws more power from the line in order to supply energy to the load. When the load is light the efficiency is low, as the load is increased the efficiency is raised.

So it is with the diaphragm. Without a horn the efficiency is low, and with a horn the efficiency is increased. The horn may be thought of as analagous to a lever which gives the diaphragm a better grip on the surrounding air. And so the term "radiator" more accurately described the action of a horn.

Where They Differ.

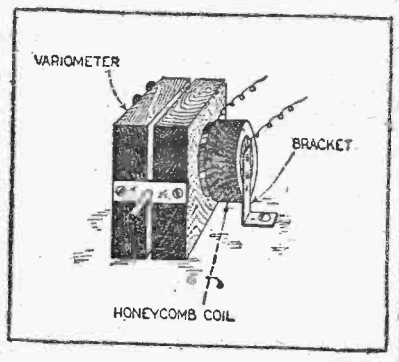
A good horn, therefore, is one which causes the diaphragm to radiate almost uniformly at all frequencies within the desired limits. This condition is more easily attained in a phonograph than in a load speaker. In the phonograph the diaphragm is forced to follow the vibrations of the record except for the slight spring of the needle; while in the loud speaker the diaphragm is not impelled to follow the variations of current in the windings because there is no rigid connection between the two.

In the phonograph it is necessary only that the horn shall radiate uniformly at different frequencies for a given root mean square velocity of the diaphragm. In the loud speaker the horn must fulfill this condition, and also help to cause the diaphragm to vibrate at a nearly uniform velocity when the same current at different frequencies is passed thru the windings.

You will find the classified advertisement section interesting. See Page 15.

Tickler in Variometer

A honeycomb coil placed in inductive relation to your variometer as illustrated very readily could be used to obtain regeneration in a radio re-



ceiving circuit. If the bracket used for supporting the honeycomb coils is so arranged that the inductive relation between the variometer and the tickler coil can be changed at will, better results would be obtained.

U. S. Bureau Tells How to Make Inductance Coil

A circular descriptive of how to make a series of single-layer inductance coils suitable for radio-frequency standards has been prepared by J. L. Preston and M. S. Strock of the bureau of standards.

Owing to the increased interest in radio-frequency measurements, the illustrated circular should be of considerable value to those technically inclined and in laboratories where a fixed conductor of known inductance and having a small radio-frequency is desired.

This type of coil in conjunction with a high-grade variable air condenser, such as the bureau of standards type, forms a very dependable and accurate wavemeter. The pamphlet is known as Letter Circular LC-103.

Window-Shade Aerial

Sewing in insulated wire on a window shade, which pulls up and down, makes a variable loop aerial and one that is located just where it gives best service—at the window.

How to Turn Your Universal Panel Set Into Reinartz Short-Wave Receiver

THIS week Mr. Freund takes his followers into the construction of a Reinhartz short-wave receiver, using the Universal panel he described last week. This series of articles ought to tickle you amateur experimenters.—The Editor.

By BENJAMIN E. FREUND.
(Chief Engineer, Radio Division, Crossland Plaff Engineering Laboratories.)

LAST week I described and illustrated the layout for the drilling of the universal panel which can be changed into almost any of the most familiar circuits. Today's treatise describes the construction and assembly of a Reinartz receiver.

The Reinartz receiver, originally devised by John L. Reinartz, has been considered by the amateurs, both in this and foreign countries, to be one of the most stable of receivers designed for the reception of radio broadcast and wireless telegraphy on low wavelengths.

The Reinartz tuner, which is regenerative, and the three-circuit regenerative tuner (Old Reliable), have been used by the broadcast listeners of this country more than any other type of receiver.

The fact that the wiring is very simple and that great care in the wiring need not be taken as in other types of circuits make it all the more popular with the inexperienced radio dabbler.

Tuner Wiring Simple.

Upon observing Fig. 1, it will be noticed that the wiring of the different members comprising the tuner is extremely simple.

The wiring of the detector and two-step amplifier, which is shown in Fig. 3 is a little more difficult. It will be noticed that the different apparatus is situated in the drawing in as near a likeness as possible to the position as occupied on the panel and baseboard.

In Fig. 1 the two variable condensers and the three inductance switches are mounted on the panel, while the Reinartz coil and small formica and bakelite strip containing the ground and antennae posts are mounted on the baseboard.

In the set constructed by the writer Carter induction switches were used. If nine-point induction switches cannot be obtained, fifteen-point switches may be used thruout. This particular make was used because of its silent operation, which is due to positive pigtail connection to the switch arm or movable member of the switch. As the Reinartz circuit calls for switches and taps for the control of the inductances used, the elimination of any unnecessary friction contacts is very much desirable. It is for this reason that the pigtail connection appealed to the writer.

Condensers and Inductance.

The condensers used are .0005 microfarad capacity, which generally is the capacity of a 23-plate condenser.

The standard 21-tap coil can be used for the inductance. The coil is generally wound in spider-web fashion.

The leads, or taps, on the Reinartz coil, as illustrated, in Fig. 1, are numbered and connections are to be made shown on the induction switches.

The wiring of the tuning elements are shown separately from the wiring of the detector and two-step amplifier, which is shown in Fig. 2.

The detector and two-step amplifier, when assembled and wired, can be a permanent affair and need not be changed for any of the other nine circuits which are to appear in these columns from week to week.

The parts which comprise the detector and two-stage amplifier are as follows:

3 Erla sockets.
2 Low-ratio Thordarson transformers.
2 20-ohm Carter rheostats.
1 6-ohm Carter rheostat.
5 binding posts.

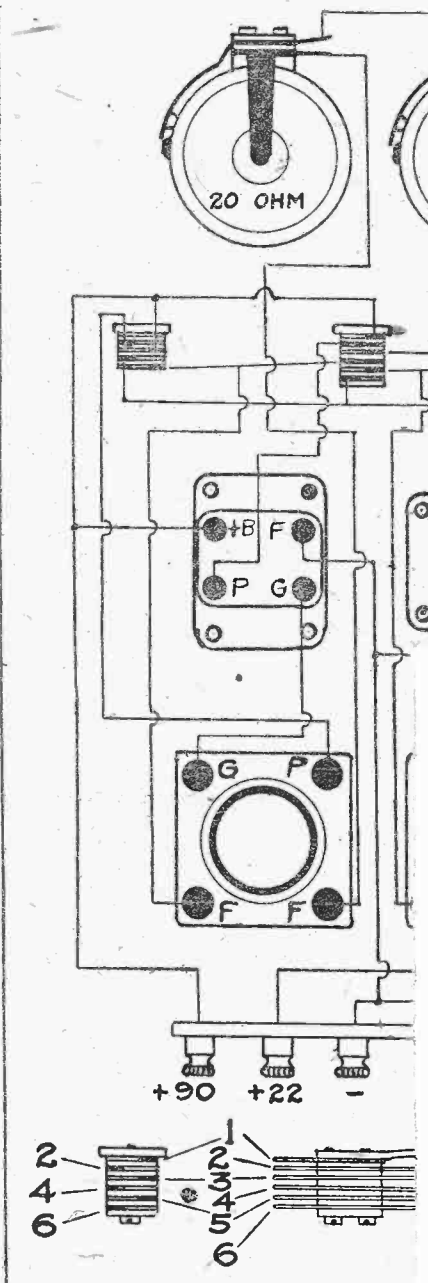
Insists on Low Ratio.

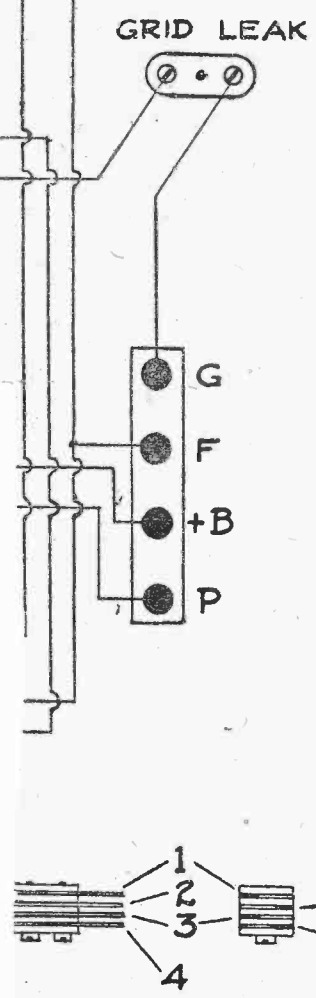
Some of my readers often wonder why I persistently recommend low-ratio transformers for both the first and second stage of amplification. I have found in so doing better quality without any noticeable loss of volume.

The transformers used in the construction of the set built by the writer were 3½-to-1 ratio. The markings, as shown in Fig. 2, are as follows:

Terminals plus "B" and "P" are primary leads, and connect to the positive "B" battery and plate circuits, respectively. Terminals "G" and "F" are secondary leads and connect to the grid and negative filament circuits, respectively.

Twenty-ohm rheostats are illustrated for use with the C-301-A or UV-201-A tubes as amplifiers and a 6-ohm rheostat is to be used for the control of





The Detector Circuit.

The detector circuit is at the right and the first and second stage amplifiers at the left, respectively.

The first right-hand jack is a No. 105 Carter jack. The center jack is also a No. 105 Carter jack, and the left-hand jack is a No. 103 Carter jack.

The grid leak, as used by the writer, is a Bradley leak. A .00025 or .0005 fixed grid condenser should be connected across it. Tho the grid condenser is not shown in Fig. 2 it is essential and must be adhered to.

The terminals marked "G," "F," "Plus B" and "P," are connected to a terminal strip with binding posts. The likewise marked leads from the tuning element are connected to these posts.

With the use of this strip the various circuits can be applied and changed without changing the detector and two-stage amplifier hook-up.

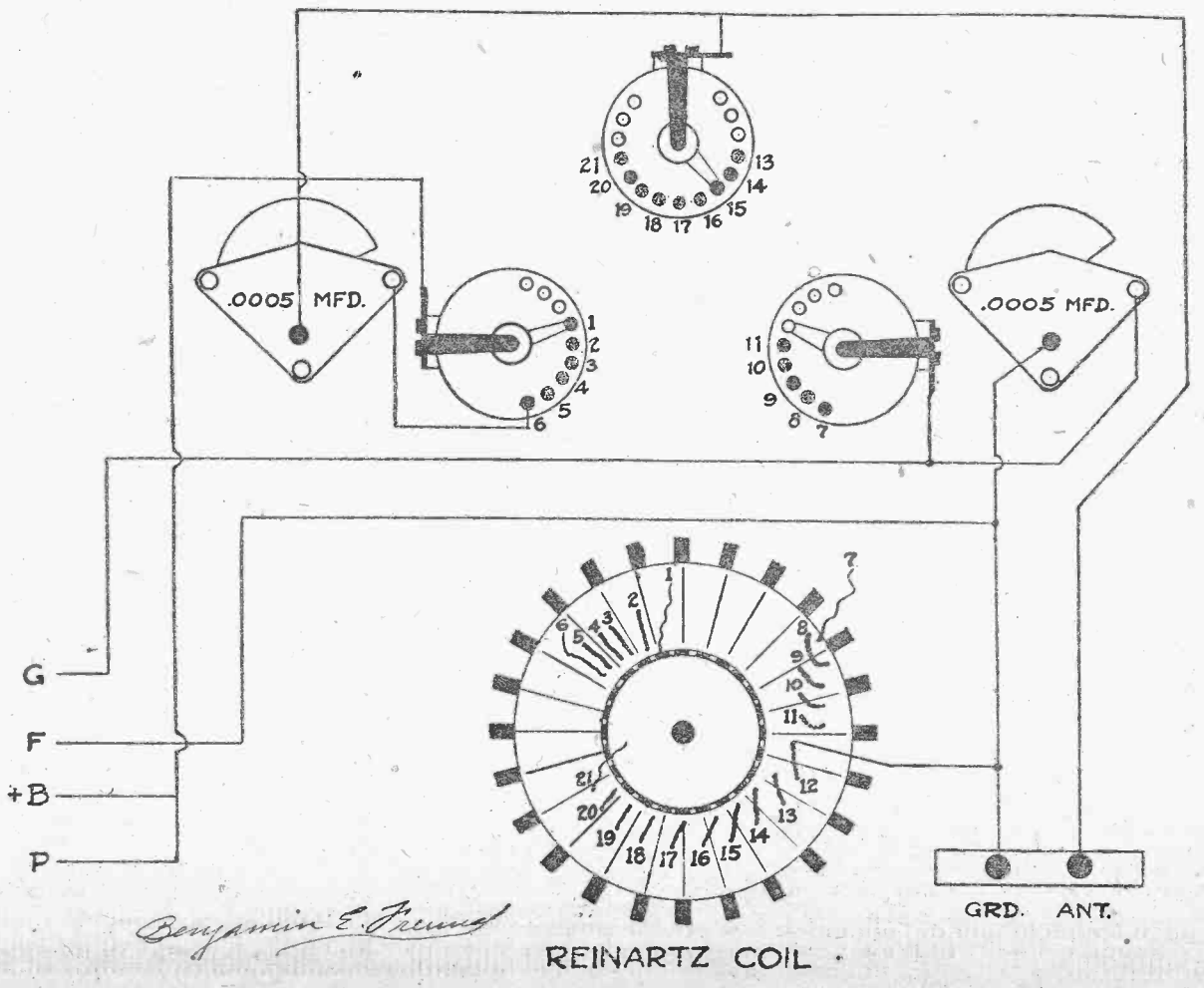
The two binding posts at the bottom of Fig. 2 and at the right are "A" battery posts. The three at the left tuning element. (Either .001 or .002 tials are marked, respectively.

A phone, or by-pass condenser, can be connected if desired from the negative filament to the "Plus B" post of the terminal strip connecting to the tuning element. (Either .001 or .002 MFD.)

With the above information the writer believes there will be no difficulties to overcome.

Next week's article will describe how to convert the universal panel into a three-circuit regenerative receiver.

Be sure to read the classified advertisements on Page 15.



Coolidge Gets North Pole on Radio Code

WASHINGTON, Jan. 16.—President Coolidge has communicated successfully with Capt. Donald B. MacMillan in the Arctic.

The combined service of three great internationally known systems of communication, private and commercial, the Radio Corporation of America, the American Radio Relay league and the Western Union Telegraph company were required to connect by the ether and land wire the President's private office in the White House with the cabin of the ice-bound schooner Bowdoin in winter quarters at North Greenland, submerged in the stillness of the far north.

The message from the chief executive to the explorer was turned over first to the Radio corporation and reached its New York offices. There it remained because this organization's world-wide chain of communication is carried on by huge high-power stations operating on exceptionally long wave lengths, while all communication to and from the explorer is carried on by amateur short wave stations.

The next stage of the journey was via the Western Union to the headquarters of the American Radio Relay league at Hartford, Conn. Immediately the message was handed to S. Kruse, operator of amateur station 10A in that city. He closed his antenna switch and persistently called amateurs in the Great Lakes region.

After several vain attempts the message was received at the amateur station 8ZZ in Detroit, Mich., from which point it was relayed to another amateur located in western Canada. Meanwhile twenty different amateurs had heard the message, and realizing its importance, sought to carry it along another stage of the journey by as many different routes. Finally it reached 9BP, operated by Jack Barnsley at Prince Rupert, British Columbia, who sent it on the final lap to North Greenland.

The reply received by Barnsley from the explorer read: "Deeply appreciative of your holiday greetings and wishes for new year; all's well on the Bowdoin in the middle of long Arctic night." This was received at the White House by means of amateur radio to Prince Rupert, Western Union to Hartford, Conn., and the Radio Corporation of America to this city.

Foreigners Pick Up U. S. Stations with One Tube

WGY, the Schenectady, N. Y., broadcasting station, has been picked up in Berlin, Germany; Copenhagen, Denmark, and Trondhjem, Norway, according to letters received.

G. Schroeter, superintendent of Transradio Betriebszentrale, Berlin, Germany, writing Nov. 28, reported reception at 3:30 a. m. Sunday, Nov. 25. Mr. Schroeter heard the General Electric company's signals with one tube. With two low-frequency amplifiers the signals came in very loud. His antenna was fifty meters long, twenty-one meters high at one end and eight meters high at the other.

One tube reception also was reported by S. Salegaard of Trondhjem, Norway. He picked up WGY Wednesday morning, Nov. 21, and Saturday morning, Nov. 24.

A. Lykstoft of Copenhagen, Denmark, picked up WGY at 4:15 o'clock on the morning of Wednesday, Nov. 21. He used a "home-constructed regenerative receiver, consisting of one high-frequency detector and one low-frequency stage. By adding an extra high frequency and two low frequency stages, he was able to hear music and speech on his loud speaker. "My antenna," reported Mr. Lyketoft, "consists of three wires, each fifty-two feet long, on the roof of a five-story building in the center of the town. Most nights I can hear your station when atmospherics are not too strong."

WOOD PANELS.

Wood makes a very poor panel for a radio set because of its low dielectric properties. A rubber composition such as bakelite, radion or formica should be used. Glass is very good but because of its fragility and difficulty of drilling it is not practical.

Split Variometers Cause Experimenters Trouble with Superduc Circuit

THE Superduc circuit is proving a sensation. However, like all freak circuits, the experimenters must expect to meet with eccentricities and even disappointments. The Superduc was not offered Post readers as a proven circuit. It still is in the experimental stage, and those who are seeking a permanent receiver set and not a circuit to play with, had betber steer clear of the Superduc until experimenters have established its real merits.—The Editor.

By LEWIS B. HAGERMAN.
(Technical Editor The Chicago Post.)

CONSIDERABLE trouble is being had by the local fans in obtaining split variometers for their Superduc sets. According to reports from several local dealers, the demand is much greater than the supply. To meet this they have been splitting their own, which is O. K. if it is done right. But as the job is very complicated in some cases, frequent mistakes are being made, which result in the ultimate failure of the purchaser to get results.

A variometer is split when the two halves of the rotor are connected in series, the two outside ends acting as terminals and the stator the same. There should be no electrical connection between the rotor and stator whatsoever.

Several local manufacturers turn out split and unsplit variometers, which, to all outward appearance, are exactly the same. Great care must be taken when purchasing that the word "split variometer" appears on the article or the box in which they are contained.

Want Audio-amplification.

Aside from the above very little difficulty is being had by the experimenter with the Superduc.

There have been so many inquiries for hook-ups showing the position of additional variable condensers and one or two stages of audio-frequency amplification that I have had the hook-ups drawn up and am presenting them on this page.

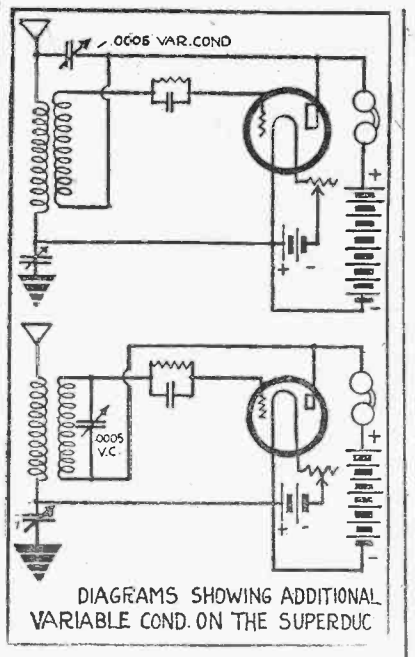
If you are having difficulty in tuning in low wave-length stations, the hook-up showing the variable condenser across the rotor of the variometer will correct it. If you merely wish to make your set finer in tuning, the hook-up showing the condenser across the aerial plate lead will suit your requirements.

On the amplification, low-rate transformers must be used on both the first and second stages. It is necessary to do this in order to get distortionless amplification.

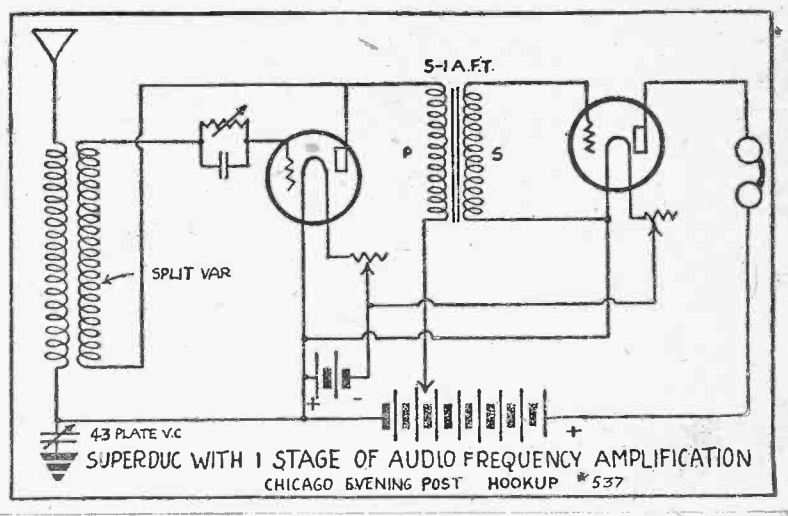
Mr. Smalley of the American Insurance company says: "In reply to your request of Jan. 3, 1924, in regard to the result of your new Superduc set, I wish to state that I received the following on loud speaker: KDKA, WCBD KFKX, WDAF, WGR, WHAZ, WLW, WOC, WOS, WTAZ, WOR, WRC, WGF, also GBM, Northern Electric company, Montreal, Canada."

This is one of many letters received from enthusiastic fans commenting upon the clarity of tone, volume and selectivity of the Superduc.

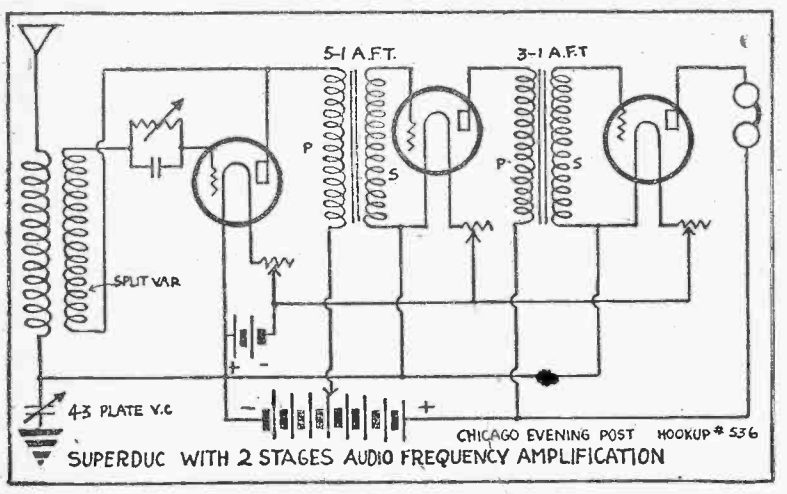
Next week I am going to show pictures and give construction details of two sets, using the Superduc circuit, one of which is the Superduc Junior, a three-tube set in a 7 by 14 cabinet, and the other, the Superduc De Luxe. The Superduc De Luxe, which was built for a very prominent moving picture and stage star, is mounted and incased entirely in glass.



DIAGRAMS SHOWING ADDITIONAL VARIABLE COND. ON THE SUPERDUC



SUPERDUC WITH 1 STAGE OF AUDIO FREQUENCY AMPLIFICATION
CHICAGO EVENING POST HOOKUP * 537



SUPERDUC WITH 2 STAGES AUDIO FREQUENCY AMPLIFICATION
CHICAGO EVENING POST HOOKUP * 536

Obmage of Rheostats.

Care also must be taken to use the proper ohmage on the rheostats for your tubes. The following is a list of tubes and the correct rheostat to use with each:

UV-200, C-300, WD-11, WD-12, VT-1, VT-2, use a rheostat of 6-ohm resistance; UV-201-A, C-301-A, use a rheostat of 25-ohm resistance; UV-199, C299, use a rheostat of 40-ohm resistance.

To obtain proper results the above must be adhered to. If you do not your reception will be affected and the life of the tube impaired.

When UV-199 or C-299 tubes are used for amplification, a "C" battery of from three to nine volts should be used on each tube. This is inserted in the filament lead of the transformer, negative to the transformer and positive to the filament.

Reports Sermon by Radio

The Daily Mail of Fredericton, New Brunswick, Canada, recently carried a report of a sermon broadcast by WGY. The reporter picked up the sermon at his receiver, getting every word of Rev. Gordon Baker of the First Baptist church of Schenectady without difficulty. In an introduction it was stated that this was the first time that a paper in eastern Canada had thus reported a sermon.

New Tuner Makes Chart for Logging of Stations

ONE of the newest contributions to the radio art recently brought out by the federal research division is a tuner of the variocoupler type, so designed that a wide coupling between its primary and secondary coils can be obtained.

Unlike the old-style variocouplers used in regenerative circuits, the secondary of this distinctive Federal tuner is completely divorced from the primary. The closest which they can be set approximates three inches, making it possible to secure a high degree of selectivity without sacrificing signal strength a particle.

In the Federal receivers types 59 and 61, this new variocouples tuner permits a simplicity of tuning in keeping with the latest receivers on the market.

Another novel tuner which requires only the adjustment of a single tuning condenser has been incorporated in the Federal type 110 receiver. In this tuner the antenna circuit is untuned. A five-point selectivity switch enables the operator to obtain any desired degree of selectivity.

A blank tuning chart is shipped with each Federal set. The ease with which it can be filled in is illustrated in the accompanying diagram.

The original of this chart was submitted by Gilbert Hyatt of Buffalo as testimonial of its reference value in locating stations. Mr. Hyatt says that frequently a long program, such as opera, symphony concert or prize fight is picked up. His chart, such as illustrated, immediately tells what station is transmitting. No need to wait until the transmission is finished.

The chart furnshed with the type 110 is even more simple, since it requires the recording of only two adjustments, namely, selectivity switch position and condenser setting.

The modern receiver is a musical instrument out of which comes all kinds of entertainment. Because of the large number of stations sending such entertainment, each one should be charted both for simplicity in tuning and ease of identification.

Opera Star's Song Over Radio Lulls Baby to Sleep

The mail clerk at the Congress hotel is thinking of organizing a "Down with Radio" club. Myrna Sharlow, Chicago Civic Opera soprano, a guest of the hotel, sang over the radio at the Edgewater Beach station. Result: One armful of letters every hour for three days.

Miss Sharlow in private life is Mrs. Ted Hitchcock. Mr. Hitchcock lives in Decatur. When not in Chicago he writes his wife regularly. Result: Miss Sharlow had to commandeer the services of her mother to find Mr. Hitchcock's letter, after she had passed several hours herself riffling the mail, looking for his handwriting.

Radio is a wonderful thing, Miss Sharlow believes. As witness this letter from an Oak Park business man:

"Madame Sharlow: You will be interested in learning that our baby, an attractive little miss of 4 months, was soon lulled to sleep shortly after 8 o'clock by the sweet melodies of your wonderful voice, as broadcast thru our loud speaker. This, too, after her father had put in more than an hour trying to pacify her. Could you have any better approval of your ability than this?"

Be sure to read the classified advertisements on Page 15.

Eugene F. McDonald, prominent Chicagoan and owner of the WJAZ broadcasting station at Edgewater Beach, Chicago, and N. J. Herrmann, former part owner of the Boston Red Sox and now president of the Chicago Radio show, endeavored to check up a message which has been sent to the MacMillan exploring party, snowbound in the far north, to learn that they had established a record for distance broadcasting. At their suite in the Hotel Belmont they learned they had established a world's record for distance, their message having been picked up, by confirmation in the Samoa islands, 7,500 miles away. Whether their message reached the MacMillan ship, Bowdoin, will not be learned for several days because of the fact that the ship's message will have to be relayed back here.

Questions You Ask and Answers We Give

ANTENNA CONSTRUCTION.

1542—CHICAGO: I am taking this opportunity to state that your radio section is very, very good and is greatly appreciated by me. I wish to take advantage of your offer to assist the radio public. Would you kindly advise me the proper aerial to erect under the following conditions:. (1) Space available—Attic of frame building. (2) Length of attic—Forty feet east and westerly directions. (3) Number of wires possible to erect—Three. (4) Height of aerial—Thirty-five feet above ground. (5) Aerial lead-in must come thru ceiling twelve feet from west end. (6) Three circuit tube receiver twenty-five feet above ground. (7) Ground wire to water pipes—Length twenty feet.

Erect your aerial as per the mailed diagram.

REFLEX AND AUTOPLEX HOOK-UPS.

1575—CHICAGO: Will you kindly send me a diagram or hook-up for reflex circuit and "autoplex circuit." I am a boy of 14 years and am interested in radio and have one called the "Reinartz."

The hook-ups you request are shown on this page.

INDOOR ANTENNA.

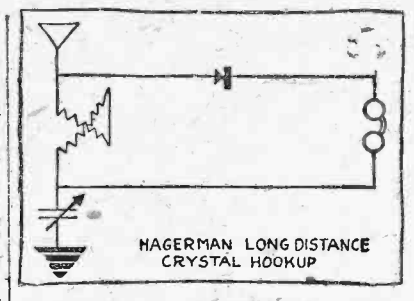
1075—CHICAGO: My radio set, which is hooked-up like the inclosed diagram, has a habit of fading when I tune in to station KDKA. What can be done to stop that fading? How can a potentiometer be connected in the circuit? I have a twenty-five turn honeycomb coil and would like to know if it could be used to any advantage in the circuit.

Your trouble lies in the fact that you are using an inside aerial. The proper aerial to use would be one strand of wire, 100 feet long, in a straight line, 6 to 8 feet above all obstacles on the roof. A potentiometer is shunted directly across the "A" battery and the negative "B," instead of being connected to the positive "A," is connected to the center of the potentiometer. Allow us to compliment you on the neat form of your letter.

IMPROVING AN R. C.

1074—CHICAGO: I have a Westinghouse R. C. regenerative receiver. I am desirous of changing this to an ultra-audion or some similar circuit that is a better distance getter. Could you furnish me with a diagram of my present set and indicate what changes would be necessary in order to do this. In view of the fact that the rotor shaft of the vario coupler and the variable condenser are the same, with the result that both turn simultaneously, would any difficulty be experienced in changing the wiring? Would I be able to change the hook-up by simply switching some of the connections that are made across the back of the set? Your radio section appeals to me more than any other I have seen so far. Keep up the good work.

We do not advise changing the hook-up inside your set, as it would require its being completely dismantled, but your set can be improved by inserting a variometer in the plate circuit and set it on top of the cabinet, as shown in the mailed diagram.



Q. & A.—1023 and 1076: Above is the famous crystal hook-up that is giving such remarkable results.

GOOD HOOK-UP.

620—CHICAGO: I have a Kellogg variometer, a Kellogg 23 and 11 plate vernier condenser, a 400- ohm potentio meter and a variable grid leak. I would appreciate it very much if you would send me a hook-up using these parts that is selective and also a distance getter. I also have the parts for two stages of audio-frequency.

Kindly refer to Superduc circuit which appears on another page.

NOISY NEUTRODYNE.

1032—CHICAGO: I have a five-tube Bremmer Tully Neutrodyne set and it works wonderful when there is no interference, but between the hours of 5 and 10 p. m. I get some awful howls and static that has been explained to me as being from regenerative sets. Is there any way I can get rid of that? I have just one straight aerial running east and west, about 85 feet long.

With a five-tube Neutrodyne set, such as you have, there should be no interference of the type which you mention. These noises are probably due to the fact that your set is not completely neutralized. Of course it is possible they are caused by regenerative sets, but I doubt if the interference would be as great as you say.

HAGERMAN CRYSTAL.

1023—CHICAGO: Will you please send me your hook-up on long-distance crystal set. Also would like to know if a Kellogg variometer would work as satisfactory as the one you used in your test.

The hook-up you request is shown. A Kellogg variometer may be used.

THREE H. C. COIL HOOK-UP.

1024—CHICAGO: I have been reading your Radio Magazine continually and find it very interesting.

I hereby take liberty to ask you, if possible, to mail proper hook-up, for one tube, three honeycomb coil set.

The hook-up you request is shown.

FREE SERVICE

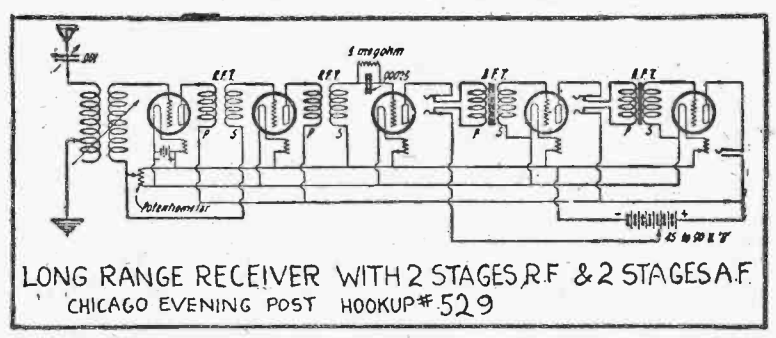
QUESTIONS asked on any subject pertaining to radio will be answered in this department in either the daily edition or the Radio Magazine published each Thursday. No charges are made for this service.

Due to the immense volume of letters being received by the Question and Answer department, the following restrictions must be made:

All letters must be plainly written in ink and perferably typewritten, and only on one side of the paper.

Drawings, hook-ups, etc., must be on a separate sheet from question and clearly drawn, showing values of parts.

Do not ask for panel layouts, construction details, etc., for a set unless they have appeared in the columns of this magazine. Self-addressed and stamped envelope must be inclosed. Address all your letters to Radio Questions and Answers Department, The Chicago Evening Post, 12-14 South Market Street, Chicago.



Q. & A.—1071: A very reliable, simple and efficient five-tube transformer coupled R.-F. set is shown above.

REINARTZ TWO-STAGE.

1100—CHICAGO: Please send me a plan or diagram of a three-tube Reinartz receiver.

You will find shown the hook-up you desire.

REINARTZ AND RADIO-FREQUENCY.

1103—CHICAGO: I would consider it a great favor if you would be so kind as to send me a complete and detailed hook-up of a Rienartz receiving set comprising one step of radio-frequency and two steps of audio-frequency.

Hook-up of Reinartz set with radio-frequency is shown.

1451—CHICAGO: Kindly send me a diagram of of the three-tube Reinartz circuit. Also a list of parts used in making it.

The diagram you request is shown.

OLD RELIABLE DATA.

1020—CHICAGO: I am anxious to receive information concerning your "Old Reliable Hook-up" which has been running in the Thursday issue of The Post. I have the last copy, but missed the earlier issues. Please advise me as to how I can receive full information. Your articles tell of its extreme efficiency and I want to try it out.

The hook-up you request has been mailed.

TWO-STAGE AMPLIFIERS.

1028—OAK PARK: What is the name of the inclosed hook-up? Also, send hook-up for two steps of audio-frequency amplification to be added without changing the original diagram. I enjoy your special Thursday radio section very much, and am specially interested in many of the articles.

The hook-up mailed us is of a single-circuit regenerative set. The amplification diagram you request is shown.

RHEOSTAT OHMAGE.

1079—CHICAGO: Would you please let me know how I can test the ohms of a rheostat?

It is impossible for the ordinary person to test the ohmage of a rheostat. Any good radio man could tell you what it was by looking at it.

INSIDE AERIAL.

1072—CHICAGO: I am inclosing herewith a hook-up of my three-circuit regenerative and would appreciate very much if you would make a check of it and let me know if it is satisfactory. I don't seem to be able to get any distant stations. Occasionally I can get KDKA and WCY, but very seldom. I also am unable to tune out WDAP and get KYW or WMAQ. If I get any outside stations they are very faint, altho Chicago stations I can operate on the loud speaker, but are noisy. Below is a list of parts I am using: De Forrest 33-P vernier condenser, Day-Fan variocoupler, two switches (8 points each), 2 Remler variometers, two 3-P condensers, one hooked in with each variometer, two 10-1 General Electric transformers, three UV-201-A vac tubes, three 10-ohm rheostats, 120 amp. Willard storage battery, three Eveready 22½-V "B" batteries. I am also using and inside aerial fifty feet long, placed around the picture molding.

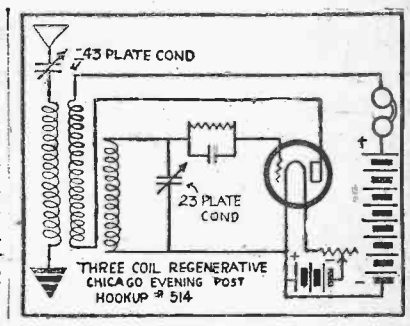
In your list of parts submitted, you have listed three 10-ohm rheostats to use with three 201-A tubes. This is probably the reason you cannot tune out-of-town stations clearly. If you would erect an outside aerial, the results as to volume, distance, etc., would be a great deal better than you are getting now. The aerial you are now using is very impractical. Two people cannot use the same aerial. There is no method whereby a set of the type you have could be calibrated as to wave length. In your drawing it appears as if your first jack was wired incorrectly, but it must be a mistake in your drawing or the set would not work at all, wired as shown.

1071—CHICAGO: Am inclosing a hook-up using 2 R. F.-1 detector and 2 A. F. I am unable to time in the good outside stations, having heard only Elgin, Zion City, Pittsburg, Mulford, Kan., Hastings, Neb., and even the Chicago stations are hard to tune in. I have a loud speaker (Magnavox), but cannot get much volume into it except after 11 p. m. at night. I have ninety volts of "B" battery, a 100 amp. hour "A" battery; both of these tested up good this p. m. I have a fifty-foot wire aerial on top of a three-story building facing east and west. No interference. Lead-in comes off the middle of these wires. Having been thinking of putting in a "C" battery. Can you suggest any changes for the betterment of this set or could you give me a good tested hook-up using these parts which you could recommend. Am inclosing stamped envelope for reply. I have been reading your Thursday radio section with interest. It's better than any radio magazine I have ever read, especially the three-wave trap suggestions you have printed, which is something really necessary for Chicago amateurs.

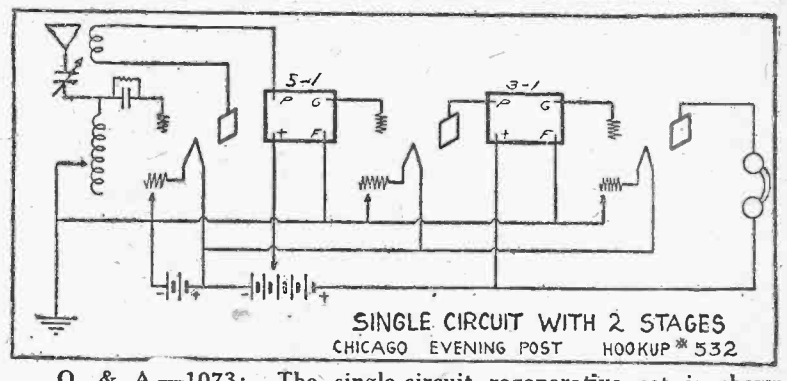
We do not approve of the circuit you are now using in your set. If you will hook it up as shown in the diagram on this page, we can assure you of very surprising results. The range on a loud speaker is approximately 1,500 to 2,000 miles.

AUTOPLEX DIFFICULTIES.

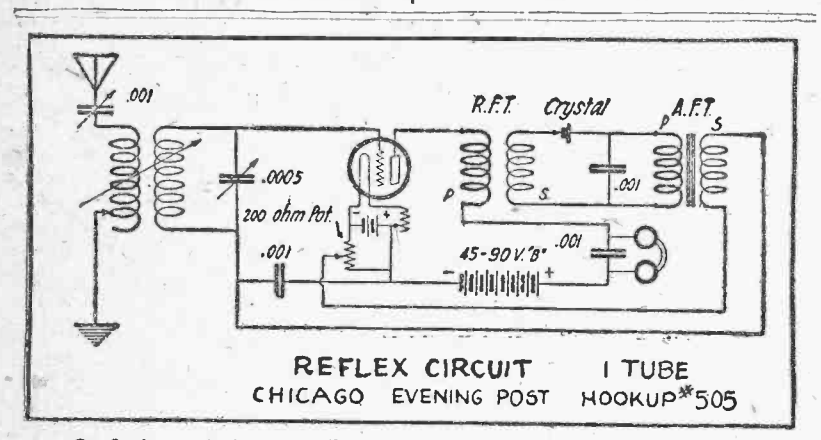
1073—CHICAGO: I have not had good results with the Autoplex set. The only station I received was KDKA, East Pittsburg.



Q. & A.—1024: The original three-honeycomb-coil set is shown above. This is the simplest form of three-circuit regenerative set.



Q. & A.—1073: The single-circuit regenerative set is shown above. Use low-ratio transformers, as shown, so as to obtain distortionless amplification.



Q. & A.—1575: A reflex circuit appears above that gives exceptionally reliable reception.

FAN ANTENNA.

1070—CHICAGO: I have with much interest watched your new department; in fact, it has been the cause of my subscription to The Post, and if consistent I would like a little information. I notice you lay stress, and you seem to be the only paper in Chicago that does, on the directional qualities of an antenna. I have a Zenith receiving set with a vertical lead-in of approximately forty feet, and two wires each approximately eighty feet, running due south from the top of the lead-in. I am not able to bring in (and I might say here it is not due to inexperience in tunning, run-down batteries or anything of that sort) stations that I should bring in, and it has occurred to me that possibly a fan-shaped antenna, which I am in position to erect, would do this. What would be your advice in this respect, or in general with regard to an antenna, length, etc., with this particular set?

A fan-shaped antenna, made of wires about sixty feet long, would be very efficient. We would advise bringing lead-ins from wires to your set so that you may use all or one or two at a time. This will enable you to carry on very interesting experiments as to directional effects and counterpoise results. We will be glad to hear of any results you have with the above.

HAGERMAN CRYSTAL.

1076—CHICAGO: Will you please send me your hook-up of the long-distance crystal set.

The hook-up of the Hagerman long-distance crystal set, as per your request, is shown.

WILL NOT TUNE TO HIGH WAVE LENGTHS.

1077—CHICAGO: I have an Armstrong three-circuit set hooked up as below. I am showing only the detector circuit, as the set works all right, but will not tune above 441 meters. I have received sixty stations in three months, but they are all below 441 meters. I get all the local stations, including KYW, but they (those above 441) are not sharply tuned and are not as loud as should be.

I have tried a 50-turn and a 75-turn honeycomb coil in series with the aerial, and this only raises the wave length a few meters. A 23-plate condenser across the secondary of my coupler enabled me to get WCAE, 469 meters, but no higher. There are 77 turns on the primary of my coupler.

I heard that the wave length can be raised by putting honeycomb coils in the plate and grid circuits. Can you give me details?

My variometers are supposed to tune up to 550 meters, but maybe it's them that's holding me down.

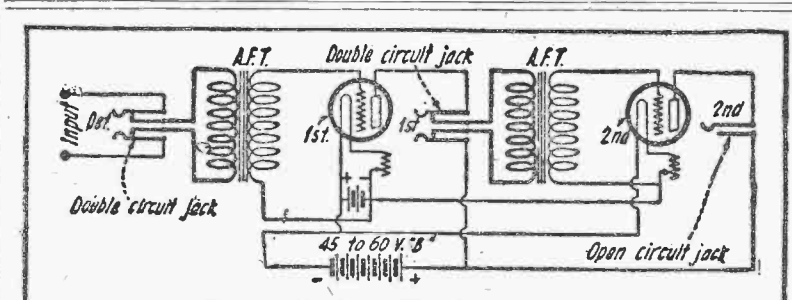
I am told that when the grid variometer is "clear in," that is, the rotor windings are parallel and running in the same direction as the stator windings, the set is tuned as high as it will go. When my grid variometer is "in," I get WOS, 441 meters. I would appreciate any advice you could give me that would enable me to get my set to tune up to 550 or 600 meters. I would like to congratulate you upon the completeness of your Radio Post. It beats 25-cent magazines that have as many "ads" as the Saturday Evening Post.

A possible solution of your problem would be to add small inductances of from fifteen to twenty turns, to be determined by experimentation in the grid and plate circuits, as shown in the accompanying diagram. Your circuit is O. K. There is no other method we could advise to enable you to procure the results you desire.

SINGLE CIRCUIT WITH TWO STAGES.

1073—CHICAGO: I am attaching herewith a diagram of the set now being used by the writer and wish you would please check it over and see if the range cannot be improved, as so far I have not had much luck in bringing in any number of outside stations. Use an outside aerial of eighty feet in length, with a thirty-foot lead-in; ground wire attached to pipe driven into ground to depth of three feet. Have succeeded in bringing in the following stations: WDAP, KYW, WMAQ, WJAZ, WTAS, WCBD, KFKX, KDKA and WOS. After checking over my hook-ups, any advice you can give me will be greatly appreciated, and am inclosing an addressed envelope for your convenience. The Chicago Evening Post's Radio Magazine, issued weekly, sure in the class of them all and here is one phan who can hardly wait for Thursday to come.

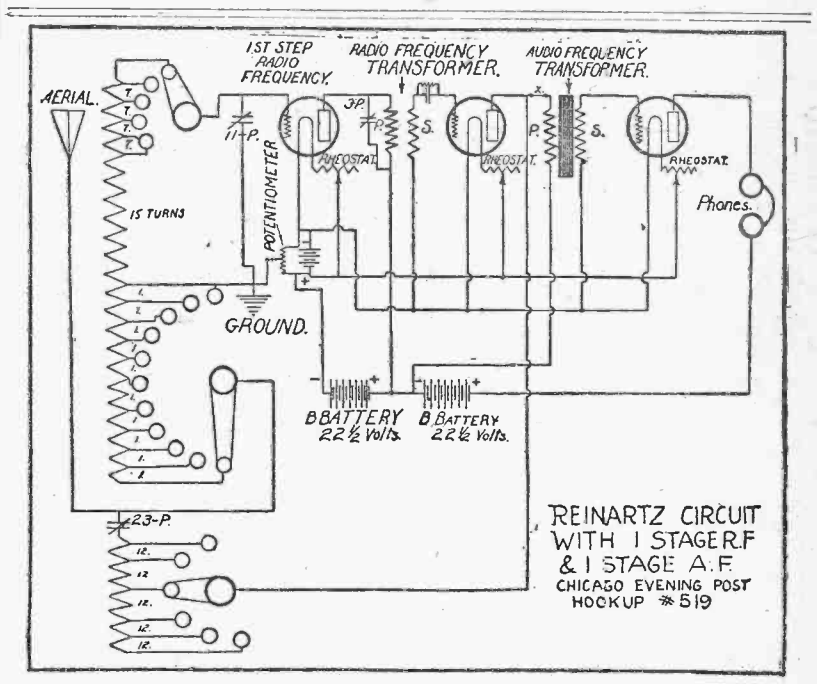
We cannot understand your drawing as mailed us. The correct hook-up to use is shown. Kindly wire your set in accordance, and we can assure you of from 1,000 to 1,500 miles reception on the loud speaker. Your ground is not very good. Would advise a direct connection to a water pipe or radiator



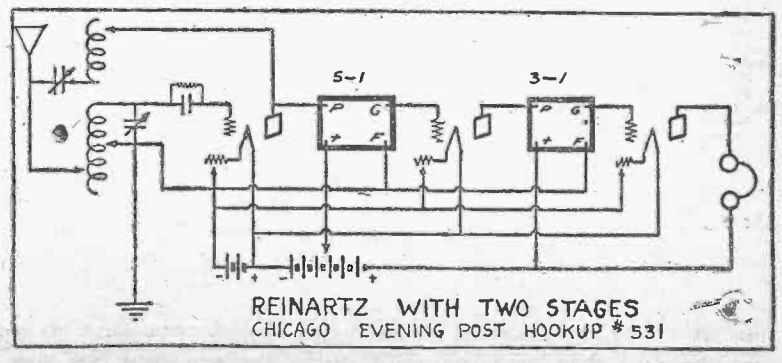
Q. & A.—1028 and 1053: A two-stage amplifier that is adaptable to any set is shown above.

Below are parts used: Two Columbia multi-circuit variometers, one 1500-turn coil (honeycomb), one VT-2 tube, one Howard rheostat, one 6-volt 80-ampere "A" battery, four 45-volt "B" batteries and one 4½-volt "C" (positive to grid variometer). But I do not get sufficient volume to operate a loud speaker on this station. There is a rushing noise and much interference from low-wave code stations. The coil is mounted under socket between two bakelite panels. The best collector I find is ground put on aerial post. Tube will only oscillate when rheostat is turned on three-fourths to full. When KDKA is tuned in a wave of noises goes back and forth disturbing tuning. I tried a variable grid-leak, also, but got only a hum, and altho I received WDAP, I could not tune at all. (1) Would a grounded shield destroy noises? (2) Would loading coil between each variometer help to get away from code stations, altogether, and, if so, what size? (3) Would a 1250 turn coil give better results and more volume? (4) What is the amperage per hour on a VT-2 tube? (5) How long should an 80-ampere "A" battery last before recharging? (6) Is illustration of variometers (binding posts) O. K.? I would appreciate any help from you, and I sure enjoy your section.

Below are answers to your questions relating to your Autoplex set: (1) A ground shield would eliminate body capacity. (2) A loading coil in the plate and grid circuits would enable you to receive higher wave lengths. Use one of about seventy-five turns. (3) A 1250-turn coil is advised by Mr. Muhleman. Therefore, we would recommend using it instead of a 1500. (4) A VT-2 tube consumes one-tenth ampere an hour. (5) An 80-ampere battery can be used forty-five or fifty hours on one charge. (6) Wiring of variometers as shown is O. K.



Q. & A.—1103: The Reinartz set with one stage of R.-F. and one stage of A.-F. is shown above. To make this a four-tube set merely add one stage of A.-F.



Q. & A.—1100 and 1451: Two stages of A.-F. are shown on the Reinartz set above.

Radio Replaces Alp Dogs

The Swiss Alpine club proposes to install at several points on the Alps small radio stations by which lost travelers can summon help from towns far below in the valleys. So the rescue work begun many years ago by the monks of the Monastery of St. Bernard, assisted by their famous trained dogs, yields as does everything else in the modern world to the progress of science.

Today's Radio Programs

Continued from Page 3.

Ham Stevenson; program, selections by the orchestra, march, "Liberty Bell," Sousa; "Mighty Lak a Rose," Nevin; "Lullaby," Nevin; "The Rosary," Nevin; "The Atonement of Pan" (permission Schirmer company); intermezzo and "Dance of the Nymphs," entr'acte, and "Dance of the Harpies," Hadley; gems from Stephen Foster; "To a Wild Rose," MacDowell; "Uncle Remus," MacDowell; "Witches' Dance," MacDowell; "Little Flower Garden," Buel; march, "The Heart of America," Pryor; bass and soprano solos, selected; 9:55 p. m., Arlington time signals, weather forecast; 10:30 p. m., special late evening concert.

WBZ—Springfield, Mass.; 337 meters:
Day—10:55 a. m., Arlington time signals; weather reports, Boston and Springfield market reports.

Evening—6 p. m., "Preparation of Federal Income Tax Returns," by Thomas McCarry, tax consultant of Springfield; 6:30 p. m., bedtime story for the kiddies; 6:40 p. m., farmers' period—letter from the New England homestead; 7 p. m., concert by Margaret O'Brien, soprano; Mrs. Miriam Munyan Thomson, pianist; 8 p. m., bedtime story for grown-ups by Orison S. Marden; 8:55 p. m., Arlington time signals.

WCAE—Pittsburg, Pa.; 462 meters:
Day—11:30 a. m., news, weather reports, reading of daily program; 3:30 p. m., stock market reports, Sunshine Girl and Uncle "Kaybee," news; 5:30 p. m., dinner concert transmitted from William Penn hotel.

WEAF—New York city; 492 meters:
Day—10 to 11 a. m., Edith M. Burtis, associate editor of the Silent Partner, to speak on spring fashions; market reports by the American Agriculturist and United States department of agriculture; 3 to 4:30 p. m., musical program to be announced.

Evening—6 to 11 p. m., midweek services under the auspices of the New York Federation of Churches; United Cigar Stores daily sport talk, by Thornton Fisher; Ruth Bodell, lyric soprano, accompanied by Edith Griffing; "The Care and Treatment of the Scalp," by Charles W. Hoys & Co., Inc.; "Holland's Desert," by Wirt W. Barnitz, traveler; talk by the Bank of America; musical program direct from Hunter college, New York city; musical program direct from the recording studios of the Columbia Phonograph company, New York city; Ernest Thompson-Seton, famous author, to speak for National Carbon company; Dora Damon Pardee, cornetist; Raymond Freemantle, barytone; program by Gimbel Bros. Vincent Lopez orchestra from Hotel Pennsylvania, New York city.

WHN—New York city, Lowe's State broadcasting station; 360 meters:
Day—1:15-1:30 p. m., Larry McCarthy, barytone, singing, "Why Don't My Dreams Come True," "Bobbsy," "When You Gave Your Heart to Me"; Joe Hollander at the piano; 1:30-1:35 p. m., Jack Sheehan singing "Annabelle"; 1:35-1:45 p. m., Clif Robertson singing "Who's the Dearest Girl in Town" and "Why Did I Kiss That Girl"; 1:45-1:50 p. m., Tom Bracken singing "Remember the Waltz" and "Whose Issy Is-He"; 1:50-2 p. m., Billy Joyce in piano solos; 2-2:15 p. m., Marguerite Ackerman, Swedish soprano, singing popular songs; 2:45-3 p. m., Jaci Morisse, tenor, singing "You Wanted Someone to Play With," "Mona" and others; 3-4 p. m., Oreste and his Pekin orchestra from the Peek Inn restaurant; 4-4:10 p. m., William Berkes, barytone, singing "I Wonder Who's Dancing With You" and "So I Took the Fifty Thousand Dollars"; 4:10-4.20 p. m., Max Hitrig singing "You Can't Make a Fool Out of Me" and "Irish Moon"; 4:20-4:30 p. m., Matty Levine in piano selections.

Evening—8:30-9 p. m., Lou Gold and his Wigwam Club orchestra; 9-9:10 p. m., "Benjamin Franklin," by Hon. Joseph A. Lawson of the National Security league; 9:10-9:15 p. m., Judith Roth singing "Tell the Rose"; 9:15-9:25 p. m., Al Wilson singing "Just for Tonight" and "Barefoot Days"; 9:25-9:30 p. m., Jack Fagan singing "Oh Didn't It Rain" and "Syncopated Step"; 9:30-9:35 p. m., Ross Fowler, barytone, singing "Chansonette," "Supposing" and "Kiss in the Dark"; 9:35-10:05 p. m., Melo Club Dance orchestra, Dave Reish, leader; 10:05-10:15 p. m., Richard Douglas, tenor, popular songs; 10:15-10:30 p. m., Charles Tobias and Lou Breau, song writers and composers, singing "There's a Bend at the End of the Swanee," "In the Old Arm Chair," "Sweet Baby" and "A Voice With a Smile"; 10:30-11 p. m., musical program to be announced.

WGI—Medford Hillside, Mass.; 360 meters:
Day—11 a. m., noon day program; 11:40 a. m., New England weather forecast furnished by the United States weather bureau; 11:45 a. m., closing report on farmers produce market report; 2 p. m., Amrad Women's club program; 4:30 p. m., closing stock market reports furnished by Elmer H. Bright and company members of the New York and Boston Stock exchange, government reports, live stock market report; 5 p. m., club meeting.

Evening—6 p. m., "Stories for Parents," by the Children's Aid association; "Why Does Your Child Fuss About His Food"? a broadcast prepared by the habit clinic of the Division of Mental Hygiene and the Community Health association.; musical by George Brinton Beale and friends.

WHAZ—Troy, N. Y.; 330 meters: This station broadcasts only on Monday evenings.

WGY—Schenectady, N. Y.; 380 meters:
Silent night Wednesday.

Day—10:55 a. m., time signals; 11:30 a. m., stock market report; 11:40 a. m., produce market report; 10:45 a. m., weather; 1 p. m., music and address, "The American Hostess—Her Dinners," Mrs. C. H. Pearse, Schenectady Woman's club; 5 p. m., produce and stock market quotations; new bulletins.

Evening—6:45 p. m., radio drama, "The Truth," by Clyde Fitch, presented by WGY Players; a few moments with new books, L. L. Hopkins, assistant librarian, General Electric company; instrumental selection, "Reminiscences" (Roth), by WGY orchestra; drama, "The Truth," a play in four acts, by Clyde Fitch, WGY Players; the cast: Warder, Edward H. Smith; Roland, Maurice G. Randall; Lindon, Edward E. St. Louis; servant at the Warder's', Frank Oliver; Becky Warder, Rose Cohn; Eve Lindon, Margaret V. Smith; Laura Fisher, Lola Sommers; Mrs. Genevieve Crespigny, Helen Campbell; messenger boy, Earle Harvey; act 1, at the Warders' in New York; Thursday afternoon; instrumental selection, "Reverie" (H. Vieuxtemps), by orchestra; act 2, at the Warders' Saturday afternoon just after lunch; instrumental selection, "An Album Leaf" (R. Wagner), by orchestra; act 3, at Stephen Roland's in Baltimore, Saturday night; instrumental selection, "Notturno No. 3," by orchestra; act 4, at Stephen Roland's Monday morning; instrumental selection, "Traume" (R. Wagner), by orchestra.

WGR—Buffalo; 319 meters:
Day—9:45 a. m., weather forecast for Buffalo and western New York; 11 a. m., weather, produce and live stock market reports and agriograms from the United States department of agriculture; 11:30 a. m., organ, dining-room, Hotel Statler; 1:30 p. m., closing prices of Chicago Board of Trade; 2:30 p. m., closing prices of New York Stock exchange; 3 p. m., tea-time music; 5:30 p. m., dinner music, Vincent Lopez, Hotel Statler, dance orchestra.

Evening—8:30 p. m., digest of the day's news; second broadcasting of all daily reports; industrial employment bulletin; the American Boy story.

WJY—New York city; 405 meters:
This station broadcasts only on Sundays at 2:30 p. m. to 6 p. m.

WJZ—New York city; 455 meters: No silent night.

Day—2 p. m., organ recital on the Hotel Astor organ, by Leo Riggs, by direct wire from the Hotel Astor; 3:45 p. m., concert.

Evening—6:30 p. m., dinner music from Hotel Adelphia Concert orchestra, A. Candelori, director.

WOO—Philadelphia; 509 meters: Silent Sunday, Tuesday, Thursday, Friday and Saturday evenings.

Day—10 a. m., grand organ; 10:30 a. m., United States weather forecast; 10:55 a. m., United States naval observatory time signals; 11 a. m., luncheon music by the Tea Room orchestra; 3:45 p. m., grand organ and trumpets; 4 p. m., sports results and police reports.

WOR—Newark, N. J.; 405 meters:
Day—1:30 p. m., Jean Spiro, tenor, now with "The Miracle"; 1:45 p. m., Nadine Morton, composer-pianist; 2 p. m., Clifton Webb, actor and dancer, now starring in the new production soon to open in New York; 2:10 p. m., continuation of tenor selections by Jean Spiro; 2:40 p. m., Nadine Morton, composer-pianist; 5:15 p. m., Constance Irwin in readings from Eugene Field; children's stories; 5:30 p. m. to p. m., "Music While You Dine," featured by Tom Cooper's Country Club orchestra.

WRC—Washington, D. C., 469 meters: Silent Tuesday, Thursday and Saturday evenings.

Day—4:15 p. m., children's hour, by Peggy Albion.

WRW—Tarrytown, N. Y.; 273 meters:
WDAR—Philadelphia, Pa.; 395 meters:
Day—10:45 a. m., daily almanac; 11 a. m., organ recital from the Stanley theater, features from the studio, Arcadia Concert orchestra, Fery Sarkozi director; 12 m., Arcadia Concert orchestra; Mrs. Anna B. Scott, "The Market Basket"; recital from the studio; 3:30 p. m., woman's club hour, under the direction of the Haddon Fortnightly club of Haddonfield, N. J.; Mrs Clement Remington, president; 6:30 p. m., Dream Daddy with the boys and girls

Midwest Programs.

WCAL—Northfield, Minn., St. Olaf college, P. Skifter, director; Ellu Hjertass, program director; 360 meters:
Sunday, 11 a. m. and 8:30 p. m.; Thursday, 9 p. m.; Friday, 7 p. m.; Saturday, 12 noon.

WCX—Detroit, Mich.; 517 meters:
Day—1 p. m., news bulletins; 1:15 p. m., stock quotations; 1:50 p. m., government weather forecast; 3:15 p. m., music; 5 p. m., dinner concert, broadcast from Hotel Tuller;

Evening—7:30 p. m., musical program; Ford band broadcast from Arcadia auditorium.

WJAX—Cleveland; 390 meters; Silent every night except Tuesday and Thursday.

WLAG—Minneapolis, Minn; 417 meters: No silent nights.

Day—9:30 to 10:45 a. m., announcements, news, markets; 10:45 a. m., household hints; 11:35 a. m., surprise program; 1:30 p. m., markets; 2 p. m., dancing lesson by Tess Cooperman; 2:35 p. m., Ronning's Leanington orchestra, assisted by Lou Emmel, barytone; 4 p. m., short story; 4:30 p. m., markets; 5:30 p. m., children's hour, Tess Cooperman, story-teller.

Evening—6 p. m., sport hour, by Dr. J. S. Dick Jr., "More Dogs"; 6:15 p. m., Osborn's Minneapolis Athletic Club orchestra; 7:30 p. m., farm lecture program, talk by Benjamin Franklin Coffin; 9:15 p. m., weather and time report.

WLW—Cincinnati; 309 meters; silent Friday and Saturday.

Day—10:30 a. m., weather forecast and business reports; 1:30 p. m., business reports; 3 p. m., market reports; 4 p. m., piano selections by Adelaide Apfel.

Evening—10 p. m., "Ille," a radario in one act, by Eugene O'Neil, given by the Crosley Radarians, directed by Helen Schuster-Martin. In the cast: Ben, the cabin boy, Maynard Babbs; steward, Joseph Schreck; Capt. Keeny, Willard Crane; Slocum, second mate, Joseph Flick; Mrs. Keeny, Alice Harris; Joe, Ralph Haburton; descriptionist, A. R. Plough. Sea program of music from the Cincinnati Conservatory of Music; "The Sea" (MacDowell), Miss Margaret Powell, soprano solo; "Sea Pieces" (MacDowell), Miss Hildred Gabriel, piano solo; "An Old Song Resung" (Griffes); "Am Meer" (Schubert), Mr. Everett Marshall, barytone solo; "Sea Gypsies" (Clough-Leiter), Mr. Howard Fuldner, barytone solo, Carey's Band and Orchestra. 1. March. 2. Cornet and trombone duet. 3. March. 4. "Maggie." 5. "I'll Take You Home Again." 6. "Whose Heart Are You Breaking Tonight"?

WOC—Davenport, Iowa; 481 meters: Silent Tuesdays.

Day—10 a. m., opening market quotations; 10:55 a. m., time signals; 11 a. m., weather and river forecast; 11:05 a. m., market quotations; 12 noon, chimes concert; 2 p. m., closing stocks and markets; 3:30 p. m., educational program and concert; 5:45 p. m., chimes concert; 6:30 p. m., Sandman's visit.

WTAM—Cleveland; 390 meters: Broadcasts only Wednesday and Saturday evenings at 7 to 8 p. m.

WWJ—Detroit, Mich.; 517 meters: Silent Saturday.

Day—12 noon, dance music by Jean Goldkette's orchestra, broadcast from the Graystone ballroom.

Evening—Music.

WOI—Ames, Iowa, Iowa State College; 360 meters.

Southwest Programs.

KSD—St. Louis; 546 meters: Silent Friday.

Day—Opening midseason and closing quotations on the St. Louis grain markets; live stock conditions; Liverpool and New York cotton market; New York stocks, bonds and money market; metal markets, weather reports, forecast and news bulletins are broadcast at 8:40, 9:40, 10:40, 11:40, 12:40, 1:40, 2:40 and 4 daily.

Evening—8 p. m., broadcasting the concert of the St. Louis Symphony orchestra, Frederick Fischer, conducting, Rudolph Ganz, pianist, soloist, as given at the Odeon.

WBAP—Fort Worth, Texas; 476 meters:
Day—10 a. m. to 4 p. m., markets and financial review.

Evening—7:30 to 8:30 p. m., concert by a group of Fort Worth artists, vocal and instrumental (E. L. O. announcing); 9:30 to 10:45 p. m., concert by a group of artists from Van Alsyne, Texas (the Hired Hand announcing)

WDAF—Kansas City, Mo.; 411 meters.
Day—3:30 to 4:30 p. m., D. Ambert Haley's Dance and Concert orchestra.

Evening—6 to 7 p. m., piano tuning in number on the Duo-Art; marketgram, weather forecast, time signal and road report; address, speaker from the William Jewell college, Liberty, Mo.; the children's story and information period; music, Fritz Hanlein's Trianon Ensemble, Hotel Muehlebach; 11:45 p. m. to 1 a. m., "The Merry Old Chief" and the Coon-Sanders Novelty-Singing orchestra, plantation grill, Hotel Muehlebach.

WFAA—Dallas, Texas; 147 meters: Silent Wednesday.

Day—10:30 a. m., United States weather bureau report and forecast and C. A. M. A. A. highway condition bulletin for the southwest followed by Dallas produce market quotations, early cotton market report and Wall street review; 12:30 p. m., address; 2:30 to 2:45 p. m., Dallas live stock market, late general markets, sport news; 3:30 to 4 p. m., agriograms, health, bulletins, Texas market news; 5:30 to 6 p. m., bedtime story and fairy tale, told by Miss Mary C. Tooney.

Evening—8:30-9:30 p. m., five-minute talk for safety council on safety week; music by the Belcanto Male Quartet.

WGV—New Orleans; 359 meters.

WHAS—Louisville; 400 meters: Silent Mondays.

Day—4 to 5 p. m., selections by the Walnut theater orchestra Walter Davison, conductor; selections by the Strand theater orchestra, Harry S. Currie, conductor.

Evening—9 to 10:30, music.

WHB—Kansas City, Mo.; 411 meters: Silent Monday, Wednesday and Friday.

Day—8:25 to 8:30, estimated live stock receipts; 9:25 to 9:40, live stock, grain quotations; 10:25 to 10:40, live stock and grain quotations, weather and shippers' forecast, road conditions and foreign exchange; 11:25 to 11:40, live stock, grain quotations; 12:35 to 1 p. m., popular dance music by request, Sweeney Radio orchestra; 1:25 to 1:50 p. m. closing grain and live stock quotations; 2 to 3 p. m., ladies' hour program of classical and popular musical selections by the Sweeney Radio orchestra; 3 p. m., grain market, weather, news.

Evening—7 to 7:45 p. m., saxophone solo, selected, Floyd Estep; talk on "The Needless Waste of Food Producing Power," by Dave E. Darrah, Charles City, Iowa; piano solo, selected, George Parrish; 8 to 10 p. m., regular Thursday evening concert, the vocal music arranged by James E. Prior, given by the pupils of the Cranston School of Music; accompaniments played by Mrs. J. J. Tobin: Quartet, "From the Valley" (Balfe), Constance Ferlet, Mrs. Glen Williams, James Mack and Herbert Fraher; soprano solo, "Carmena" (vocal waltz), (Wilson), Katherine Fitzgerald; tenor solo, "My Golden Rose" (Logan), James Mack; soprano solo, "A Kiss in the Dark" (Herbert), Clara Gehling; piano solo, Prelude in G minor (Rachmaninoff), Thomas Sheehy; quartet, "Fairest Daughters of the Graces" (Verdi), Constance Ferlet, Mrs. Glen Williams, James Mack and James Prior; barytone solo, "Requiem" (Homer), Herbert Fraher; soprano solo, "Mia, Mia, Mia" (Fortune Teller), (Herbert); duet, "Song of Love" (Blossom Time) (Schubert), Katherine Fitzgerld and James Prior; soprano solo, "Caro Nome" (Rigoletto) (Verdi), Constance Ferlet; saxophone solo, "Wonderful One" (Whiteman), John Fitzgerld; James Prior at piano; contralto solo, "Ave Maria" (Mascagni), Straucy Edwards; bass solo, "Little Town in the Ould County Down" (Carlo), James Prior; quintet, "Italian Street Song (Naughty Marietta), (Herbert), Constance Ferlet, soloist; Katherine Fitzgerld, soprano; Mrs. Glen Williams, contralto; James Mack, tenor; Herbert Fraher, barytone; instrumental selections, Sweeney Radio orchestra.

WMC—Memphis; 500 meters: Silent Wednesday.

Day—Stocks and news every half hour from 9 a. m. to 10 p. m.

Evening—8:30 p. m., the Chisca Hotel Philharmonic orchestra in their weekly recital.

WOAI—San Antonio, Texas; 385 meters: Silent nights, Mondays, Wednesdays and Thursdays.

WSB—Atlanta, Ga.; 428 meters.
Day—5:15 p. m., "Home Gardening," talk by William B. Deckner; 5:25 p. m., kiddie program and Burgess bedtime story by Miss Bonnie Barnhardt.

Evening—8 to 9 p. m., program by the Georgia Railway and Power company band, D. N. Baldwin director; 10:45 p. m., Transcontinental Radiowl organ recital from the First Presbyterian church by Dr. Charles A. Sheldon.

WHAB—Galveston, Texas; 360 meters:

Pacific Coast Concerts.

KOG—Oakland, Cal.; General Electric company; 312 meters.

KDZE—Seattle, Wash.; 455 meters: Silent nights, Tuesdays, Thursdays and Sundays.

KFDR—San Francisco; 509 meters:
Evening—Music.

KGW—Portland, Ore.; Portland Oregonian; 492 meters.
Day—1 p. m., weather forecast; 5:30 p. m., woman's program, story reading.

Evening—7:30 p. m., weather forecast and market reports; 10 p. m., Shakespearean readings by Miss J. Hunter Addison; 12 p. m., dance music by George Olsen's Metropolitan orchestra, under direction of Herman Kenin; solos.

KHJ—Los Angeles; 395 meters:
Evening—10:45, 11:30 p. m. to 1 a. m.

KPO—San Francisco; 425 meters; 500 watts: Crair F. Morrison, station director; Ada Morgan O'Brien, program director. Friday nights silent.

Day—2 p. m., time signals from the naval observatory; 3 to 4 p. m., Rudy Sieger's Fairmount Hotel orchestra by remote control.

Evening—8 to 9 p. m., dinner concert by George Lipschultz and music masters from the Loew's Warfield theater; Lela Johnstone, dramatic soprano, will render selections during the dinner program; 10 to 11 p. m., G. Harold Montague Schultcis at console of the Robert Morton organ; 11 to 12 p. m., a Japanese romance, "Sayonara" (Cadman) will be given by Mrs. Philip V. Hein, soprano; Abraham Levin, tenor, with Mrs. Abraham Levin at the piano; Prof. Jean Kovalski from Royal Conservatory of Music, Warsaw and Petrograd, will render a number of mandolin selections; 12 to 1 a. m., E. Max Bradfield's Palace Hotel Dance orchestra.

Opinions of Phans Freely Given

IT IS VERY RELIABLE.

RADIO EDITOR—I want to let you know of the wonderful results obtained from the "Old Reliable" hook-up, which appeared in the issue of Dec. 13. I will not go into detail explaining each and every station received. However, I do want to tell you that the "Old Reliable" has brought them in from Troy, N. Y., to Fort Worth, Texas; from Minneapolis to Louisville. Mind you, I have not yet sat down to try to get distant stations. These were merely picked up while tuning in (or rather fishing) for the local stations. My calling this hook-up "the best ever" is putting it mildly.

Am using mostly Sears-Roebuck parts in this set. But I am so enthusastic about this hook-up I am willing to go the limit in building a de luxe set. I fully believe that this hook-up cannot be beaten. Hook-ups may come and hook-ups may go, but "The Old Reliable" will keep on bringing in the distant stations.

Would you advise me to get all Kellogg equipment, condensers, variometer, variocoupler, etc.? Am using the new Federal transformers, both 5 to 1 ratio. Is this O. K.? Or would you advise a 5 to 1 and 3 to 1?—H. E. SCHWARTZ, 1507 North Austin boulevard, Chicago.

SIGNALS COME IN WEAK.

RADIO EDITOR: I recently constructed the "old reliable" set as outlined in your Thursday radio magazine section and my results have not been at all satisfactory.

My aerial is about 105 feet long with a 25-foot lead-in wire. It is stretched northeast and southwest between two buildings, is 30 feet above ground and gave excellent results on my crystal set.

I am using only one tube, C-299, and the only outside station I have been able to get is Elgin. They came in very weak, regardless of whether I used twenty-two and one-half or forty volts on the plate. Local stations are not near as loud as neighbors bring them in on a single WD-12 tube Reinartz set using an inside aerial around the picture molding.

Using the battery connections as shown in your diagrams all I could get was whistles which I could not tune in, in any way. On changing to the submitted battery connections which is the same as Armstrong two variometer and variocoupler hook-up, I obtained the above results.

I have understood that the C-299 was a better detector tube than WD-12. Is this true? Is the submitted hook-up all right? Will you please explain in your article next Thursday the proper method of tuning this set?

Any help you can give me will be appreciated. I think your radio magazine section is the finest I have seen and I look forward to it each week.—HOWARD J. ADAMS, 6716 Blackstone Avenue.

Your aerial is fair, providing you mean that it is 105 feet in one stretch of single wire. Fifty feet additional wire would increase signal strength.

The C-299 tube is all right. It is the equal of the WD-11 and WD-12 tube, if not better.

Battery connections shown in a diagram published in The Post were for the standard six-volt tubes. Since you are using C-299 be sure to use filament connections, shown in printed directions that accompany the tubes. Use also only plate voltage recommended by manufacturers.

Your hook-up is O. K. Might try reversing leads on plate variometer. Also change phone terminals on the posts. Readjust grid leak. Also use your rheostat in tuning.

This receiver tunes quite sharply and it may be that this is where your trouble comes from. I am giving some notes on tuning elsewhere in today's article.

VARIOMETER BOTHERS HIM.

RADIO EDITOR: In am building "The Old Reliable," but I am somewhat confused with the Kellogg variometer I have bought. The wires from the motor do not connect the same as the one in your pictorial diagram in the Dec. 13 magazine. Must I fix mine different? Can I use this diagram for wiring? How will I connect the primary series parallel switch? I cannot find this in the hook-up.—C. WIT, 5920 South Francisco Avenue, Chicago.

The variometer you have is the same one shown in illustration referred to in your letter. It is of the split type and, unfortunately, the manufacturers do not inclose printed instructions with it. This neglect has brought a flood of letters to this office from radiophans like yourself.

Unfasten the pigtail connections on the variometer and connect them just as you see in the pictorial diagram printed Dec. 13.

The wiring plan shown in the pictorial diagram is correct and was intended for you to follow. Cannot give you a hook-up for the series parallel switch, as I explained last week in my article. There are many difficult types of these switches, and the diagram covering one type would not answer for the others. When you buy your switch from the dealer ask him to show you how to connect it, or, if you already have purchased it, show it to some radiophan friend who can assist you. Sorry I cannot be more definite. Leave out the switch if it confuses you and connect the condenser in the antenna circuit, just as it is shown in the pictorial diagram.

TUBES DO NOT OSCILLATE.

RADIO EDITOR: I have just completed a three-circuit regenerative set, using one 43-plate condenser, one Premier "Micrometer" variocoupler 180 degrees range, 150 to 800 meters, two "Workrite" wood variometers range, 150 to 705 meters, one W.D.-11 tube, fifty feet of aerial single wire. My condenser is on the ground side and I am using a series, parallel switch.

My set does not oscillate. That is, I cannot locate stations by the whistling of carrier signals, and the only station I have been able to get is WAAF, 286 meters. I get it on twenty-eight turns on the variocoupler. The coupler has 10, ten-twin taps on the ground side and 10 one-turn taps on the aerial side. With forty turns I can just hear WDAP, 360 meters, but other stations I cannot get.—C. O. WILLSON, 3850 Lake Park Avenue, Chicago.

While your hook-up is an original Armstrong three-circuit regenerative circuit, it is not "the old reliable" hook-up which I have been describing. If you would use a 43-plate, or even a 23-plate, variable condenser shunted across the secondary of your coupler and connected into the grid circuit, instead of the grid variometer, you now are using, you would have "the old reliable" and a much more efficient circuit.

Your coupler is a good one, and, if wound, as you say, for 150 to 800 meters, you should have no trouble bringing in the higher-wave length stations. However, try loosening up the aerial circuit. Place a small coil of about 25 to 35 turns, winding No. 22 DCC wire on a three-inch tube in series with the aerial. You may have to vary the turns a little one way or the other. Suggest you use your present condenser in series with the aerial instead of the ground. It will help you control the wave-length of your aerial.

As to the nonoscillating tube. This may be a faulty tube or it may be that your filament control is faulty. Be sure you have proper resistance—six ohms for the WD-11 tube, and do not try to burn tube too brightly. These tubes work best at a cherry-red heat. Turn up tube brightly until signals come in and then gradually reduce until signal is clear and best.

Be sure to read the classified advertisements on Page 15.

PLEA FOR OPERA NIGHT.

RADIO EDITOR: Ever since the last time WMAQ broadcast the grand opera given by the Chicago Civic Opera company I have been wondering if a letter written by a poor, humble "listener-in" and published by you would help the many suffering from the same misfortune I am?

When KYW broadcasts the opera, WMAQ, out of courtesy, remains silent. If KYW does not remain silent they do not interfere, but WJAZ, using the same wave length as WMAQ, has a nightly concert from 10 to 12, and as a consequence, since they do not co-operate with WMAQ in so much as to keep silent just one hour and possibly thirty minutes once a week, hundreds of people are deprived of a great enjoyment because WMAQ changes their wave length at 10 p. m. to keep from interfering with WJAZ.

If a vote were taken, I do not suppose three who have been tuned in for opera tune in for the concert. So why not do a little kindness in that way and let the lowly crystal user (who seldom can get WJAZ) have a little pleasure?

I myself have a tube set, but graduated from a crystal set and know how I enjoyed the opera last winter.

Wonder if WJAZ had its attention called to the old, old motto, "Even as you have done to the least of these," etc., and "Do unto others as you would have others do unto you," it would do differently for the next few times the opera consents to let us listen without seeing? Even a tube set cannot get it. Hoping this will do some good, I sign—MRS. J. A. JOHNSON, 558 East 37th street.

CHANCE TO HELP, FELLOWS.

RADIO EDITOR: Might I inquire thru your magazine whether there be perhaps an active radiophan among your readers able and willing to be a "Good Fellow" to a deserving widow and her disabled and deaf daughter for one or two evenings?

What I have in mind is that such a one located somewhere in this neighborhood (University of Chicago) bring his single or double "circuiter" to the house and, perhaps, give the daughter the pleasure of listening for the first time to human sound or music.

I shall, of course, assist in every way and pay all incidental expenses. A really effective aerial and ground wire is available, as I have rigged them up to accommodate the lady's little crystal set given to her by the Sun Dodgers' club of WDAP, on the Drake hotel.—WALTER THEELE, 6039 Kimbark avenue.

(Note—This worthy plea is referred to the radiophans. I am quite sure Mr. Theele is going to receive a deluge of offers. The Night Prowler says he will bring "Old Reliable" out any evening you say.)

Broadcasting Stations and Schedule of Programs

Continued from Page 2.

WDAK—Hartford, Conn., the Courant, 261 meters.
WDAL—Jacksonville, Fla., Florida Times-Union, 360 meters.
WDAO—Dallas, Texas, Automotive Electric company, 360 meters.
WDAP—Chicago, Ill., Board of Trade, 300 meters.
WDAR—Philadelphia, Pa., Lit Brothers, 395 meters.
WDAS—Worcester, Mass., 692a Main street, Samuel A. Waite, 360 meters.
WDAU—New Bedford, Mass., Slocum Kilburn, 360 meters.
WDAX—Centerville, Iowa, First National bank, 360 meters.
WDAY—Fargo, N. D., Radio Equipment Corporation, 244 meters; director, L. W. Hamm; daily, 9:30 a. m., weather; Tuesday, Thursday, Saturday, 7:30 to 8:30 p. m., music; Sunday, 4 to 5 p. m., orchestra.
WDBC—Lancaster, Pa., Kirk, Johnson & Co., 258 meters.
WDBF—Youngstown, Ohio, 254 West Federal street, Robert G. Phillips, 261 meters.
WDM—Washington, D. C., Church of the Covenant, 360 meters.
WDT—Stapleton, N. Y., Ship Owners Radio Service, 405 meters.
WDZ—Tuscola, Ill., Star Store building, James L. Bush, 278 meters.
WEAA—Flint, Mich, Fallain & Lathrop, 280 meters.
WEAB—Fort Dodge, Iowa, Standard Radio Equipment company, 360 meters.
WEAF—New York, N. Y., American Telephone and Telegraph company, 492 meters.
WEAG—Edgewood, R. I., Nicholas-Hineline-Bassett Laboratory, 231 meters.
WEAH—Wichita, Kan., Wichita Board of Trade, 244 meters.
WEAI—Ithaca, N. Y., Cornell university, 286 meters.
WEAJ—Vermillion, S. D., University of South Dakota, 360 meters.
WEAM—North Plainfield, N. J., Borough of North Plainfield (W. Gibson Buttfield), 250 meters.
WEAN—Providence, R. I., Shepard company, 273 meters.
WEAO—Columbus, Ohio, Ohio State university, 360 meters.
WEAP—Mobile, Ala., Mobile Radio company, 360 meters.
WEAR—Baltimore, Md., Baltimore American and News Publishing company, 360 meters.
WEAS—Washington, D. C., Hecht company, 360 meters.
WEAU—Sioux City, Iowa, Davidson Brothers company, 360 meters.
WEAY—Houston, Texas, Iris theater (Will Horowitz Jr.), 360 meters.
WEB—St. Louis, Mo., Benwood company, 360 meters.
WEV—Houston, Texas, Hurlburt-Still Electrical company, 360 meters.
WEW—St. Louis, Mo., St. Louis university, 261 meters: 9 a. m., estimated receipts of live stock at public stockyards; opening trend of hog market; opening futures, wheat for St. Louis and Kansas City; opening trend of market; Liverpool cables; 10 a. m., official weather reports, river stages; 2 p. m., closing market quotations, live stock, grain markets, fruits and vegetables, eggs and poultry; 5 p. m., special weather and river bulletins, agrigrams, etc.; other special musical program will be announced previously.
WFAA—Dallas, Texas, Dallas News and Dallas Journal, 476 meters.
WFAB—Syracuse, N. Y., 802 McBride street, Carl F. Woese, 234 meters.
WFAF—Poughkeepsie, N. Y., H. C. Spratley Radio company, 360 meters.
WFAH—Port Arthur, Texas, Electric Supply company, 360 meters.
WFAJ—Asherville, N. C., Hi-Grade Wireless Instrument company, 360 meters.
WFAM—St. Cloud, Minn., Times Publishing company, 360 meters.
WFAN—Hutchinson, Minn., Hutchinson Electric Service company, 360 meters, 100 watts; daily 12 noon to 12:05 p. m., Twin City radio programs; 12:05 to 12:20 p. m., long distance radio discussion; 12:20 to 12:25 p. m., markets; 12:25 to 12:30 p. m., news; Tuesdays, 8:10 p. m., entertainment.
WFAQ—Cameron, Mo., Missouri Wesleyan college, 360 meters.
WFAT—Sioux Falls, S. D., Daily Argus-Leader, 360 meters.
WFAV—Lincoln, Neb., University of Nebraska, department of electrical engineering, 360 meters.
WFI—Philadelphia, Pa., Strawbridge & Clothier, 395 meters; 9:15 a. m., produce market and live stock reports; 12 m., Meyer Davis Bellevue Stratford hotel concert orchestra; 12:50 p. m., agricultural report; 1 p. m., concert by Louisa Knowlton, cellist; Strawbridge & Clothier male quartet; John Owens, tenor; Edayfed Lewis, tenor; Harold Simonds, barytone; John Vandersloot, bass; Loretta Kerk, pianist and accompanist; 5:30 p. m., Meyer Davis Bellevue Stratford Hotel concert orchestra; 6 p. m., "Snowball" talks to the children.
WGAL—Lancaster, Pa., Lancaster Electric Supply and Construction company, 248 meters.
WGAN—Pensacola, Fla., 216 West Romana street, Cecil E. Lloyd, 360 meters.
WGAQ—Shreveport, La., Glenwood Radio corporation (W. G. Patterson), 360 meters.
WGAR—Fort Smith, Ark., Southwest American, 360 meters.
WGAU—Wooster, Ohio, Radio Monufacturing and Service company (Marcus G. Limb), 226 meters.
WGAW—Altoona, Pa., 1918 West Chestnut street, Ernest C. Albright, 261 meters.
WGAY—Madison, Wis., Northwestern Radio company, 360 meters; daily, 1 to 4:30 p. m., concert and tests; 7:30 p. m. concert; Sunday, 7:30 p. m., radio chapel, sacred music.
WGAZ—South Bend, Ind., South Bend Tribune, 360 meters.
WGI—Medford Hillside, Mass., American Radio and Research corporation, 360 meters.
WGL—Philadelphia, Pa., 2303 North Broad street, Thomas F. Y. Howlett, 360 meters.
WGR—Buffalo, N. Y., Federal Telephone and Telegraph company, 319 meters.
WGV—New Orleans, La., Interstate Electric company, 360 meters.
WGY—Schenectady, N. Y., General Electric company, 380 meters.
WHA—Madison, Wis., University of Wisconsin, 360 meters.
WHAA—Iowa City, Iowa, State University of Iowa, 283 meters.
WHAB—Galveston, Texas, Clark W. Thompson, 360 meters.
WHAC—Waterloo, Iowa, Cole Brothers Electric company, 360 meters.
WHAD—Milwaukee, Wis., Marquette university, 280 meters; J. B. Kremer, program director; L. E. Coodes, H. P. Warring, Wednesday, 7:30 p. m.

WHAG—Cincinnati, Ohio, University of Cincinnati, 222 meters.
WHAH—Joplin, Mo., Hafer Supply company, 360 meters.
WHAI—Davenport, Iowa, Radio Equipment and Manufacturing company, 360 meters.
WHAK—Clarksburg, W. Va., Roberts Hardware company, 360 meters.
WHAL—Lansing, Mich., Lansing Capital News, 248 meters.
WHAM—Rochester, N. Y., University of Rochester (Eastman School of Music), 360 meters.
WHAP—Decature, Ill., Otta & Kahn, 360 meters.
WHAQ—Washington, D. C., Semmes Motor company, 360 meters.
WHAR—Atlantic City, N. J., Paramount Radio and Electric company (W. H. A. Paulus), 231 meters.
WHAS—Louisville, Ky., Courier-Journal and Louisville Times, 300 meters; silent Monday night; daily, 4 to 6 p. m., music; 5 p. m., news; 7:30 to 9 p. m., music, lectures.
WHAV—Wilmington, Del., Wilmington Electrical Special company, 360 meters.
WHAZ—Troy, N. Y., Rensselaer Polytechnic Institute, 380 meters.
WIB—Kansas City, Mo., Sweeney School company, 411 meters.
WHD—Morgantown, W. Va., West Virginia University, 360 meters.
WHK—Cleveland, Ohio, Radiovox company (Warren R. Cox), 360 meters.
WHN—Ridgewood, N. Y., George Schubel, 360 meters.
WIAB—Rockford, Ill., Joslyn Automobile company, 252 meters. Monday and Friday, 8 to 930 p. m. Sunday, 12:30 p. m.
WIAC—Galveston, Texas, Galveston Tribune, 360 meters.
WIAD—Ocean City, N. J., Ocean City Yacht club (Howard R. Miller), 254 meters.
WIAF—New Orleans, La., 139 North Alexander street, Gustav A. DeCortin, 234 meters.
WIAH—Newton, Iowa, Continental Radio and Manufacturing company, 258 meters.
WIAI—Springfield, Mo., Heer Stores company, 360 meters.
WIAJ—Neenah, Wis., Fox River Valley Radio Supply company (Quinn Brothers), 224 meters.
WIAK—Omaha, Neb., Journal-Stockman company, 278 meters.
WIAO—Milwaukee, Wis., School of Engineering of Milwaukee, 360 meters.
WIAQ—Marion, Ind., Chronicle Publishing company, 226 meters.
WIAR—Paducah, Ky., Paducah Evening Sun, 360 meters.
WIAS—Burlington, Iowa, Home Electric company, 360 meters.
WIAT—Tarkio, Mo., Leon T. Noel, 360 meters.
WIAU—Le Mars, Iowa, American Trust and Savings bank, 360 meters.
WIK—McKeesport, Pa., K. & L. Electric company (Herbert F. Kelso and Hunter J. Lohman), 360 meters.
WIL—Washington, D. C., Continental Electric Supply company, 360 meters.
WIP—Philadelphia, Pa., Gimbel Brothers, 509 meters.
WJAB—Lincoln, Neb., American Electric company, 360 meters.
WJAD—Waco, Texas, Jackson's Radio Engineering laboratories, 360 meters.
WJAF—Muncie, Ind., Press Publishing company, 360 meters.
WJAG—Norfolk, Neb., Norfolk Daily News (Huse Publishing company), 360 meters.
WJAK—Greentown, Ind., Clifford L. White, 254 meters.
WJAM—Cedar Rapids, Iowa, 302 3d Avenue West, D. M. Perham, 268 meters.
WJAN—Peoria, Ill., Peoria Star, 280 meters.
WJAQ—Topeka, Kan., Capper Publications, 360 meters, 100 watts; director, J. A. Machel; weather, news, roads, etc.; daily, 9 to 9:45 a. m., bond gossip, financial news and grain markets; 10 to 10:45 a. m., quotations upon foreign exchange, live stock, grain, bonds and stocks, financial news bulletins and weather reports; 2 to 2:45 p. m., quotations upon grain, stock, butter, eggs, poultry, foreign exchange and bonds, financial news bulletins and weather reports; 3 to 3:45 p. m., quotations upon fruits and vegetables, butter, eggs and poultry, live stock, hay and grain, flour and feed, foreign exchange, bonds and stocks, weather reports.
WJAR—Providence, R. I., The Outlet company (J. Samuels and Brother), 360 meters.
WJAS—Pittsburg, Pa., Pittsburg Radio Supply House, 360 meters.
WJAT—Marshall, Mo., Kelly-Vawter Jewelry company, 360 meters.
WJAX—Cleveland, Ohio, Union Trust company, 360 meters.
WJAZ—Chicago, Ill., Chicago Radio laboratory, 448 meters.
WJD—Granville, Ohio, Richard H. Howe, 229 meters.
WJH—Washington, D. C., White & Boyer company, 273 meters.
WJX—New York, N. Y., Deforest Radio Telephone and Telegraph company, 360 meters.
WJY—New York, N. Y., R. C. A., 405 meters.
WJZ—New York, N. Y., R. C. A., 455 meters.
WKAA—Cedar Rapids, Iowa, 1444 2d avenue, East, H. F. Paar, 268 meters.
WKAD—East Providence, R. I., Charles Loof (Cresent park), 240 meters.
WKAF—Wichita Falls, Texas, W. S. Radio Supply company, 360 meters.
WKAN—Montgomery, Ala., United Battery Service company, 226 meters.
WKAP—Cranston, R. I., Dutee W. Flint, 360 meters.
WKAQ—San Juan, P. R., Radio Corporation of Porto Rico, 360 meters.
WKAR—East Lansing, Mich., Michigan Agricultural college, 280 meters.
WKAS—Springfield, Mo., L. E. Lines Music company, 360 meters.
WKAV—Laconia, N. H., Laconia Radio club, 254 meters.
WKAW—Beloit, Wis., Turner Cycle company, 242 meters.
WKAX—Bridgeport, Conn., 1789 Park avenue, William A. MacFarlane, 231 meters.
WKAY—Gainesville, Ga., Brenau college, 280 meters.
WKC—Baltimore, Md., Joseph M. Zamoiski company, 360 meters.
WKY—Oklahoma City, Okla., WKY Radio shop, 360 meters.
WLAC—Raleigh, N. C., North Carolina State college, 360 meters.
WLAG—Minneapolis, Minn., Cutting and Washington Radio corporation, 417 meters.
WLAH—Syracuse, N. Y., 425 Brownell street, Samuel Woodworth, 234 meters.
WLAJ—Waco, Texas, Waco Electrical Supply company, 360 meters.
WLAK—Bellows Falls, Vt., Vermont Farm Machine corporation, 360 meters.
WLAL—Tulsa, Okla., Naylor Electric company, 360 meters.
WLAN—Houlton, Maine, Putnam Hardware company, 283 meters.
WLAP—Louisville, Ky., 306 West Breckenridge street, W. V. Jordan, 360 meters.
WLAQ—Kalamazoo, Mich., 108 Elm street, Arthur E. Schilling, 360 meters.
WLAT—Burlington, Iowa, Radio and Specialty company, 360 meters.
WLAV—Pensacola, Fla., Electric Shop, 254 meters.
WLAW—New York, N. Y., police department, City of New York, 360 meters.
WLAX—Greencastle, Ind., Putnam Electric company (Greencastle Community Broadcasting station), 231 meters.
WLB—Minneapolis, Minn., University of Minnesota, 360 meters.
WLW—Cincinnati, Ohio, Crosley Manufacturing company, 309 meters.
WMAB—Oklahoma City, Okla., Radio Supply company, 360 meters.
WMAC—Cazenova, N. Y., Fernwood street, J. Edw. Page (Olive B. Meredith), 261 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WMAH—Lincoln, Neb., General Supply company, 254 meters; H. C. Harvey, station director; Monday and Friday, 9 to 10:30 p. m., dance music.
WMAJ—Kansas City, Mo., Drovers Telegram company, 275 meters; J. E. Cook, operator; daily, 8:15 a. m., to 2:25 p. m., markets and news.
WMAK—Lockport, N. Y., Norton Laboratories, 360 meters.
WMAL—Trenton, N. J., Trenton Hardware company, 256 meters.
WMAM—Beaumont, Texas, Beaumont Radio Equipment company, 360 meters.
WMAP—Easton, Pa., Utility Battery service, 246 meters.
WMAQ—Chicago, Ill., Chicago Daily News, 448 meters; Miss Judith C. Waller, director; program announced daily.
WMAV—Auburn, Ala., Alabama Polytechnic institute, 250 meters; Sunday morning and afternoon church services; evening, lectures.
WMAY—St. Louis, Mo., Kingshighway Presbyterian church, 280 meters.
WMAZ—Macon, Ga., Mercer university, 268 meters.
WMC—Memphis, Tenn., "Commercial Appeal" (Commercial Publishing company), 500 meters, George D. Hay, announcer; F. Y. Root, operator.
WMH—Cincinnati, Ohio, Precision Equipment company, 248 meters.
WMU—Washington, D. C., Doubleday-Hill Electric company, 261 meters.
WNAC—Boston, Mass., Shepard stores, 278 meters.
WNAD—Norman, Okla., University of Oklahoma, 360 meters.
WNAL—Omaha, Neb., 5019 Capitol avenue, R. J. Rockwell, 242 meters.
WNAM—Evansville, Ind., Ideal Apparatus company, 360 meters.
WNAN—Syracuse, N. Y., Syracuse Radio Telephone company, 286 meters.
WNAP—Springfield, Ohio, Wittenberg college, 231 meters.
WNAQ—Charleston, S. C., Charleston Radio Electric company, 360 meters.
WNAR—Butler, Mo., C. C. Rhodes, 231 meters.
WNAS—Austin, Texas, Texas Radio Corporation and Austin Statesman, 360 meters.
WNAT—Philadelphia, Pa., Lemmig Brothers company (Frederick Lemmig), 360 meters.
WNAW—Fort Monroe, Va., Peninsular Radio club (Henry Kunzmann), 360 meters.
WNAX—Yankton, S. D., Dakota Radio Apparatus company, 244 meters.
WNJ—Albany, N. Y., Shotton Radio Manufacturing company, 360 meters.
WOAA—Ardmore, Okla., Dr. Walter Hardy, 360 meters.
WOAC—Lima, Ohio, Maus Radio company, 266 meters.
WOAD—Sigourney, Iowa, Friday Battery and Electric corporation, 360 meters.
WOAE—Fremont, Neb., Midland college, 360 meters.
WOAF—Tyler, Texas, Tyler Commercial college, 360 meters; Director, A. B. Chenier; a. m., markets; afternoon, music; evening service Sunday.
WOAG—Belvidere, Ill., Apollo theater (Belvidere Amusement company), 224 meters.
WOAH—Charleston, S. C., Palmetto Radio corporation, 360 meters.
WOAI—San Antonio, Texas, Southern Equipment company, 385 meters.
WOAJ—Parsons, Kan., Ervins Electrical company, 258 meters.
WOAK—Frankfort, Ky., Collins Hardware company, 240 meters.
WOAL—Webster Groves, Mo., 4 Jefferson road, William E. Woods, 229 meters.
WOAN—Lawrenceburg, Tenn., Vaughn Conservatory of Music (James D. Vaughn), 360 meters; 8 p. m., music.
WOAO—Mishawaka, Ind., Lyradion Manufacturing company, 360 meters.
WOAP—Kalamazoo, Mich., Kalamazoo college, 240 meters.
WOAQ—Portsmouth, Va., Portsmouth Kiwanis club, 360 meters.
WOAR—Philadelphia, Pa., 360 meters; director, J. E. Lit; program director, C. Stephens.
WOAT—Wilmington, Del., 215 Market street, Boyd M. Hamp, 360 meters.
WOAV—Erie, Pa., Pennsylvania National Guard, 2d Battalion, 112th Infantry, 242 meters.
WOAW—Omaha, Neb., Woodmen of the World, 526 meters; evening entertainment every night.
WOAX—Trenton, N. J., 600 Ingham avenue, Franklyn J. Wolff, 240 meters.
WOAZ—Stamford, Texas, Penick Hughes company, 360 meters.
WOC—Davenport, Iowa, Palmer School of Chiropractic, 484 meters.
WOI—Ames, Iowa, Iowa State college, 360 meters.
WOK—Pine Bluff, Ark., Pine Bluff company, 360 meters.
WOO—Philadelphia, Pa., 13th and Market streets, John Wanamaker, 509 meters; director, Gordon H. Cullen.
WOQ—Kansas City, Mo., Western Radio company, 360 meters.
WOR—Newark, N. J., L. Bamberger & Co., 405 meters.
WOS—Jefferson City, Mo., Missouri State Marketing bureau, 441 meters.
WPAB—State College, Pa., Pennsylvania State college, 360 meters.
WPAC—Okmulgee, Okla., Donaldson Radio company, 360 meters.
WPAD—Chicago, Ill., W. A. Weiboldt & Co., 360 meters.
WPAH—Waupaca, Wis., Wisconsin department of markets, 360 meters.
WPAJ—New Haven, Conn., Doolittle Radio corporation, 268 meters.
WPAK—Agricultural College, N. D., North Dakota Agricultural college, 360 meters.
WPAL—Columbus, Ohio, Superior Radio and Telegraph Equipment company, 286 meters.
WPAM—Topeka, Kan., Auerbach & Guettel, 360 meters, 100 watts; W. A. Beasley, director; markets; special programs 6:15 p. m.
WPAP—Winchester, Ky., 222 Lexington avenue, Theodore D. Phillips, 360 meters.
WPAQ—Frostburg, Md., General Sales and Engineering company, 360 meters.
WPAR—Beloit, Kan., Ward Battery and Radio company, 360 meters.
WPAT—El Paso, Texas, St. Patrick's cathedral, 360 meters.
WPAU—Moorhead, Minn., Concordia college, 360 meters.
WPAZ—Charleston, W. Va., Dr. John R. Koch, 273 meters.
WPG—New Lebanon, Ohio, Nushawg Poultry farm, 243 meters.
WQAA—Parkesburg, Pa., Horace A. Beale Jr., 360 meters.
WQAB—Springfield, Mo., Southwest Missouri State Teachers' college, 236 meters.
WQAC—Amarillo, Texas, 108 East 8th street, E. B. Gish, 360 meters.
WQAD—Waterbury, Conn., Whitall Electric company, 242 meters; 6:30 to 7:45 p. m., Monday, Wednesday, and Friday.
WQAE—Springfield, Vt., Moore Radio News station (Edmund B. Moore), 275 meters.
WQAF—Sandusky, Ohio, Sandusky Register, 240 meters.
WQAH—Lexington, Ky., Brock-Anderson Electrical Engineering company, 254 meters.
WQAL—Mattoon, Ill., Coles County Telephone and Telegraph company, 258 meters.
WQAM—Miami, Fla., Electrical Equipment company, 300 meters. Director, R. H. Horning. Tuesday, 7 to 8 a. m., 9 to 10 a. m., Sunday.
WQAN—Scranton, Pa., Scranton Times, 280 meters.
WQAO—New York, N. Y., Calvary Baptist church, 360 meters.
WQAQ—Abilene, Texas, West Texas Radio company, 360 meters.
WQAS—Lowell, Mass., Prince-Walter company, 266 meters.
WQAV—Greenville, S. C., Huntington and Guerry (Inc.), 258 meters.
WQAW—Washington, D. C., Catholic university, 236 meters.
WQAX—Peoria, Ill., Radio Equipment company, 360 meters.
WQAZ—Greensboro, N. C., Greensboro Daily News, 360 meters.
WHAA—Houston, Texas, Rice institute, 360 meters.
WRAD—Marion, Kan., Taylor Radio shop (G. L. Taylor), 360 meters.
WRAF—Laporte, Ind., The Radio club (Inc.), 224 meters.
WRAH—Providence, R. I., Stanley N. Read, 231 meters.
WRAL—St. Croix Falls, Wis., Northern States Power company, 248 meters.
WRAN—Waterloo, Iowa, Black Hawk Electrical company, 236 meters. Director, H. R. Plowman; 5 to 6 p. m. week days; 8:15 to 9:15 p. m. Monday, concert.
WRAO—St. Louis, Mo., Radio Service company, 360 meters.
WRAP—Winter Park, Fla., Winter Park Electrical Construction company, 360 meters.
WRAU—Amarillo, Texas, Amarillo Daily News, 360 meters.
WRAV—Yellow Springs, Ohio, Antioch college, 360 meters.
WRAW—Reading, Pa., Avenue Radio shop (Horace D. Good), 238 meters.
WRAX—Gloucester City, N. J., Flaxon's garage, 268 meters.
WRAY—Scranton, Pa., Radio Sales corporation, 280 meters.
WRAZ—Newark, N. J., Radio Shop of Newark (Herman Lubinsky), 233 meters.
WRC—Washington, D. C., Radio Corporation of America.
WRK—Hamilton, Ohio, Doron Bros. Electric company, 360 meters.
WRL—Schenectady, N. Y., Union college, 360 meters.
WRM—Urbana, Ill., University of Illinois, 360 meters.
WRR—Dallas, Texas, City of Dallas (police and fire signal department), 360 meters.
WRW—Tarrytown, N. Y., Tarrytown Radio Research laboratory, 273 meters.
WSAB—Cape Girardeau, Mo., Southeast Missouri State Teachers' college, 360 meters.
WSAC—Clemson College, S. C., Clemson Agricultural college, 360 meters.
WSAD—Providence, R. I., J. A. Foster company, 261 meters.
WSAG—St. Petersburg, Fla., City of St. Petersburg (Loren V. Davis), 244 meters.
WSAH—Chicago, Ill., 4801 Woodlawn avenue, A. J. Leonard, Jr., 248 meters.
WSAI—Cincinnati, Ohio, United States Playing Cards company, 309 meters.
WSAJ—Grove City, Pa., Grove City college, 360 meters.
ESAK—Middleport, Ohio, Foster Egner (Daily News, Pomeroy, Ohio), 258 meters.
WSAL—Brookville, Ind., Franklin Electric company, 360 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WSB—Atlanta, Ga., Atlanta Journal company, 429 meters. No silent night. Day schedule 12-1 p. m., musical programs 2:30 p. m., weather; 5-5:30 p. m., bedtime story. Evening—8-9 p. m., popular concert.
WSL—Utica, N. Y., J. & M. Electric company, 360 meters.
WSY—Birmingham, Ala., Alabama Power company, 360 meters.
WTAC—Johnstown, Pa., Pennsylvania Traffic company, 360 meters.
WTAS—Elgin, Ill., Charles E. Erbstein, 275 meters. Evening schedule—7:30 p. m., musical program.
WTAU—Tecumseh, Neb., Ruegy Battery and Electric company, 360 meters.
WTAW—College Station, Texas, Agricultural and Mechanical college, 360 meters.
WTG—Manhattan, Kan., Kansas State Agricultural college, 485 meters.
WWAD—Philadelphia, Pa., Wright & Wright, 360 meters.
WWAX—Laredo, Texas, Wormser Brothers, 360 meters.
WWB—Canton, Ohio, Daily News Printing company, 360 meters.
WWI—Dearborn, Mich., Ford Motor company, 360 meters.
WWJ—Detroit, Mich., Detroit News, 580 meters. Silent Saturday. Day schedule—8:30 a. m., household hints and talks for women; 9:25 a. m., weather; 10:55 a. m., time signals; 2 p. m., concert. Evening schedule—8:30 p. m., concert.
WWL—New Orleans, La., Loyalo university, 360 meters.
WWT—Buffalo, N. Y., McCarthy Brothers & Ford, 360 meters.
WWZ—New York city, Wannamaker's department store, 360 meters.

You will find the classified advertisement section interesting. See Page 15.

Opinions of Radiophans

WANTS MORE SILENT NIGHTS.

RADIO EDITOR: I have just discovered your progressive radio section this last week and noted especially the page devoted to listeners' letters.

Some of the BCL's are having quite a time tuning out local stations, and I am one of them. Altho I have added a wave trap to a three-circuit set, built of all best standard apparatus, I cannot get within 40 meters of WDAP or WJAZ.

WMAQ and KYW are not so troublesome. I am within eight blocks of WJAZ and four miles of WDAP.

What else could I do to tune out these two? Why can't some of the broadcasters have another silent night on Thursdays, instead of using up too much power and making the power company wealthy.

In fact, on Monday they squeeze in an extra talk or so that they can use some more power and spoil the fans' silent night. So let's all get a move on and make Thursday another silent night.

The World Crier never has anything, anyway, and comes on at midnight on silent night and spoils the DX fan's hopes.

Just like a "ham," who wants to listen for DX, code gets sore when some one-kilowatt spark comes in and he reports to the A. R. R. L.

About three-circuit Armstrong sets—they are quite selective on out-of-town broadcasters, but when it comes to local stuff—well!

Let's get Thursday evening—as a silent night, with Monday evening, and set an example for New York city to follow.

The Night Prowler complained of not having enough DX loggings. I just sent him some worth looking at and we would have more if we had Thursday evening. Good luck to your section.—E. G. DEWILDE, 5410 Wayne Avenue, Chicago.

THE WASHINGTON, PA., STATION.

RADIO EDITOR: In a recent issue was a letter regarding a station at Washington, Pa. One night late in December I heard some band music, followed by an announcement about the "Athens band." The station letters I could not find in your Thursday section, and as I could not catch the name of the town, only caught "Pennsylvania," I did not keep a record of the station letters.

I find there is a station at Washington, Pa. The letters are WABT, and I understand that it is operated by "Holiday-Hall, radio engineers."

Now some information, please.

I have a water pipe and a gas pipe three feet underground from the house to the garage. We now use the water pipe for our ground. Would you run the ground wire from the water pipe to the gas pipe so as to get more ground? Would it be safe to do so? Keep up the good work against those big stations. KYW killed Fort Worth, Texas, for me last night. This is the second time in ten days.—H. E. WARNER, 1115 Ashland avenue, Wilmette, Ill.

(Note—Better keep away from gas pipes. They are hazardous and not permitted by city fire laws.—The Editor.)

ANOTHER BUSTED BUBBLE!

RADIO EDITOR: It's really too bad to disillusion Rose Cuneo Paneri and Pearl Leisner regarding their supposed reception of the Spanish War Veterans' program broadcast from WOC, about 8:55 p. m., Wednesday, Dec. 12. What they actually heard was a rebroadcast of this program from WDAP here in Chicago. WDAP did not give their call letters, but broadcast portions of WOC's program and also parts of WMAQ's. The next evening they rebroadcast parts of WBAP's program. No doubt it was merely a matter of experiment upon the part of WDAP'S staff, but the ethics of such procedure without call letters and an explanation are open to question. Owners of neutrodyne sets could easily detect what was going on, by the difference in wave lengths and by WDAP'S generator hum, but crystal-set users, of course, cannot do this. I live within a few blocks of the Drake (WDAP), and listened alternately to WOC on 484 meters and WDAP on 360, so there is no question as to the correctness of my statements. In addition I talked with several other users of neutrodyno sets who confirmed my assertion.—HENRY E. BOHN, 1341 North Dearborn Street, Chicago.

IT IS ALL RIGHT, SIR.

RADIO EDITOR: I am greatly interested in the Hagerman "Superdue" circuit described in last week's issue of your Radio Magazine, especially in view of my having experimented for the last six weeks with a variation of the Casey ultra-audion hook-up using a variocoupler instead of a tapped coil. Using a single WD-12 tube, I have tuned in everything from Los Angeles to Havana in the same satisfactory manner as described by Mr. Hagerman.

I note in your answer, No. 536, under questions and answers of the same issue of your magazine, that you do not recommend a hook-up such as I have made. Of course, this set is subject to interference from local stations to a certain extent, but last night I listened-in on WMC and WEAF, for instance, when KYW and WJAZ were operating and experienced no interference at all. My set is not shielded and is absolutely free from body capacity.—W. H. RUSKAMP, 8134 South Throop Street, Chicago.

HEARS COAST STATION ON ONE CIRCUIT

RADIO EDITOR—Here are the outside stations I logged Monday night, Jan. 7 (silent night):

WOC, Davenport, Iowa; WBAP, Fort Worth, Texas; WCAE, Pittsburg, Pa.; WOAW, Omaha, Neb.; KSD, St. Louis, Mo.; WMC, Memphis, Tenn.; WFAA, Dallas, Texas; WOS, Jefferson City, Mo.; WSB, Atlanta, Ga.; WHB, Kansas City, Mo.; WCBD, Zion, Ill.; WCX, Detroit, Mich.; WRC, Washington, D. C.; WHAZ, Troy, N. Y.; WTAS, Elgin, Ill.; WDAF, Kansas City, Mo.; KFI, Los Angeles, Cal.; KPO, San Francisco, Cal.; CHCX, Montreal, Que., Can.; 9 HF, St. Louis, Ill; 9 CRW, Minneapolis, Minn.; 9 CWL, Denver, Colo.; 9 BK, Frankfort, Ind.; 9 BOW, Concordia, Kan.; 9 ALQ, Larimore, N. D.

I am using a single circuit receiver with two stages of audio-frequency. Some of the stations were loud enough to operate a loud speaker.—JAMES DeLANEY, 5447 Michigan Avenue, Chicago, Ill.

AHEAD OF ALL OTHERS.

RADIO EDITOR: Your paper sure is to be congratulated for the Radio Magazine, published by you, and the radio news in your daily paper. I am using this means to show my appreciation of your wonderful work, which I really consider ahead of any other magazine of the same nature.—WILLIAM J. RAHN, Deputy Clerk of the Superior Court, Chicago.

PRAISES AND PRODS.

RADIO EDITOR: We sure have dandy stations here in Chicago—KYW, WJAZ, WDAP and WMAQ. They can't be beat, but I wish they would pipe down on Mondays.—C. C. CAREY, 6215 Ellis Avenue, Chicago.

POST AIDS LONDON LISTENER.

RADIO EDITOR: The following extracts are taken from a letter received Jan. 4 from a very close friend in London, England:

"The receipt of the list of broadcasting stations (Radio section of The Post) was most opportune, as I was actually carrying out listening tests that week and found it very helpful to have reliable information on wave lengths.

"I sat up until 3:30 a. m. over a period of ten days, but only succeeded in logging two stations, namely: WHAZ and WBZ.

"The former came in strong between 3:15 a. m. and 3:30 a. m. (English time) on the morning of Dec. 3, the announcements regarding a wireless trio and the music being delightfully clear.

"I have since heard these stations several times, but not so clearly.

"The set used was a seven-valve super outfit using a frame antenna two feet square."

In the fall of 1922 I had the pleasure of being with this gentleman in London and can vouch for the veracity of his statements. I have refrained from mentioning his name due to his association in the radio field in Europe and his failure to state if I could make the letter public. I shall be glad to furnish any further information if you so desire.

I arrived in Chicago from England in the fall of 1913, and was acquainted with The Post. Since that time I have been a constant reader. It is the cleanest and fairest newspaper in the city, and as far as my experience with newspapers in the United States I might include all of them.—S. C. SUMMERFIELD, Associate A. I. E. E., 4846 Hutchinson Street, Chicago.

HEARS HASTINGS ON CRYSTAL.

RADIO EDITOR: I wish to be the person to congratulate Mr. Hagerman on his crystal hook-up, and you on The Post's radio section. So far I have heard Elgin, Zion KSD, St. Louis, and a station I'm not clear about. Sunday night from 11:30 to 12:30 I listened to a station that sounded like HXF, and understood it to be the experimental station for KDKA. At times they would fade out completely, and then again grow loud. I heard over twenty transmissions with various modulations. I would like to know just what station that was. If it really was East Pittsburg, it is my farthest reception.—RAYMOND COUGHLIN, 325 South Robey street, Chicago.

(NOTE: It was probably the relay station at Hastings, Neb., relaying KDKA.—THE EDITOR.)

RADIO EDITOR: I have a dry-cell set in which I use a WD-12 tube. I constructed this set of the very cheapest material I could buy. The entire cost with two pair of head phones, batteries, tube, antenna and ground included cost less than $25. I have heard ninety-four different stations up to the present time, including Los Angeles, San Antonio, Atlanta, Schenectady and Wampeton, N. D. The following list will give a better knowledge of this set's range:

KDKA, KFJK, KFFV, KSD, KYW, KFEV, KFKB, KLZ, KHJ, KFKX, KFAF, KFJL, KFI, 9DTI, Leon, Iowa (call letters not understood), 5BJ, 5LJ, 5RC, WAAK, WBAP, WCAE, WCX, WCK, WDAF, WDAP, WEAB, WEAH, WEAK, WFB, WFAA, WGF, WGR, WGY, WHAA, WHAS, WHB, WHK, WIAR, WJAT, WJAZ, WJAX, WLAG, WLB, WLW, WMAJ, WMAQ, WMAU, WMC, WNAV, WOAW, WOC, WOI, WOG, WOS, WPAD, WIL, WSAI, WSB, WTAS, WWJ, WAAW, WCBD, WSAX, WCAP, WMAB, WJAS, WCAH, WTAM, WEAO, WKY, WDAO, WPAM, WBAH, WOO, WFAV, WOR, WRC, WHAZ, WAAF, WDAR, WDAX, WCAL, WPAJ.

I have had this set only about seven months, so I have a good chance for improvement of distance as well as for operation. I am only 16 years old, so you see I'm a rather young phan. I have just connected a variometer in my set, so it will take me some time to learn the position of the stations again. Anyway, I think I shall reach the 100-mark before spring.—WILFORD MURPHY, Box 115, Powersville, Mo.

NO DANGER WITH THIS CHARGE.

RADIO EDITOR: Your issue of Dec. 27 contained an article entitled, "Batteries in use must not be placed on charge."

We are inclosing a small booklet descriptive of a type of charger which we are manufacturing and selling in very large quantities to which this article does not apply and we would be pleased to have you examine it carefully.

Most of the hot cathode types of rectifiers use auto-transformers, and where the set is grounded tubes will be blown out. The vibrating type of charger has various constructions, some of which will burn out tubes, but all of which are too noisy for use during the operation of the set due to sparking at the contact points. One of the storage battery companies is combining our charger with their unit and is recommending charging the battery whenever it is necessary, whether the set is in operation or not. A large proportion of our customers have found that this can be done and we ourselves have made exhaustive tests in this connection. The bureau of standards also has done some work on this and has written us agreeing that this can be done satisfactorily.

The Fansteel company primarily is interested in manufacturing and developing uses for various rare metals, chiefly tungsten, molybdenum and tantalum. Thru them we have become familiar with the radio business in one way or another, and especially with tubes, for a good many years.

If it is practicable to modify the article already printed in such a way as to correct the misapprehension in the public's mind which I believe they have gained from it, our company would be very much obliged to you.—FANSTEEL PRODUCTS COMPANY, INC., Ronald Webster, secretary.

ANOTHER ANSWER, MR. GODWIN.

RADIO EDITOR: In answer to query of I. O. Godwin, will say I received the wonderful concert he received and same was a Philippine orchestra of the Pacific Mail steamship Venzuela, being broadcast thru station WEAF of New York city. They sure put on some wonderful concerts.

Also, in answer to the north sider regarding the 448 station, tell him not to move west, as he will have a pest and nuisance who for broadcasting has 448 beaten, and that is WTAS of Elgin. Of course, they can be tuned out easily as can 448, but then here are owners of sets who cannot do same.—J. D. MACK, 728 Pleasant Avenue, Glen Ellyn, Ill.

HE HEARD IT, ALL RIGHT!

RADIO EDITOR: In answer to John D. McCurrach's inquiry regarding the station WAVB which you printed in the Thursday (Jan. 10) Radio Magazine, I wish to state that I, too, heard this station at Washington, Pa., but on Jan. 1, 1924. I understood the call to be WADP, also heard the announcer state the orchestra was composed of Ohio university students and that the station WADP was located on the Washington hotel, Washington, Pa. He also stated they would like to hear from anyone listening west of the Mississippi river as to their reception.—H. J. ADAMS, 6716 Blackstone Avenue, Chicago.

BIG JOB, MAN!

RADIO EDITOR: In order to facilitate bringing in favorite stations and also trying to find other stations, I would suggest that The Post Radio Magazine print the list of broadcasting stations with the wave lengths of each, put in such order that you can mark condenser settings. The above came to the mind of the writer while having difficulty in distinguishing the call letters of a station.—A. G. KATZ, 1335 Norwood Street, Chicago.

REFERRED TO READERS.

RADIO EDITOR: Wouldn't it be possible to find out for me what station in Winnipeg, Canada, was broadcasting the piano selection, "No, No Nora," about 1:45 a. m., Friday, Jan. 4? Also, will the "Superdue" tune out WJAZ and bring in outside stations? Your Radio Magazine is the best in the city. Keep up the good work.—FRED UHLEMANN.

The Chicago Evening Post Radio Magazine

RADIO EXCHANGE

5c a Word

Radio Classified Advertisements will be inserted in this section at 5c per word per insertion. Minimum 10 words. Two initials count as one word. No display type, cuts or borders allowed.

If box number is desired, allow four extra words. Box answers will be mailed to advertisers free of charge. Address The Chicago Evening Post, Radio Department, 12 South Market-st.

SETS FOR SALE.

NEW 3-TUBE ARMSTRONG CIRCUIT—Complete with storage battery and loud speaker; price $125. Phone Wellington 1126. Call evenings.

REINARTZ 1-TUBE SET—Ready to hook up. $11; with tube and dry battery, $15; bought larger set. Kenwood 6483.

NEW $208 3-TUBE GREBE—Complete with tubes, loud speaker, head phone, "B" batteries and storage batteries; electrical machinery in building prohibits use of radio set. C. W. HALLENGREN, 2030 Irving Park-blvd. Graceland 8617. Price $135.

FEDERAL NO. 110 RADIO—Like new; cost $110; will sell for $75. Call Graceland 7060 evenings.

5-TUBE NEUTRODYNE—Complete with tubes and loud speaker, head phone, batteries, etc., $125. S. WILKINSON, 5118 Fletcher-st. Kildare 9413.

$225 BUYS $2,100 NAVY RADIOPHONE TRANSMITTER - RECEIVER, including power amplifier, loud speaker, 2 motor generators, 8 tubes, extra head phones, microphones, spare parts complete except batteries; need cash. E. LAWRENCE, 24 Hitchcock Hall, University of Chicago.

3-TUBE ARMSTRONG—Long distance getter; also 5-tube Atwater-Kent; will sell reasonable. Call Ravenswood 7851, or 2409 Winnemac-av.

SETS FOR SALE.

RADIO SETS MADE TO ORDER—Wired, rewired, repaired and put up in any style cabinet; all the latest and best circuits; let me know your wants; I use quality parts. S. KALE, 3211 W. Armitage-av., Chicago.

5-TUBE NEUTRODYNE, 3-CIRCUIT REGENERATIVE (Old Reliable); all sets made to order; call evenings. Phone Spaulding 2377, or S. KALWASINSKI, 2744 N. Troy-st., Chicago.

TUBE SET AND 2-STEP AMPLIFIER IN mahogany cabinets; long distance guaranteed; sell for less than cost. 1349 W. Jackson-blvd.

5-TUBE NEUTRODYNE RECEIVER—New, for $75, or complete with tubes, batteries, phones, etc., $125; nothing else needed; will make any set at low cost. SCHMALZIGAN, 218 E. Garfield-blvd. Ken. 1317.

3-TUBE RADIO—Tubes, phones, "B" batteries, new storage battery and loud speaker, in nice cabinet, $75. 2300 N. Kimball, 1st flat.

NEW 3-TUBE RADIOS BUILT of Bremer-Tully and All-American parts, $65 complete. Beverly 1043, after 6:30 p. m.

3-TUBE ATWATER-KENT, $30—1-TUBE Reinartz, $15; 1-tube Peerless, $12; 2-step amplifier unit, $15; private party. Belmont 2268.

RADIO—3-TUBES, $45—COST $80. BARBER, 1421 S. Crawford-av.

Post Radio Ads Bring Results

REPAIRS.

RADIO SETS REPAIRED—Rewired or rebuilt; satisfaction guaranteed or no fee asked; charges reasonable. SIDNEY H. STONE, 5233 Glenwood-av. Edgewater 0805.

BUILDING AND REPAIR.

RADIO SETS REPAIRED AND REBUILT to order; work guaranteed; crystal sets in cabinet, installed for $10. Phone Albany 5076, 2300 N. Kimball, 1st flat.

EXCHANGE.

WANT RADIO PARTS—Loop dentist will exchange dental service. D-209, Chicago Evening Post.

AERIALS.

FIRST-CLASS AERIALS constructed reasonable. MR. SCHULZ, Hyde Park 0072.

RADIO SERVICE.

WILL WIRE OR REPAIR your set during spare time; charges will be reasonable. A. J. G. MEINER, 3224 Wallace-st.

CONSTRUCTION.

LET ME BUILD YOUR SET and save you money; write or call after 6:30 p. m. 5152 South Park-av., city.

CABINETS.

7x21 CABINET WITH BUILT-IN SPEAKER—Size 16¼x22¾x10; slightly marred. $4; $10 value. SMITH, 3968 Drexel-blvd.

Two-Way Tests Prove Antennas Must Be Large

It is seldom that an amateur radio long-distance test is accomplished without there being uncovered some technical truth destined to have a far-reaching effect on amateur transmission and frequently radio communication in general. Recently amateurs in France and Connecticut succeeded in carrying on the first short-wave communication between the two continents.

This feat not only meant that the dreams of amateur radio men had been finally realized, but it also brought to light a number of ideas in connection with short-wave radio that may be of important and lasting value. After thoroly going over the construction of French 8AB and American 1MO, the two stations most prominent during the tests, S. Kruse, technical editor of "QST," has been able to draw some interesting conclusions.

The common opinion that the minimum amount of interference experienced on the wave length of 100 meters used by these stations was mainly responsible for the success of the two-way transoceanic tests is not true, according to Mr. Kruse, in an article, "What the Work with F8AB Teaches the A. R. R. L.," which is to appear in full in the February issue of the amateur magazine "QST."

On the other hand, Mr. Kruse believes the transatlantic success was due primarily to the fact that each station participating used antennas that are large for the waves they are working. "Working an antenna that way," he says, "gives high radiation efficiency. The moment that statement is made the tribe of amperehounds will rise in protest. Nevertheless we are putting more power into the ether than ever before, tho the antenna current does drop.

"The idea has now been put thru some weeks of steady work with amateurs and in every case the successful American stations have been using big antennas with series condensers. Most of us do not have 'X' licenses, so we cannot work on 100 meters, but the lesson is just as good at 150 meters. Be sure to give your antenna a fundamental wave length of at least 220 meters."

When a writer says, "Use an aerial of one wire 100 feet long," he means that it should be 100 feet in one straight line, not in circles, angles or triangles. The length of an aerial is the distance from the lead to its farthest point, not the amount of wire used.

TERMINALS MAKE GOOD CONNECTIONS.

The use of copper terminals when wiring a set is strongly advised. By employing them a much firmer connection can be made to a binding post, socket or transformer than by merely twisting the wire. Of course, they should be soldered to the wire so as to make a permanent connection.

OHMAGE OF MULTITUBE RHEOSTAT.

When two amplifying tubes are controlled by one rheostat the ohmage of the rheostat should be lower than required for one tube. For instance, if two UV-199s or 299s are used, only a 25 ohm rheostat is required. If two 201-A's or two 301-A's are used only a 15 ohm rheostat is required.

SHIELDING PANELS.

A shielded panel will reduce body capacity, but it oftentimes also reduces the efficiency of a set. A much better method of eliminating body capacity is to extend the shaft of the instrument and place it three or four inches back from the panel. Never use a shield as a conductor for your "A" battery or your "B" battery.

RADIO CHAIN STORES

3 STORES IN CHICAGO

Chicago Leading Radio Stores' Offers

Another week of matchless bargains for radiophans—the greatest values in Chicago, bar none. All high quality and dependable. Another sale that will crowd our stores every day to next Thursday.

TUBES

CUNNINGHAM and RADIOTRON TUBES at special cut prices for this week only:—

201A, 199, WD12 or WD11. On sale here at only_____ $4.69

WESTINGHOUSE WR-21 TUBES

Detector or Amplifier, for use with 3 dry cells, does away with storage batteries. Very specially priced for this sale at

$2.89

Two for $5.49

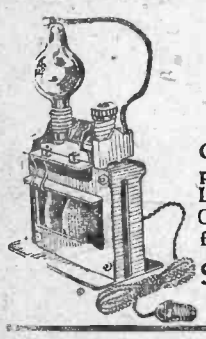
VARIABLE CONDENSERS

All Bakelite End Plates	Regular Price	Our Price
43-Plate Vernier	$7.00	$3.48
23-Plate Vernier	6.00	3.15
14-Plate Vernier	5.50	2.98
3-Plate Vernier	2.00	.98

PLAIN STYLE

	Regular Price	Our Price
43-Plate Plain	$4.00	$1.69
23-Plate Plain	3.50	1.39
11-Plate Plain	3.00	1.25
5-Plate Plain	2.50	1.15

BATTERY CHARGER WITH GENUINE TUNGAR BULB



Charges 2 amperes per hour. List price $18. Our special price for this sale

$8.69

REINARTZ 1-Tube Set

Complete, assembled. All parts in mahogany finished cabinet. Specially priced for this week's sale at

$15.95

PARTS ONLY—Unassembled. Price___ $11.45

Aerial Wire

Stranded Aerial Wire, used by U. S. Signal Corps. 100 ft. for_____ 29c

OTHER SPECIALS

Panels—High-grade, polished. Special per square inch _____ 1½c

Neutroformers, set of 3____$5.50

Neutrodons, each_____$1.00

Hercules, 4-Ways Plugs, Each, 65c. Two for___ $1.19

Molded V. T. Sockets, Each, 35c. Three for___ $1.00

V. T. Sockets, each_____19c

Enclosed Crystal Detector___49c

Phoné Jacks, up from_____19c

Phone Cords, special at_____33c

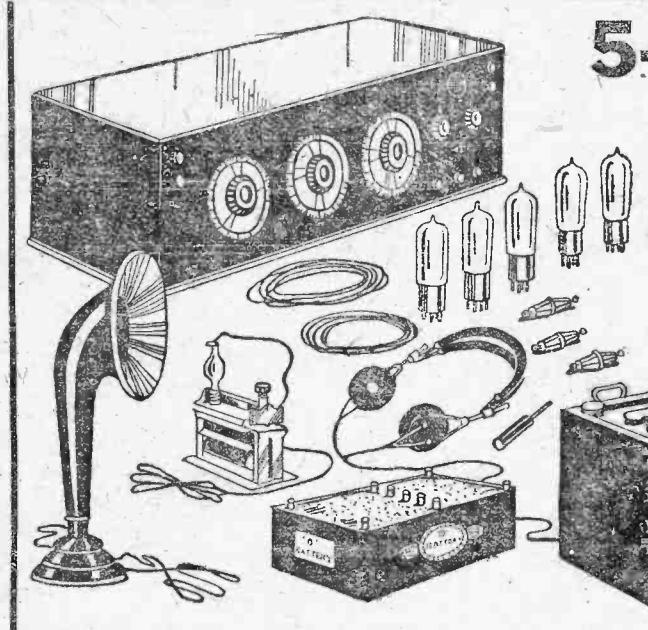
Raven Hygrade Variometer, $2.19

Jefferson Transformer_____$2.48

Antenella or Ducon Aerial Plug—Does away with outside Aerial. Special price___ 98c

Klosner Vernier Rheostats—Special for this sale___ 79c

Reinartz Mounted Coils____$1.59



5-Tube NEUTRODYNE Set Complete

Our tremendous sale during last week prompts us to guarantee the same low price for another week on this wonder set. We couldn't furnish you anything better if you came to us with TWICE the amount we ask. THERE IS NONE BETTER. Remember—we offer this set COMPLETE—no extras! Set comes in a very high grade cabinet, all parts assembled, including—

A $300 Value for $151.49

- Five Radiotron Tubes
- Loud Speaker
- Storage Battery
- Battery Charger
- B Batteries
- Head Set
- Aerial Wire
- Ground Wire
- Insulators
- Phone Plugs and
- Ground Clamp

Each Set with a Guarantee or Money Refunded. Complete with all listed parts, as above, for $151.49.

We Carry All Parts and Prints for Making These Sets

HEAD SETS

The Famous Baldwin Head Sets, listed at $12.00 a pair, offered in this six-day sale at an unusually low price_____ $6.69

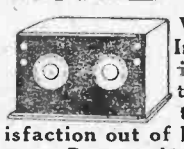
SPECIAL We have 200 Kilbourne - Clark guaranteed single Head Sets which we are offering at a very special price — actually the best value in Chicago— $1.79

OTHER SPECIAL VALUES	LIST PRICE	SALE PRICE
Roller-Smith	$8.00	$3.68
Edsh	7.50	4.25
Berwick 3000 ohm	7.00	2.98
Berwick 2000 ohm	6.00	2.68
Manhattan 3000 ohm	6.00	3.68
Manhattan 2000 ohm	5.00	3.25
Brandes	6.50	4.95

SETS IN CABINETS COMPLETE

Each Set Complete at the Price Quoted, Less Accessories	Prices Assembled Complete in Cabinet	Prices Unassembled
5-Tube Neutrodyne Set	$76.25	$61.00
4-Tube Neutrodyne Set	66.25	53.00
3-Tube Neutrodyne Set	36.66	29.33

WAVE TRAPS



Will cut out all Interference. This is an essential to the fan who wants to get utmost satisfaction out of his set. Parts only____ $4.98

COMPLETE—In highly polished cabinet, specially priced at $7.95.

LOUD SPEAKER

Beautifully finished. Stands 22 inches high. Guaranteed workmanship. With Edsh Unit,

$8.49

With Baldwin Unit,

$9.69

Our Guarantee!

Is your absolute assurance of complete satisfaction. We guarantee that EACH and EVERY article described herein—or that we sell you—is first-class in quality and workmanship—and warranted to satisfy you our customer. WE INSTALL RADIO SETS ON APPROVAL. Leave—or send us—your name and address.

IF IT'S RADIO — WE'VE GOT IT

CABINETS

Solid Oak and Mahogany Finish. Note the Prices:—

6x10½_____$2.10

6x21_____ 2.75

We have all others in stock.

Radio Corporation Cabinets

Genuine Veneer Finish Mahogany. 9¼x13¼. $10.00 value. Special ____ $2.69

Complete Parts for 2-STAGE AMPLIFIER

Can be used on any long or short wave V. T. receiver or crystal receiving set; will operate any loud speaker or loud speaking unit attachment.

1 7x9 Panel.
1 High-Ratio All-American or Thordarson Transformer.
1 Low-Ratio All-American or Thordarson Transformer.
1 Howard Rheostat.
2 Bakelite Sockets.
3 Double Jacks.
13 Binding Posts.

SOLD ELSEWHERE AT $20.00

OUR SPECIAL PRICE

$12.69

OUR MARVEL CRYSTAL SET

Made by one of the largest and most reliable manufacturers. Complete with the following

STANDARD EQUIPMENT

Head Set, Aerial Wire, Ground Wire, Insulators, Ground Clamp.

COMPLETE—Ready to Install and FULLY GUARANTEED

A REMARKABLE VALUE

$10.50

Complete Parts for POWER AMPLIFIER

1 Set of Push and Pull Thordarson or All-American Power Transformers.
2 V. T. Sockets.
1 Howard Power Rheostat.
8 Binding Posts.
5 Switch Points and Stops.
1 Switch Lever.
1 Cutler-Hammer Filament Switch.
1 7x9 Panel.

Baseboard and instructions for assembling and mounting.

SOLD ELSEWHERE AT $25.00

OUR SPECIAL PRICE

$16.69

STORAGE BATTERIES

We guarantee each battery for TWO YEARS. If you have any trouble at all return for cash refund. Special prices for this sale:—

60 Ampere Hours $10.48
80 Ampere Hours 11.75
100 Ampere Hours 14.25
120 Ampere Hours 17.50

FREE EDSH Hydrometer with each battery bought in this sale.

5c, 10c and 25c Specials

Pathfinder 19c	Telephone Cord Tips.....2 for 5c	Contact Points, per dozen 5c
Spaghetti, assorted colors, yd.....7c	Soldering Lugs, all sizes, dozen...10c	Stops, dozen.....5c
2 ft. length Square Wire.....2 for 5c	Porcelain Insulators 5c	Switch Levers...10c
Round Hook-up Wire, 25-ft. coil for 25c	Composition Insulators 10c	Adjustable Levers for 19c
		Battery Porcelain Switch 19c

Cockaday Circuit—Complete Parts

Specially offered in this week's sale at an extremely low price_____ $10.98

B Batteries

22½ volt; fresh stock. Special price for this sale _____ 98c

EXTRA SPECIAL!

Baldwin Type C Loud Speaker Unit. $6.00 value. Our price_____ $4.35

NEW NORTH SIDE STORE—2423 N. HALSTED STREET

RADIO CHAIN STORES OF AMERICA

3 CHICAGO STORES

167 W. RANDOLPH ST.
9-SO. CLARK ST.

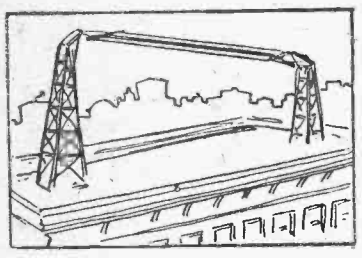
3 CHICAGO STORES

OPEN EVENINGS AND SUNDAY

MAIL ORDERS FILLED

THE CHICAGO EVENING POST

RADIO MAGAZINE



Published Every Thursday

THURSDAY, JANUARY, 24, 1924.

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The Chicago Evening Post

BROADCASTING

HOME RADIO

RADIO SETS

HOOK-UPS

AMATEUR RECEPTION

HOME-WORKSHOP

RADIO SCIENCE-

RADIO PROGRAMS

LOCAL NEWS

U.S. RADIO NEWS

HOME LABORATORY

AMATEUR TRANSMISSION

RADIO STATIONS

INVENTIONS

D.X. RECORDS

RADIO PRACTICE-

COMMERCIAL

MARY MAYO DE FOREST, wife of Dr. Lee De Forest, the inventor of the audion tube. She has a surprisingly fine soprano voice and has appeared in concerts both in this country and Europe. She was heard recently in Chicago over WJAZ.

FOREIGN RADIO NEWS

MANUFACTURERS NEWS

NEW EQUIPMENT

DEALERS NEWS

JOBBER NEWS

IN THIS ISSUE

Hook-up and Construction Details of Simplified Regenerative Set in Compact Form—How to Build a Superduc Junior—Tuning the Universal Panel from a Reinartz into a Three-Circuit Regenerative Receiver—Helpful Hints on Operation of Home Sets.

Broadcasting Stations and Schedules

Central, or Chicago time, is shown on all stations. If necessary to ascertain local time on any station deduct two hours from time shown for Pacific coast stations, one hour from time shown for the Rocky mountain stations and add one hour to those stations using eastern time. Hawaiian island time is four hours and a half slower than Chicago time. In the list the call number of the station is first given, followed by the location, the owner's name, wave length used and broadcasting schedule in order named. THE POST is making a thoro canvass of all stations in order that this directory may be complete and accurate. Changes are so frequent in stations and schedules that no list can be satisfactory which is not corrected frequently. Corrections and additions to this list will be made from week to week. Stations are urged to co-operate by sending information of changes in schedule to Radio Editor, The Chicago Evening Post.

CFAC—Calgary Herald, Calgary, Canada; 430 meters; Fred Carleton, director and operator; silent Monday. Wednesday and Thursday; Tuesday, day, 1 to 1:30, night, 7:45 to 7:55; Friday, day, 1 to 1:30, night, 7:45 to 8:45 and 11 to 12.

CKAC—La Presse, Montreal, Canada; 430 meters; J. M. Carter, announcer and director; day, 4, music; 4:30, weather and stock reports; special Tuesday, Thursday and Saturday, night, 7, kiddies stories in French and English; 7:30 to 10 lectures in French and English, music; Sunday, day, 4, sacred music.

CKOC—Wentworth Radio Supply company, Hamilton, Ont.; 410 meters H. Slach, operator; silent nights, Tuesday, Thursday; Saturday, night, 7:30 to 9; special Sunday night church exercises, 7 to 8.

CYL—Mexico City, D. F. "El Universal"; 500 meters; Reul Azcarraga, director; G. Obregon Jr., announcer (Spanish), Sendel Hodges, announcer (English); daily, 12:54 p. m., news and weather; 8:24 p. m., war bulletins from the war and navy departments; Tuesdays and Fridays, 8:24 to 8:54 p. m., music; Sunday, 7:24 p. m., war bulletins.

KDKA—East Pittsburg, Westinghouse Electric and Manufacturing company, 326 meters.

KDPM—Cleveland, Ohio, Westinghouse Electric and Manufacturing company, 270 meters.

KDPT—San Diego, Calif., Southern Electrical company, 244 meters.

KDYL—Salt Lake City, Utah, Telegram Publishing company, 244 meters.

KDYM—San Diego, Calif., Savoy theater, 252 meters.

KDYQ—Oregon Institute of Technology, Portland, Ore., 360 meters; program director, L. E. Simson.

KDYQ—Portland, Ore., Oregon Institute of Technology, 360 meters.

KDYS—Great Falls, Mont., The Tribune, 360 meters.

KDYW—Phoenix, Ariz., Smith Hughes & Co., 360 meters.

KDYX—Honolulu, Hawaii, Star Bulletin, 360 meters.

KDZB—Bakersfield, Calif., 1402 20th street, Frank E. Seifert, 240 meters.

KDZE—Seattle, Wash., The Rhodes company, 455 meters.

KDZF—Los Angeles, Calif., Automobile Club of Southern California, 278 meters.

KDZI—Wenatchee, Wash., Electric Supply company, 360 meters.

KDZK—Reno, Nev., Nevada Machinery and Electric company, 360 meters.

KDZQ—Denver, Colo., Nichols Academy of Music, 360 meters.

KDZR—Bellingham Publishing company, Bellingham, Wash., 261 meters; 50 watts; operator and announcer, A. M. Brown; silent Thursday; night, 9 to 10, local talent, phonograph music.

KDZT—Seattle, Wash., Seattle Radio association, 360 meters.

KFAD—Phoenix, Ariz., McArthur Bros. Mercantile company, 360 meters.

KFAE—Pullman, Wash., State College of Washington, 360 meters; director, H. V. Carpenter; program manager, A. J. Kralowse; silent Tuesday, Thursday, Saturday, Sunday, night, 9:30 to 11; educational lectures.

KFAF—Western Radio corporation, Denver, Colo., 360 meters. Silent nights, Sunday and Wednesday. Nights, 9 to 10.

KFAJ—Boulder, Colo., University of Colorado, 360 meters.

KFAN—Moscow, Idaho, The Electric shop, 360 meters.

KFAP—Butte, Mont., Standard Publishing company, 360 meters.

KFAR—Hollywood, Calif., Studio Lighting Service company (O. K. Olsen), 280 meters.

KFAU—Boise, Idaho, Independent School District of Boise City, Boise High school, 270 meters.

KFAV—Venice, Calif. Abbot Kinney company, 224 meters.

KFAW—Santa Ana Calif., The Radio Den (W. B. Ashford and H. T. White), 280 meters.

KFAY—Medford, Ore., Virgin's Radio service, 283 meters.

KFBB—Havre, Mont., F. A. Buttrey & Co., 360 meters.

KFBC—San Diego, Calif., W. K. Azbill, 278 meters.

KFBE—San Luis Obispo, Calif., Reuben H. Horn, 360 meters.

KFBG—Tacoma, Wash., First Presbyterian church, 360 meters.

KFBK—Sacramento, Calif., Kimball-Upson company, 283 meters.

KFBL—Everett, Wash., Leese Bros., 224 meters.

KFBS—Trinidad, Colo., Trinidad Gas and Electric Supply company and the Chronicle News, 360 meters.

KFBU—Laramie, Wyo., The Cathedral (Bishop N. S. Thomas), 283 meters.

KFCB—Phoenix, Ariz., Nielson Radio Supply company, 238 meters.

KFCD—Salem, Ore., Salem Electric company, 360 meters.

KFCF—Walla Walla, Wash., 707 Baker building, Frank A. Moore, 360 meters.

KFCH—Billings, Mont., Electric Service station (Inc.), 360 meters.

KFCK—Colorado Springs, Colo., Colorado Springs Radio company, 258 meters.

KFCL—San Antonio, Calif., Los Angeles Union Stock yards, 360 meters.

KFCM—Richmond, Calif., Richmond Radio shop (Frank T. Doeing), 360 meters.

KFCP—Ogden, Utah, 2421 Jefferson avenue, Ralph W. Flygare, 360 meters.

KFCY—Houston, Texas, Fred Mahaffey, Jr., 360 meters.

KFCY—Le Mars, Iowa, Western Union college, 252 meters.

KFCZ—Omaha, Neb., Omaha Central High school, 258 meters.

KFDA—Baker, Ore., Adler's Music store, 360 meters.

KFDD—Boise, Idaho, St. Michael's cathedral, 252 meters.

KFDH—Tuscon, Ariz., University of Arizona, 360 meters.

KFDJ—Corvallis, Ore., Oregon Agricultural college, 360 meters.

KFDL—Denver, Colo., Knight-Campbell Music company, 360 meters, 50 watts.

KFDO—Bozeman, Mont., 420 West Koch street, H. Everett Cutting, 248 meters.

KFDP—Des Moines, Iowa, Hawkeye Radio and Supply company, 278 meters.

KFDR—York, Neb., Bullock's Hardware and Sporting Goods (Robert G. Bullock), 360 meters.

KFDU—Lincoln, Neb., Nebraska Radio Electric company, 240 meters.

KFDV—Fayetteville, Ark., Gilbrech & Stinson, 360 meters.

KFDX—Shreveport, La., First Baptist church, 360 meters.

KFDY—Brookings, S. D., South Dakota State College of Agriculture and Mechanic Arts, 360 meters.

KFDZ—Minneapolis, Minn., 2510 South Thomas avenue, Harry O. Iverson, 360 meters.

KFEC—Portland, Ore., Meier & Frank company, 360 meters.

KFEJ—Tacoma, Wash., 1724 South Jay street, Guy Greason, 360 meters.

KFEL—Denver, Colo., Winner Radio corporation, 360 meters.

KFEP—Denver, Colo., Radio Equipment company (Joseph L. Turre), 240 meters.

KFEQ—Oak, Neb., J. L. Scroggin, 360 meters.

KFER—Fort Dodge, Iowa, Auto Electric Service company, 231 meters.

KFEV—Douglas, Wyo., Radio Electric Shop, 263 meters.

KFEX—Minneapolis, Minn., Augsburg Seminary, 261 meters.

KFEY—Kellogg, Idaho, Bunker Hill and Sullivan Mining and Concentrating compahy, 360 meters.

KFEZ—St. Louis, Mo., American Society of Mechanical Engineers (F. H. Schubert), 360 meters.

KFFB—Boise, Idaho, Jenkins Furniture company, 240 meters.

KFFE—Pendleton, Ore., Eastern Oregon Radio company, 360 meters.

KFFO—Hillsboro, Ore., Dr. E. S. Smith, 229 meters.

KFFP—Moberly, Mo., First Baptist church, 275 meters.

KFFQ—Colorado Springs, Colo., Marksheffel Motor company, 360 meters.

KFFR—Sparks, Nev., Nevada State Journal (Jim Kirk), 226 meters.

KFFV—Lamoni, Iowa, Graceland college, 360 meters.

KFFX—Omaha, Neb., McGraw company, 278 meters.

KFFY—Alexandria, La., Pincus & Murphy, 275 meters.

KFFZ—Dallas, Texas (portable). Al. G. Barnes Amusement company, 226 meters. —Baton Rouge, La., Louisiana State university, 254 meters.

KFGD—Chickasha, Okla., Chickasha Radio and Electric company, 248 meters.

KFGH—Standard University, Cal., Leland Stanford university, 360 meters.

KFGJ—St. Louis, Mo., Missouri National guard 138th infantry, 266 meters.

KFGL—Arlington, Ore., Arlington garage, 234 meters.

KFGP—Cheney, Kan., Cheney Radio company, 239 meters.

KFGQ—Boone, Iowa, Crary Hardware company, 226 meters.

KFGV—Utica, Neb., Heidbreder Radio Supply company, 224 meters.

KFGX—Orange, Texas, First Presbyterian church, 250 meters.

KFJB—Marshalltown, Iowa, Marshalltown Electrical company, 248 meters.

KFJC—Seattle, Wash., Post Intelligencer, 233 meters.

KFJD—Greeley, Colo., Weld County Printing and Publishing company, 236 meters.

KFJF—Oklahoma City, Okla., National Radio Manufacturing company, 252 meters.

KFJH—Selma, Cal., The Sugar Bowl (H. R. Shaw), 273 meters.

KFJI—Astoria, Ore., Liberty theater (E. E. Marsh), 252 meters.

KFJJ—Carrollton, Mo., Carrollton Radio shop, 236 meters.

KFJK—Bristow, Okla., Delano Radio and Electric company, 233 meters.

KFJI—Ottumwa, Iowa, Hardsacg Manufacturing company, 242 meters.

KFJM—Grand Forks, N. D., University of North Dakota, 229 meters.

KFJQ—Grand Forks, N. D., Electric Construction company (portable), 252 meters.

KFJR—Stevensville, Mont., Ashley C. Dixon and Son, 258 meters.

KFJV—Dexter, Iowa, Thomas H. Warren, 224 meters.

KFJW—Towanda, Kan., Le Grand Radio company, 224½ meters.

KFJX—Cedar Falls, Iowa, State Teachers' college, 229 meters.

KFJY—Fort Dodge, Iowa, Tunwall Radio company, 246 meters.

KFJZ—Fort Worth, Texas, Texas National Guard, 112th Cavalry, 254 meters.

KFKA—Greeley, Colo., Colorado State Teachers' college, 248 meters.

KFKB—Milford, Kan., Brinkley-Jones Hospital association, 286 meters.

KFKH—Lakeside, Colo., Denver Park and Amusement company, 248 meters.

KFKQ—Conway, Ark., Conway Radio laboratories, 224 meters.

KFKV—Butte, Mont., F. F. Gray, 283 meters.

KGY—Lacy, Wash., St. Martin's college 258 meters; 10 watts; evening, 10 to 11:30.

KHJ—Los Angeles, Cal., Times-Mirror company, 395 meters.

KHQ—Seattle, Wash., 419 13th avenue, Louis Wasmer, 360 meters.

KJQ—Stockton, Cal., 615 East Main street, C. O. Gould, 360 meters.

KJR—Seattle, Wash., Northwest Radio Service company; 283 meters; daily except Saturday and Sunday, 7:30 to 8:15 p. m.; Monday, Wednesday and Friday, 9:30 to 10:30.

KJS—Los Angeles, Cal., Bible Institute of Los Angeles, 360 meters.

KLN—Monterey, Cal., Monterey Electric Shop, 360 meters.

KLS—Oakland, Cal., 2201 Telegraph avenue, Warner Brothers, 360 meters; director, Miss A. Warner; announcer, S. Warner. Week days, 1:30 to 3; Friday evening, 10 to 11; Sunday afternoon, 2 to 3.

KLX—Oakland, Calif., The Oakland Tribune; 509 meters; 500 watts; silent Sunday; evenings, 9, news bulletins; 9:30, weather; 10, studio programs, lectures, entertainment.

KLZ—Denver, Colo., Reynolds Radio company, 360 meters.

KMJ—Fresno, Calif., San Joaquin Light and Power corporation, 273 meters, 50 watts; R. C. Denny, operator and director; Wayne Freund, announcer; Tuesday, Friday and Sunday night, 10 to 11.

KMO—Tacoma, Wash., Love Electric company, 360 meters.

KNJ—Roswell, New Mexico, Roswell Public Service company, 250 meters.

KNT—Aberdeen, Wash., Grays Harbor Radio company (Walter Hemrich), 263 meters.

KNV—Los Angeles, Cal., Radio Supply company, 360 meters.

9 to 10:30 p. m., music, addresses, stories, news.

KZV—Wenatchee, Wash., Wenatchee Battery and Motor company, 360 meters.

NAA—Arlington, Va., U. S. Navy dept., 435 meters; daily except Sunday, 8:45 to 9:40 a. m., markets; 11:25 to 11:40, markets; 12:45 to 1:20 p. m., markets; 2:25 to 3:40 p. m., markets; 9:05 to 9:20 p. m., weather.

WAAB—New Orleans, La., 137 South St. Patrick street, Valdemar Jensen, 268 meters.

WAAC—New Orleans, La., Tulane university, 360 meters.

WAAD—Cincinnati, Ohio, Ohio Mechanics institute, 360 meters, 25 watts, range, 50 miles.

WAAF—Chicago, Ill., Chicago Daily Drovers Journal, 286 meters: Daily except Sundays and holidays, 8:10, 10:45, 12:40, 3, 4:30 p. m., markets; 10:30, 12:30 p. m., weather.

WAAH—St. Paul, Minn., Commonwealth Electric company, 360 meters.

WAAK—Milwaukee, Wis., Gimbel Brothers, 280 meters.

WAAM—Newark, N. J., I. R. Nelson company, 263 meters.

WAAN—Columbia, Mo., University of Missouri, 254 meters.

WAAW—Omaha, Neb., Omaha Grain Exchange, 360 meters, 500 watts: Daily except Sunday, 9:45, 10:45, 11:45, 12:45, 1:15 and 8, world markets; final report Saturday at 12:45 p. m.

WAAZ—Emporia, Kan., Hollister-Miller Motor company, 360 meters.

WAAB—Harrisburg, Pa., Dr. John B. Lawrence, 266 meters.

WABC—Anderson, Ind., Fulwider-Grimes Battery company, 229 meters.

WABD—Dayton, Ohio, Parker high school, 283 meters.

WABE—Washington, D. C., Young Men's Christian association, 283 meters.

WABI—Mount Vernon, Ill., Mount Vernon Register-News company, 234 meters.

WABG—Jacksonville, Fla., Arnold Edwards Piano company, 248 meters.

WABH—Sandusky, Ohio, Lake Shore Tire company, 240 meters.

WABI—Bangor, Me., Bangor Railway and Electric company, 240 meters.

WABA—Lake Forest, Ill., Lake Forest college, 266 meters.

WABJ—South Bend, Ind., The Radio Laboratories, 240 meters.

WABK—Worcester, Mass., First Baptist church, 252 meters.

WABL—Storrs, Conn., Connecticut Agricultural college, 283 meters.

WABM—Saginaw, Mich., F. E. Doherty Automotive and Radio Supply company, 254 meters.

WABN—La Crosse, Wis., Waldo C. Grover, 234 meters.

WABO—Rochester, N. Y., Lake Avenue Baptist church, 252 meters.

WABT—252 meters; Washington, Pa.; owner, Halliday Hall.

WABW—Wooster, Ohio; 234 meters; 20 watts.

WABX—Mount Clemens, Mich.; 270 meters; 150 watts.

WBAA—West Lafayette, Ind., Purdue university, 360 meters.

WBAD—Minneapolis, Minn., Sterling Electric company, 360 meters.

WBAH—Minneapolis, Minn., The Dayton company, 360 meters.

WBAN—Paterson, N. J., Wireless Phone corporation, 244 meters

WBAO—Decatur, Ill., James Millikin university, 360 meters.

WBAP—Fort Worth, Texas, Wortham-Carter Publishing company (Star-Telegram), 476 meters, 750 watts: Silent Saturday and Sunday nights. Operator, E. L. Olds; supervisor, H. W. Hough; announcer, "The Hired Hand." Daily program, 11 a. m., markets, aviation, weather; 12 noon, 1, 2, 4 p. m., markets and information; 5 p. m., financial news; 8:30 to 11:45 p. m., concert.

WBAV—Columbus, Ohio, Einer and Huphins company, 390 meters; 500 watts. Director, R. S. Bohannan; program director Miss Helen Mears; announcer, H. E. Day. Daily except Sunday, 12:30 to 1, markets and news. Monday evening, 8 to 10, music.

WBAW—Marietta, Ohio, Marietta college, 246 meters.

WBAX—Wilkesbarre, Pa., 66 Gildersleeve street, John H. Stenger, Jr., 360 meters.

WBAY—New York, N. Y., Western Electric company, 492 meters.

WBBA—Newark, Ohio, Newark Radio Laboratories, 240 meters.

WBBC—Sterling, Ill., Sterling Radio Equipment company, 229 meters.

WBBD—Reading, Pa., Barbey Battery Service, 234 meters.

WBL—Anthony, Kan., T. & H. Radio company, 261 meters.

WBS—Newark, N. J., D. W. May, Inc., 360 meters.

WBT—Charlotte, N. C., Southern Radio corporation, 360 meters.

WBU—Chicago, Ill., City of Chicago, 286 meters.

WBZ—Springfield, Mass., Westinghouse Electric and Manufacturing company, 337 meters.

WCAD—Canton, N. Y., St. Lawrence university, 280 meters.

WCAE—Pittsburg, Pa., Kaufmann & Baer company, 462 meters; daily, 11:30, weather; 2:30, news; 3:30, stocks; 5:30, dinner music; 6:30, children's stories; 7:30, music; Sunday, 2 p. m., people's radio church service, Rev. Dr. George W. Shelton; 6:30, music.

WCAG—New Orleans, La., 2813 Calhoun street, Clyde R. Randall, 268 meters.

WCAR—Columbus, Ohio, Entrekin Electric company, 236 meters.

WCAJ—University Place, Neb., Nebraska Wesleyan university, 360 meters; station director and announcer, J. C. Jensen; daily, 10:30 a. m., weather; Tuesday, 6 p. m., children's stories; Thursday, 8 p. m., lectures and music.

WCAK—Houston, Texas, 2504 Bagby street, Alfred P. Daniel, 360 meters.

WCAL—Northfield, Minn., St. Olaf college, 360 meters.

WCAM—Villanova, Pa., Villanova college, 360 meters.

WCAO—Baltimore, Md., Sanders & Stayman company, 360 meters; daily, 10:55, time signals; 11 a. m., weather; 11:05, music; Monday and Wednesday, 7 p. m., music.

WCAP—Washington, D. C., Chesapeake & Potomac Telephone company, 469 meters.

WCAR—San Antonio, Texas, Alamo Radio Electric company, 360 meters.

WCAS—Minneapolis, Minn., William Hood Dunwoodie Industrial institute, 246 meters; director, M. R. Bass; operator and announcer, F. P. Upton; Monday, 7 to 7:30 p. m., music; Tuesday, 8:15 to 9:30 p. m., music and educational programs (9:30 to 10:45 on alternate weeks); Wednesday, 6:30 to 7, music and technical lectures; Thursday, 7 to 7:30 p. m., notes on radio and code practice.

WCAT—Rapid City, S. D., South Dakota State School of Mines, 240 meters.

WCAU—Philadelphia, Pa., Durham & Co., 286 meters.

WCAV—Little Rock, Ark., J. C. Dice Electric company, 360 meters.

WCAX—Burlington, Vt., University of Belmont, 360 meters.

WCAY—Milwaukee, Wis., Kesselman O'Driscoll company, 261 meters.

WCAZ—Carthage, Ill., Carthage college, 246 meters.

Continued on Page 14.

THE CHICAGO EVENING POST TABLOID RADIO SCHEDULES

These stations are those most commonly tuned in evenings by the Chicago broadcast listeners. The time given is central standard. Pacific coast time is two hours earlier than that shown here. Mountain time is one hour earlier, and eastern time one hour later. Evening program schedules only are given. This list was compiled by The Chicago Evening Post Radio Department and is protected by copyright.

STATION	Miles	Met	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Chicago—									
KYW, Comm. Edison Bldg		536		6:30- 9:30	6:30-12:00	6:30- 9:30	6:30- 9:30	6:30-12 m.	6:30- 9:30
WAAF, Union Stock Yards		286	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00		
WMAQ, Hotel La Salle		536		7:00- 9:55	7:00- 9:55	7:00- 9:55	7:00- 9:55	8:00-10:00	
WDAP, Drake Hotel		360		7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	9:15-10:30
WJAZ, Edgewater Beach Hotel		448		10:00-12:30	10:00-12:30	10:00-12:30	10:00-12:30	10:00- 2:00	6:00- 9:00
Suburban—									
WCBD, Zion, Ill	39	345	8:00- 9:00				8:00- 9:00		
WIAB, Rockford, Ill	77	252	9:00-				8:00-		12:00-
WRM, Urbana, Ill	120	360			8:50- 9:30				
WTAS, Elgin, Ill	37	275			7:30-10:00				
Eastern—									
KDKA, East Pittsburg	430	326	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WBZ, Springfield, Mass	802	337	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	
WEAF, New York City	733	495	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00
WGI, Medford Hillside, Mass	875	360	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	7:30- 9:00
WHAZ, Troy, N. Y	748	380	8:00- 9:30						
WGY, Schenectady, N. Y	698	280	6:45-11:30	6:45- 9:00	6:45- 9:00	6:45- 9:00	6:45-11:30	6:45- 9:00	
WGR, Buffalo	472	319	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	
WHN, New York City	912	360	1:15-11:00	1:15-11:00	1:15-11:00	1:15-11:00	1:15-11:00	1:15-11:00	
WJY, New York City	733	405							2:30- 6:60
WJZ, New York City	733	455	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	
WOO, Philadelphia	677	509	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	
WRC, Washington, D. C	612	469	8:00-10:00		8:00-10:00		8:00-10:00		
Midwest—									
WCX, Detroit	245	517	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00		
WJAX, Cleveland	323	390		7:30- 9:30		8:00-10:30			
WLAG, Minneapolis	358	417	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	
WLW, Cincinnati	262	309	8:00-10:00	10:00-12:00	8:00-10:00	10:00-12:00			
WOC, Davenport	105	481	7:00-11:00		7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WTAM, Cleveland	323	300	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30
WWJ, Detroit	245	517	8:30-10:00	8:30-10:00	8:30-10:00	8:30-12 m.	8:30-10:00		
Southern—									
KSD, St. Louis	270	546	8:00-11:00	8:00-11:00	8:00-11:00		8:00-11:00	8:00-11:00	
WBAP, Fort Worth, Texas	855	476	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00		
WDAF, Kansas City, Mo	430	411	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	
WFAA, Dallas, Texas	853	476	6:45- 9:30	6:45- 9:30	6:45- 9:30	6:45- 7:30	6:45- 9:30	6:45- 9:30	9:30-11:00
WGV, New Orleans	858	350	7:00- 8:00		7:00- 8:00			7:00- 8:00	
WHAS, Louisville	271	400			7:30- 9:00				4:00- 5:00
WHB, Kansas City, Mo	430	411		7:00- 9:00		7:00- 9:00	7:00- 9:00		8:00-10:00
WMC, Memphis	480	500		11:00-12:00			11:00-12:00	8:00-10:00	8:00-10:00
WOAI, San Antonio, Texas	1,080	385		9:30-10:30				9:30-10:30	
WOS, Jefferson City, Mo	337	441	8:00- 9:30		8:00- 9:30		8:00- 9:30		
WSB, Atlanta, Ga	605	428	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	7:30- 9:00
Pacific Coast—									
KFDB, San Francisco	1,910	509	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30
KGW, Portland, Ore	1,895	492	1:00-1 a.m.	10:00-11:00	10:00-11:00	10:00-11:00	1:00-2 a.m.	10:00-11:00	9:00-10:00
KHJ, Los Angeles	1,795	395	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	10:00-12:00
KPO, San Francisco	1,910	423	6:30-12 m.	6:30-12 m.	7:30-12:00	6:30-12 m.		6:30-12 m.	10:30-12 m.

KFGZ—Berrien Springs, Mich., Emmanuel Missionary college, 268 meters.

KFHA—Gunnison, Colo., Colorado State Normal school, 252 meters.

KFHB—Hood River, Ore., Rialto theater (P. L. Beardwell), 280 meters.

KFHD—St. Joseph, Mo., Utz Electric Shop company, 226 meters.

KFHF—Shreveport, La., Central Christian church, 266 meters.

KFHH—Neah Bay, Wis., Ambrose A. McCue, 283 meters.

KFHJ—Santa Barbara, Cal., Fallon & Co., 360 meters. Manager, S. Haskings. Evening—8 to 8:40 p. m., news bulletins, bed-time story; 11 to 12, music.

KFBQ—Los Gatos, Cal., Curtis Brothers Hardware store, 242 meters.

KHR—Seattle, Wash., Star Electric and Radio company, 270 meters.

KFHS—Lihue, Hawaii, Clifford J. Dow, 275 meters.

KFHU—Mayville, N. D., M. G. Steren, 261 meters.

KFHX—Hutchinson, Kan., 407 East 1st street, Robert W. Nelson, 229 meters.

KFI—Los Angeles, Cal., Earle C. Anthony (Inc.), 469 meters.

KFIB—St. Louis, Mo., 5666 Vernon avenue, Franklin W. Jenkins, 244 meters.

KFID—Iola, Kan., Ross Arbuckle's garage, 246 meters.

KFIF—Portland, Ore., Benson Polytechnic institute, 360 meters.

KFIK—Gladbrook, Iowa, Gladbrook Electric company, 234 meters.

KFIL—Louisburg, Kan., Windisch Electric Farm Equipment company, 234 meters.

KFIO—Spokane, Wash., North Central high school, 252 meters.

KFIQ—Yakima, Wash., Yakima Valley Radio Broadcasting association, 224 meters.

KFIU—Juneau, Alaska, Alaska Electric Light and Power company, 226 meters.

KFIV—Pittsburg, Kan., 706 East 10th street, V. H. Broyles, 240 meters.

KFIX — Independence, Mo., Reorganized Church of Jesus Christ of Latter Day Saints, 240 meters.

KFIY—Seattle, Wash., Brott laboratories, 236 meters.

KFIZ—Fond du Lac, Wis., Daily Commonwealth, 237 meters.

KFJA—Grand Island, Neb., Central Power company, 244 meters.

KFKX—Hastings, Neb., Westinghouse Electric and Manufacturing company, 286 meters.

KFKZ—Colorado Springs, Colo., Nassour Bros. Radio company, 234 meters.

KFLA—Butte, Mont., Abner R. Wilson, 283 meters.

KFLB—Menominee, Mich., Signal Electric Manufacturing company, 248 meters.

KFLD—Franklinton, La., Paul E. Greenlaw, 234 meters.

KFLE—Denver, Colo., National Educational Service, 268 meters.

KFLH—Salt Lake City, Utah, Erickson Radio company, 261 meters.

KFLP—Cedar Rapids, Ohio, Everette M. Foster, 240 meters.

KFLQ—Little Rock, Ark., Bizzell Radio shop, 261 meters.

KFLR—Albuquerque, N. M., University of New Mexico, 254 meters.

KFMO—Fayetteville, Ark., 263 meters, 100 watts.

KFMR—Sioux City, Iowa; 261 meters; 10 watts.

KFMS—Duluth, Minn.; 275 meters; 100 watts.

KFMT—Minneapolis, Minn.; 231 meters; 5 watts.

KFMU—San Marcos, Texas; 240 meters; 20 watts.

KFMW—Houghton, Mich.; 266 meters; 50 watts.

KFMX—Northfield, Minn.; 283 meters; 500 watts.

KGB—Tacoma, Wash., Wm. A. Mullins Electric company, 360 meters.

KGG—Hallack & Watson Radio Service, Portland, Ore., 460 meters, 50 watts. Day—2:45 to 3, news. Evening—7:30 to 8, phonograph and sporting news; 9:30 to 10, press and police reports; special Wednesday and Sunday, 11 to 12 midnight, singing concert.

KGN—Portland, Ore., Northwestern Radio Manufacturing company, 360 meters.

KGU—Honolulu, Hawaii, Waiwiwi Beach, Marion A. Mulrony, 360 meters.

KGW—Portland, Ore., Portland Oregonian; 492 meters: Day—1:30, weather; 5:30, lectures and children's hour. Evening—10, music; 11, lecture; 12, music.

KNX—Los Angeles, Cal., Electric Lighting Supply company, 360 meters.

KOB—State College, New Mexico, New Mexico College of Agriculture and Mechanic Arts, 360 meters. Daily, time signals, weather, news, crop reports; Monday, Wednesday, Friday night, 8:30 to 9:30, concerts.

KOP—Detroit Police department, Detroit, Mich., 286 meters; daily except Sunday; 1 p. m., to 6:30 p. m.

KPO—San Francisco, Cal., Hale Brothers 423 meters; silent Friday; Sunday night, 10:30 to 12, concert; Monday, 10 to 11, organ, 11 to 12, dance music; Tuesday, Wednesday, Thursday nights, 10 to 11, studio program, 11 to 12, dance music; Saturday night, 10 to 2 a. m., dance music.

KQI—Berkeley, Cal., University of California, 360 meters.

KQP—Hood River, Ore., Apple City Radio club, 360 meters.

KQV—Pittsburg, Pa., Doubleday-Hill Electric company, 360 meters.

KQW—San Jose, Cal., Berkeley Daily Gazette, 278 meters.

KSD—St. Louis, Mo., Post Dispatch (Pulitzer Publishing company), 546 meters.

KSS—Long Beach, Cal., Prest & Dean Radio company and Radio Research Society of Long Beach, Cal., 229 meters; 10 watt; Boy Scout news.

KTW—Seattle, Wash., First Presbyterian church, 360 meters.

KUO—San Francisco, Cal., Examiner Printing company, 360 meters.

KUS—Los Angeles, Cal., City Dye Works and Laundry company, 360 meters.

KUY—El Monte, Cal., Coast Radio company, 360 meters.

KWG—Stockton, Cal., Portable Wireless Telephone company, 360 meters.

KWH—Los Angeles, Cal., Los Angeles Examiner, 360 meters.

KXD—Modesto, Cal., Modesto Herald Publishing company, 360 meters.

KYQ—Honolulu, Hawaii, Electric Shop, 360 meters.

KYW—Chicago, Ill., Westinghouse Electric and Manufacturing company, 345 meters.

KZM—Oakland, Cal., 13th and Harrison streets, Preston D. Allen, 360 meters.

KZN—Salt Lake City, Utah, The Deseret News, 360 meters; daily except Sunday

Edited by a Staff of Regular and Special Contributing Writers.

The RADIO MAGAZINE Section is edited with the view of giving authentic news of the radio broadcasting field and authoritative information on the subjects of home construction of receiving and transmission sets, of the operation and maintenance of apparatus, and as an exchange of opinion for its readers.

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Squier Sees New Radio Era Coming

By HARRY B. HUNT.
(NEA Service Writer.)

WASHINGTON, Jan. 17.—"We have just arrived at the era of the ear.

"Up to the present we have gotten our education and culture chiefly thru the medium of the eye—pictures, sculpture, beautiful surroundings, the printed words of literature.

"Now, however, we have come to the era of the ear. The ear and not the eye is the medium thru which the greatest advance in knowledge, entertainment and culture is to be achieved in the immediate future."

Such is the conclusion of Maj. Gen. George O. Squier, recently retired as chief of the United States army signal corps, one of the world's foremost authorities on wire and wireless communication.

"Radio," says Squier, "is easily the greatest potentiality in the world today. Its power to reach all places simultaneously with any sort of message staggers the imagination. And it is thru radio that the ear will become the medium of our greatest future development.

Industry Grows.

"Altho the youngest of the arts, the art of radio broadcasting has completely outstripped all others. But it is not near the peak of development. In fact, it is just beginning to reach the stage of service, instead of experiment. In the immediate future we may expect the successful transmission of pictures by radio—even radio vision, by which we may witness, by radio, impressive ceremonies and scenes at the same time we are listening to the services as they are broadcast, or may even be able to see the man at the other end of a radiophone conversation."

Broadcasting Must Organize.

A necessary part of our radio progress, Squier says, is the organization of broadcasting and radio services on a systematic business basis. Today, broadcasting stations are maintained chiefly as a matter of good will or as a stimulus to the sale of equipment by radio manufacturers. They cannot be maintained definitely on that basis, Squier holds, and it is not desirable that they should be, either from the viewpoint of the radio interests or the general public.

"Plans are being considered," he says, "for getting radio distribution on a stable financial basis. We have got to decide who is going to pay for radio broadcasting, and how. The five principal broadcasting stations are each spending about $100,000 yearly in this work now. Suppose they should stop. Can't you hear the wail of protest that would go up?

Rents Radio by Month.

"One broadcasting business is now being developed on Staten island, New York, by the use of my wired wireless invention, by which the radio waves are distributed over a specific electric lighting system. Any patron who wishes to cut in on these programs simply pays $2 a month for the use of a receiving set which he can connect to any electric lighting system. He doesn't have to bother with batteries, with outside wires or other troublesome equipment, and is absolutely undisturbed by interference, static conditions, etc.

"Once broadcasting has been placed on a sound financial and dependable service basis, it will be possible to improve the programs and to get the best artists to be found anywhere.

Predicts High-Priced Stars.

"I look to see, at no distant day, the establishment of schools for the training of broadcasting entertainers. The stars of the ear, in the year 1935, will receive salaries comparable to those of the stars in the movies—the stars of the eye—receive in 1924. It will be a real profession, ranking at the top in pay and distinction.

"Can't you imagine the cultural benefits that will come when we surround ourselves, in our homes, with beautiful sound as we now try to surround ourselves with beauties that appeal to the eye?

Sees Radio in Nursery.

"Take a nursery. We paper it in designs to please the child's eye, to stir his imagination, his ambition, his initiative.

"In addition to that physical background, we can place in that nursery, by radio, a background of beautiful music, soft, subdued, but strong enough to soothe and charm and to shut out the discordant noises that swell up from the streets. That child would live in a background of beauty. One cannot estimate its cultural effect.

"That is just one of the suggestions of what we are approaching in the development of radio—of the new era of the ear!"

Above are some of the feature artists on the coming week's programs at local stations and one foreign station. Fig. 1—Irene Pavloska, at KYW Saturday evening in the opera "Martha." Fig. 2—Rex Battle, at CKAC, Montreal, this evening. Fig 3—Edith Ayers McCullough, at WJAZ. Fig. 4—Clara Laughlin, at WMAQ.

Radio Programs

Radio phans, as well as the Chicago public, will have their last chance at opera this week. Mary Garden in "Carmen" will be put on the air tonight by WMAQ and the final opera of the season will be broadcast by KYW Saturday. This last production will be "Martha," featuring Pavloska.

The great response of radio bugs to WJAZ's broadcasting of "Madame X" (Florence Macbeth) Sunday night and the number of listeners who were able to identify her voice, prove the interest of phans in good music. The operas this week will have a large "unseen" attendance.

Tonight KYW is featuring the orchestra of the Chicago Boys' club at 8:20 o'clock. Among the special numbers will be a duet by George and Henry Soper, twin cornetists, 13 years of age. The following is the program, of which Joseph J. Grill is the director:

"The Premium March".....Orchestra
Cornet Duet, "A Daisy".....
George and Henry Soper
"La Cascade," overture.....Orchestra
Trombone Solo, "O Sole Mio".....
Clarence Hedstrom
"Dynamic," overture.....Orchestra
Piano Solo, "2d Mazurka"...George Jandesek
"Royal Emblem," overture.....Orchestra
"The Peerless March".....Orchestra

The orchestra is composed of thirty-five boys from the community of the Chicago Boys' Club No. 5, 2801 South Ridgeway avenue.

CKAC (Montreal) announces a special program for tonight by the Canadian Railway band with tenor and soprano specialties.

Below are given the complete schedules of all the Chicago and suburban broadcasting stations and those of the out-of-town stations which are most commonly tuned by local radiophans.

These schedules are a regular daily feature in The Chicago Evening Post.

On Thursday of each week a complete list and schedule of every broadcasting station in the United States is published in The Chicago Evening Post's sixteen-page Radio Magazine section.

CHICAGO STATIONS

(Central Time is Shown.)

KYW—Located in Commonwealth Edison building, 536 meters; Wilson J. Wetherbee, director.

Day—9:30 a. m., news and markets; 10 a. m., market reports; 10:30 a. m., financial news and comment; 10:58 a. m., naval observatory time signals; 11 a. m., market reports; 11:05 a. m., weather report; 11:30 a. m., news and comment of the financial and commercial market; 11:35 a. m., table talk by Mrs. Anna J. Peterson.

Evening—6:30 p. m., news, financial and final market and sport summary furnished by the Union Trust company and Dun's Review; 6:50 p. m., children's bedtime story; 8 to 8:28 p. m., twenty minutes of good reading by Rev. C. J. Pemin, S. J., head of department of English, Loyola university, Chicago; 8:30 to 9:30 p.m., musical program; Sam Goldstein, tenor; Mme. Emma Roe, accompanist; Anna Mildner, reader; orchestra of the Chicago Boys' club No. 5, Joseph J. Grill, director; selection, by orchestra of the Chicago Boys' club; "Just That One Hour" (Eville), by Sam Goldstein; "Time's Rose" (Bung), by Sam Goldstein; selection by orchestra of the Chicago Boys' club; "At the Hat Counter," by Anna Mildner; selection by orchestra of the Chicago Boys' club; "My Big Little Soldier Boy" (Church), "M' Appari Tutt' Amor from Martha" (Flotow), sung by Sam Goldstein; selection by orchestra of the Boys' club; "Nothing Suited Him" and "Throwing Kisses," by Anna Mildner; selection by orchestra of the Chicago Boys' club; 9:15 p. m., program furnished by the National Live Stock and Meat Board. Speaker of the evening will be John T. Eussell, director of National Live Stock and Meat board. His subject will be "The Distribution of Meat Products to the Consumer."

WAAF—Located at Union stock yards; 286 meters.

Day—Live stock reports at 8:40, 10:30, 10:45 a. m., 12:30, 12:45, 4:30 p. m.

Evening—No schedule.

WMAQ—Located on Hotel LaSalle; 447.6 meters. Miss Judith C Waller, station director.

Day—4:30 p. m., to be announced.

Evening—6:20 p. m., talk by B. I. Miller of the Railway Mail association; weekly talk to Boy Scouts; weekly talk by Rockwell R. Stephens, auto editor the Daily News;

Continued on Page 13.

What Set to Build or to Buy

By IVERSON C. WELLS.
(Radio Editor The Chicago Post.)

One of the most frequent queries from perplexed readers made to The Post Question and Answer department is: "What receiver shall I buy or construct?"

Our answer usually is: "It all depends upon the purpose for which you wish to use a radio set, and what you expect to pay for it."

Buying radio sets for other persons without knowing what is required is about the same as trying to buy a suit of clothes for some one whose personal whims and preferences are unknown to you.

It is the purpose of this article to set forth the various factors that usually enter into the purchase or construction of a receiver, analyze those factors so one may determine which best suits his requirements and name the various types of circuits that possess the various factors.

Many Combination Circuits.

There are a number of circuits and combinations of circuits, each one having at least one outstanding feature about it. One may have extreme sensitiveness, but prove less efficient in other respects. Another may possess exceptional selectivity, but fail at something else. Another may have unusual quality of tone, but no sensitiveness or volume. And so it goes down the list.

I am going to set forth the various factors that experience teaches enter, or should enter, into the purchase or construction of radio receiving apparatus. Here they are about in the order of importance in the minds of the people:

1. Volume of reproduction.
2. Sensitiveness and range.
3. Selectivity of signals.
4. Clarity of tone.
5. Simplicity in operation.
6. Low costs.
7. Small upkeep.
8. Ease of construction.
9. Nonradiation.

No Set Has All Factors.

To find a circuit that will answer all these demands is impossible.

If the first four factors and the last one only are accepted and the other four disregarded, the question "What receiver shall I buy or construct?" easily can be answered.

Of all the proven hook-ups the Armstrong super-heterodyne with eleven vacuum tubes certainly heads the list. It is the last word in radio detection, reproduction and amplification.

It has the widest range of all circuits. It has the greatest selectivity. It has the most volume. It has clarity of tone. That covers the first four factors in our list. On point No. 9 also it answers all requirements.

However, it is extremely difficult to operate. It not only requires skillful tuning, but it is necessary for two people to run it properly. Its cost of construction is high. Its upkeep is more than any other circuit. It is difficult to construct.

It can be seen that the super-heterodyne is no set for a novice to buy, build, operate or maintain. It is not a popular receiver for that reason.

The Superdyne Comes Next.

Next in the list of receivers answering to the nine factors comes Miner's superdyne—only recently anounced.

It has almost as much volume as the heterodyne, altho fewer tubes are used. It almost is as selective and the range is just a little less. It is much easier to operate, costs less to buy or build and less to maintain.

The superdyne is much easier to construct, but still too difficult for the novice, especially if the coils are to be homemade. I would not advise anyone who never has operated a sharp-tuning receiver with several controls to buy or build a superdyne.

The radio-detector-audio circuits, perhaps, come next in the list. There are several of these types and modifications. The five-tube tuned radio-frequency-audio hook-up, to which family the Hazeltine Neutrodyne belongs, have fair volume. And while quite sensitive and selective, much less so than the two circuits first described.

Not for Novices.

In clarity of tone they are almost the equal of the heterodyne and superdyne. They also are more simple in operation, but still novices have trouble with them.

The various types of reflex circuits, including the Grimes inverse reflex, come under this grouping of radio-audio frequency receivers. They use

Continued on Page 4.

What Set to Build or to Buy

Continued from Page 3.

fewer tubes and are simpler to operate.

However, generally speaking, radio-frequency is too much for the novice. Even the more expert operator has trouble with this type of circuit.

Next in efficiency comes the Armstrong three-circuit regenerative set, which has several variations. One of them (the Old Reliable) has been described in recent issues of this magazine.

With three tubes (two-stage audio) this receiver has almost as much volume as the foregoing circuits and with a third-stage audio it is their equal. It is not quite so sensitive, but consistently will bring in all the American stations, which is about as much as the average asks for. It is not so selective, but matches fairly well in clarity of tone.

While not a simple set to tune, it is more easy to operate than any of the sets already described. It does not cost as much to buy or build as the heterodyne and superdyne, but just about as much as the multiple radio-frequency sets.

On upkeep it is cheaper, as it uses fewer tubes and, therefore, less battery current. It is much simpler to build than the heterodyne and superdyne, but a more difficult job than the radio-frequency sets.

Being a regenerative set, it will reradiate when the tube is allowed to oscillate, but is less of an offender than the one and two circuit regenerative sets.

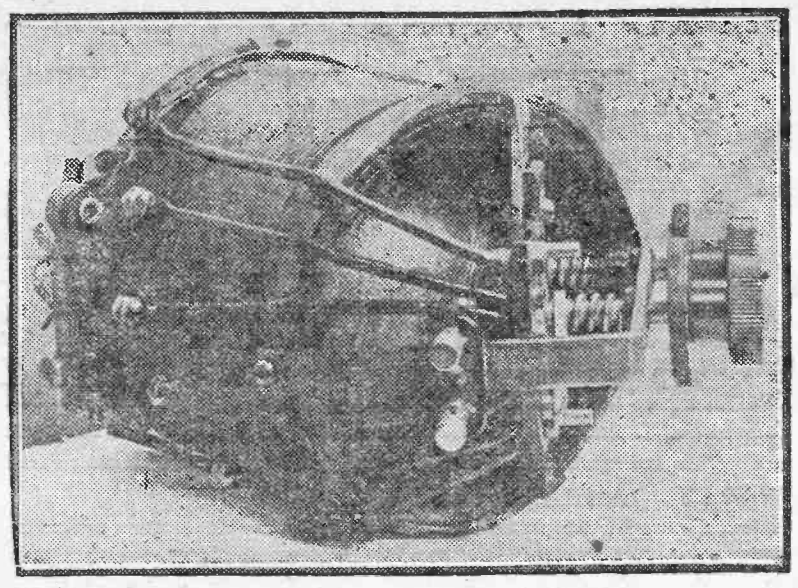
Set with Volume.

The Armstrong super-regenerative hook-up probably has greater volume than any of the circuits described. It does not have the range or selectivity of the heterodyne or superdyne, but it is about on a par with the radio-frequency circuits and just a little bit better than the Armstrong three-circuit regenerative. It is a noisy set to tune in, but the reproduction is good once the signal is cleared up.

It is simpler to operate than the heterodyne, superdyne and the radio-frequency circuits, but a little more difficult to control than the three-circuit receiver. It ranks next to the superdyne in cost of construction, but is about on a par with the three-circuit in cost of operation. It will reradiate.

The Armstrong Flivver and the Harkness modification of this receiver, described last week in these pages, has almost the volume of the circuit just described. It is simpler to operate and has nearly the same range and selectivity. It is not expensive to maintain, easier to build and will reradiate.

The Flewelling modification of the regenerative circuit, tube for tube, probably has more volume than any of the sets mentioned, except the Armstrong super and the Flivver, altho this does not mean it has more volume than the heterodyne or the superdyne, of course, as these circuits use a multiple of tubes.



The accompanying photograph is a graphic illustration of the immense strides forward that radio has been making, both technically and mechanically, in the last three years. This is a variocoupler built by W. B. Best of the Powers theater to use in one of the original Armstrong super-regenerative circuits. It is entirely hand-made. The form on which the primary is wound is a leather tube supported by one-eighth inch brass hoops to which are brazed the supports for switch points, rotor, etc. The rotor was hand-carved from a croquet ball. The rotor and stator terminals were all brought to the rear and mounted on a piece of bakelite. The instrument completed weighs about two pounds. Mr. Best says that if some of those so-called experimenters today who complain about not being able to get good apparatus had the same difficulties to confront as the original experimenters, they would more appreciate the work done by the early discoverers such as Armstrong and De Forest.

Noisy and Hard to Control.

The Flewelling has almost the same range of the three-circuit, but not near the selectivity. It is a noisy set and it is hard to control the regeneration. It howls and screams like all the supers do until the circuits are in resonance with the incoming signal. It costs much less to construct than any of the foregoing sets and its upkeep is small, as it uses only three tubes. It also is easy to build. It will reradiate.

The Autoplex, recently described in these pages, is a modification of the Armstrong super. It is in a much more simplified form. Using one tube, it has the volume of many two and three tube sets, and its range is about equal to Flewelling. Its selectivity is only fair and may be compared with the Flewelling on that score. It also is a noisy set, like all the supers, but reception is clear when the circuit is in resonance with the incoming signal.

The Autoplex is very simple to control and may be compared to the ultra-audions yet to be described. It is an inexpensive set to construct and maintain and easy to build. It reradiates.

Ultra-Audions Are Popular.

This brings us to the ultra-audion group. This is the original De Forest receiver and its simplicity of design and ease of operation makes it popular with the novice.

On volume it does not compare with any of the receivers described. Yet, with one stage of audio it will operate a loud speaker on local stations, and with two stages will give fair loud-speaker volume on stations within 500 to 600 mile range.

The circuit is a freakish one and at times performs some remarkable distance feats. It is not dependable, however. The ultra is not very selective.

It is not so noisy as some of the other regenerative sets described and is one of the simplest of sets to tune in, as it has only one critical control. "The Superduc," which was first described in these pages Jan. 3, is of the ultra-audion type.

These receivers are low in cost, have small upkeep and are easy to construct. They are great offenders on reradiation.

Become Small Transmitters.

The next type of receiver to be described is the single circuit regenerative sets. They are just a step lower in volume, selectivity and sensitiveness than the ultra-audion, which is an offshoot of the single circuiter.

What was said of operation, costs, upkeep, construction and reradiation for the ultra-audion can be applied here.

The single circuit group probably is "cussed" more than any other receiver. It is extremely difficult to keep it from oscillating, especially in the hands of an incompetent tuner. While doing this it is a miniature transmitting set with a range of several blocks.

As long as a novice operator is working one of these circuits every receiver, from the biggest to the smallest, crystals included, in the radius of several blocks, is filled with whistles and howls that run the scale from low C to high E.

The nonregenerative circuits were what we had until Armstrong came along with his regeneration idea.

Except in radio-frequency sets when they are used, few nonregenerative sets are seen today. They are weak in volume, not very selective and have only three points in their favor. They have clarity, as they are free from the howls and screeches of regeneration. They are simple in operation and their cost of construction is small. They are about as easy to construct as the ultra-audion and will not reradiate.

Crystal Has Limitations.

This brings us to the lowly crystal. On point No. 1 it is weak, as it has less volume than any other circuit. Its range, usually, is limited to ten to fifteen miles, altho some of the better contructed types will reach fifty miles consistently, and there are circuits that, under favorable conditions, will reach 400 to 500 miles. The Hagerman long-distance crystal described in these pages Nov. 28 is one of this rare type.

On selectivity the best of the crystal sets are helpless, altho by the use of expensive parts, wave traps etc., fair selectivity may be had, but since these things will bring costs up close to the one-tube set, only the "crystal phan" will invest that much to get it.

On the remaining six points, however, the crystal has all the circuits "beat a mile."

No vacuum tube detector set, however expensive tho it may be, can compare with a circuit using a crystal for the detector. There is no distortion whatsoever and the voice and music comes in clear as a bell.

It is simplest of all sets to operate, costs less to build, easy to construct, has no batteries to maintain, and, of course won't reradiate.

Eight Classes of Buyers.

That brings us to the end of the list of circuits. Now let us solve that problem:

"What receiver shall I buy or construct?"

There are eight classes of radiophans. In one of these you belong. When we have ascertained that fact your question is answered. Here is the list:

1. The fellow who wants to buy or construct a set "as cheap as possible," and is willing to sacrifice everything else to get it.
2. The fellow who wants the maximum of clarity, and is willing to sacrifice everything else to get it.
3. The fellow who wants simplicity of operation, and will sacrifice everything else to get it, except low cost.
4. The fellow who wants a medium-distance receiver, simple to operate, and will insist only on a fair measure of volume and selectivity, and yet wants to keep costs down.
5. The fellow who wants a long-distance set, who will sacrifice selectivity, but insists on a fairly easily operated set at a reasonable price.
6. The fellow who wants a long-distance set, insists on selectivity, will sacrifice a little of the operation simplicity, and is willing to pay a fair price to get it.
7. The fellow who wants a "real long-distance receiver that will bring in Cuba and coast-to-coast all the time under all conditions," and who will not worry over difficult tuning, and yet wants "to keep within reason" on costs.
8. The fellow who wants "the best that money can buy," who insists that not only the range shall be the farthest, and the volume the greatest, but that selectivity shall be 100 per cent, and is willing to sacrifice every other point to gain his own.

The Set You Should Buy.

If you belong in any of the above classes, then the receiver you should buy will be found in the following list:

Class 1—Buy or build a crystal set.
Class 2—Buy or build a crystal set.
Class 3—Buy or build a crystal set. Or buy or build a one-tube ultra-audion.
Class 4—Buy or build an ultra-audion with one or two stages of audio-amplification.
Class 5—Buy or build an Armstrong flivver, Flewelling, Reinartz or a one or two tube reflex.
Class 6—Buy or build an Armstrong super or an Armstrong three-circuit regenerative with two stages of audio.
Class 7—Buy or build a superdyne, an Armstrong super or an Armstrong three-circuit regenerative with three stages of audio.
Class 7—Buy or build a super heterodyne with eleven tubes.

"What receiver do you want to buy or build?"

Frank Conrad.

Most of the credit due to perfection of short wave broadcasting is due to the experimenting of Frank Conrad, assistant chief engineer of Westinghouse Electric and Manufacturing company, who is known to nearly every amateur in the country thru the call letters of his station 8XF, located at his home in Wilkinsburg, Pa.

MacMillan Keeps in Touch with World by Radio

For the first time in his sixteen years of sojourning off and on in the north pole region, Dr. Donald B. MacMillan, the arctic explorer, is in communication with the rest of the world. With his radio receiver he has heard hundreds of broadcasting stations in Europe and America, some as far away as California, Mexico and the Hawaiian Islands. He hears station WJAZ with unfailing regularity.

Dr. MacMillan selected the Zenith-Edgewater Beach hotel broadcasting station as the official transmitter of news to him because of its favorable location. Climatic conditions and terrestical magnetism make the eastern states much less suitable for communication with the north pole. The location of WJAZ, on the other hand, is everything that could be desired; besides, no station is more powerful or better equipped.

Brings Home to Them.

The isolation of the north pole has no more terrors for MacMillan and his seven men. Think of whiling away the dreadfully vacant and oppressive evening before the advent of radio! Now these men need not depend entirely on sheer imagination to waft themselves to enchanting places of entertainment, which distance makes more enchanting still—the ballroom aglitter with femininity and jazz; the cafes enlivened by the aroma of black coffee, good cigars and the sparkle of convival souls.

Now they can "listen in" and be present socially tho absent physically, can hear the swish of silks of the nimble dancers, the clink of glasses and silverware and the murmured conversation of the diners, the rounds of applause after each dance and all but take part in the gayety and joyous interchange so markedly absent in the north pole region.

Or, if in more serious mood, they can listen to a concert, to a sermon, to a long list of diversified, quiet entertainment and relaxation.

A special treat is served them every Wednesday at midnight. They are on hand without fail, because this is MacMillan night at station WJAZ—that is when they get word directly from home, word from relatives and friends. Then they are furnished in tabloid form the news of the previous week and the Thursday morning news hot off the press.

Christmas eve witnessed a special program of Christmas carols and music and the unexpected pleasure of Letitia Fogg. Dr. MacMillan's sister, who, with his two nieces, delivered messages from their own lips and gave greetings for themselves and the friends and relatives of the explorers.

Acknowledges Each Program.

Every Wednesday night's program, including that of Christmas eve, has been acknowledged by Dr. MacMillan. His boat, the "Bowdoin," is equipped with sending apparatus, and on Thursday he usually acknowledges the early morning program. His messages are picked up either at Prince Rupert, B. C., Moosejaw, Saskatchewan, or Avalon, Catalina Island, Cal., and then relayed to the Zenith-Edgewater Beach hotel broadcasting station. He reported that his sisters and nieces were heard distinctly—their voices were easily recognized.

Others Show Interest.

MacMillan and his crew and the Eskimo visitors to the "Bowdoin" are not the only ones whose ears are bent on these Wednesday WJAZ programs. An audience spread over a great part of the North American continent is sharing the pleasure. From remote sections of the country—from farms, ranches, lumber camps, Indian reservations and lonesome districts in the sparsely settled stretches of the United States and Canada—come frequent letters of appreciation, not to mention the thousands of testimonials from the larger centers. For many people, this occasion offers a means of getting the news.

"Even after MacMillan returns, please keep up the news service," wrote a lumber man. And from a farm thirty miles from the nearest postoffice comes a letter, "Keep up the weekly news to MacMillan and be sure to let us know when another war starts."

You will find the classified advertisement section interesting. See Page 15.

Listening In on a Moth

Dr. Phillips Thomas of the research department of the Westinghouse Electric company is shown here with his newly perfected microphone, which is so extremely sensitive that sounds hitherto unknown to the human ear are now possible of attainment. In the above photo Mr. Thomas is listening to the heartbeats of a moth. The microphone is the round instrument on the table with the two imbedded fuses. The invention has opened a new era of research.

East Pittsburg Station Broadcasts Repeated by Eight British Stations

THE station illustrated and described this week is the pioneer broadcasting station—KDKA of East Pittsburg. This is the most powerful of the stations operated by the Westinghouse Electric and Manufacturing company.—The Editor.

IT HAS been stated by many eminent authorities that radio is the greatest boon of the present century and it is fact that the usefulness of radio is limited only by the ingenuity of those who use it.

No one can claim, however, that the Westinghouse Electric & Manufacturing company of East Pittsburg, Pa., which operates the pioneer broadcaster of the world, KDKA, and also three other stations, KYW at Chicago, WBZ at Springfield, Mass., and KFKX, the new repeater at Hastings, Neb., is lagging in the race for new uses of radio.

Repeats Oversea Messages.

The latest development of this company is the repeating of messages across the ocean, and from developments of the past month, it has been proved that broadcasts originating from one station can cover almost the entire world thru the use of repeating stations. KDKA has covered, with repeaters in action, almost the half of the earth.

KFKX, the new repeating station of the company, is located at Hastings, Neb. It repeats the concerts originating at KDKA, in East Pittsburg, and services, the entire western half of the United States, Canada, Mexico, and also a large portion of South America.

Co-operates with English Stations.

Then there are the repeating stations located across water.

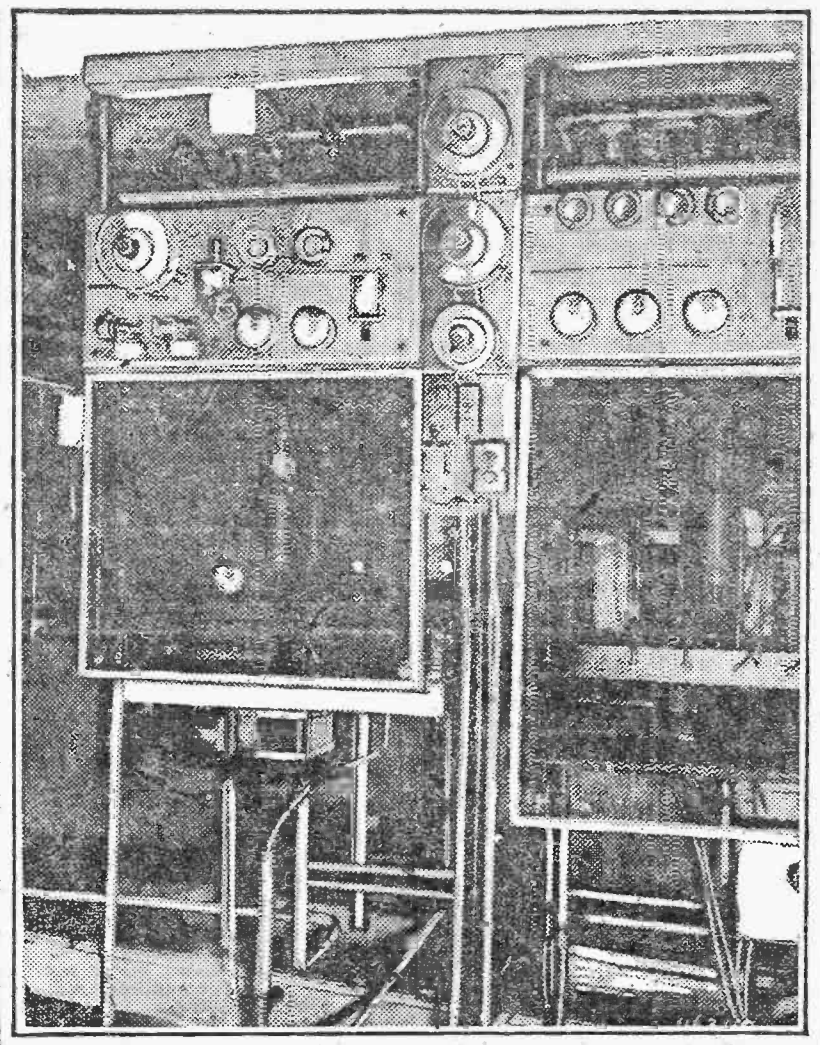
Thru co-operation with station 2AC of the Metropolitan-Vickers Electrical company, at Manchester, England, the same broadcast which is repeated from KFKX is also repeated from this English station. However, the entire eight stations of the British Broadcasting company are linked together with land lines and the result is that what one station broadcasts the lot can also broadcast providing they desire to. In the case of the Westinghouse broadcasts all the stations of the B. B. C tie-up in the repeating.

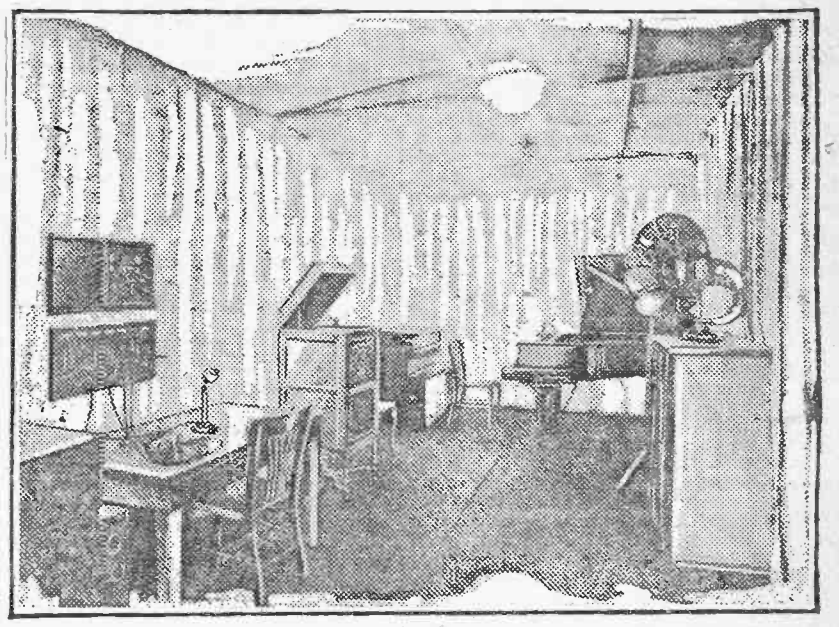
The result of these simultaneous broadcasts is that the peoples of Great Britain and of the countries of the European continent can, all of them, hear this repeated message. Telegrams have been received in America, from residents living in Switzerland, Italy, Belgium and other countries, stating that they were hearing KDKA better than they heard the broadcasts of the British company.

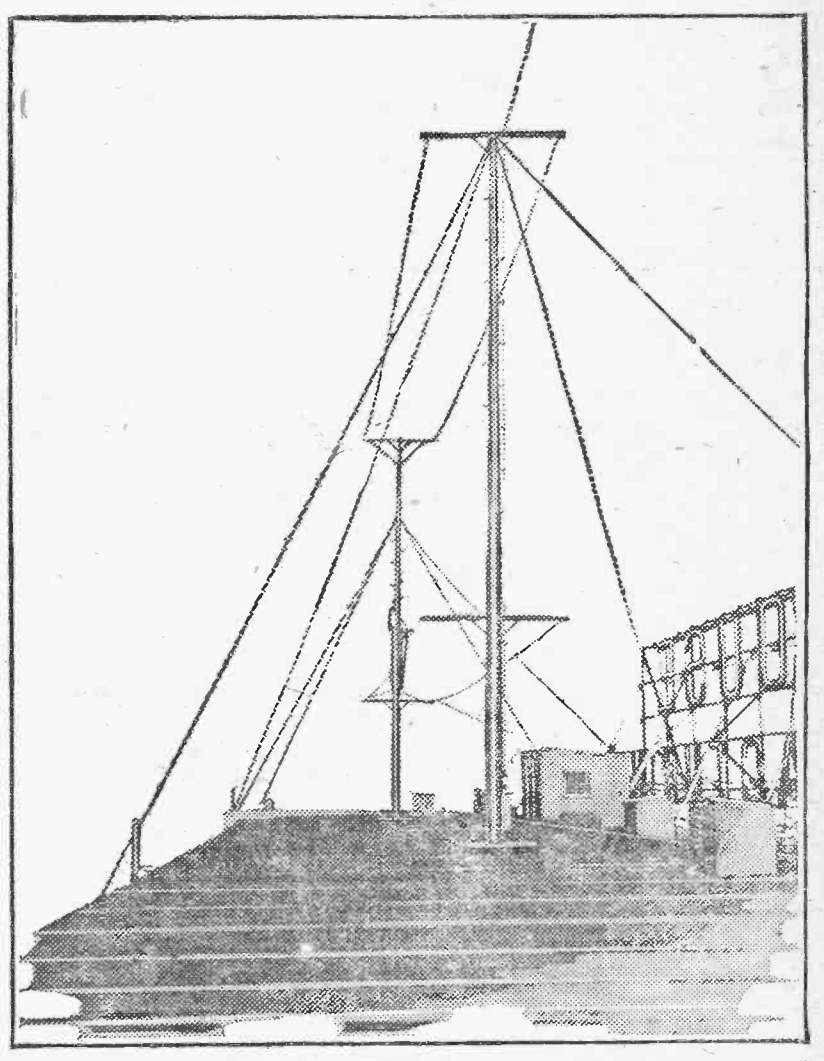
Messages Delude Them.

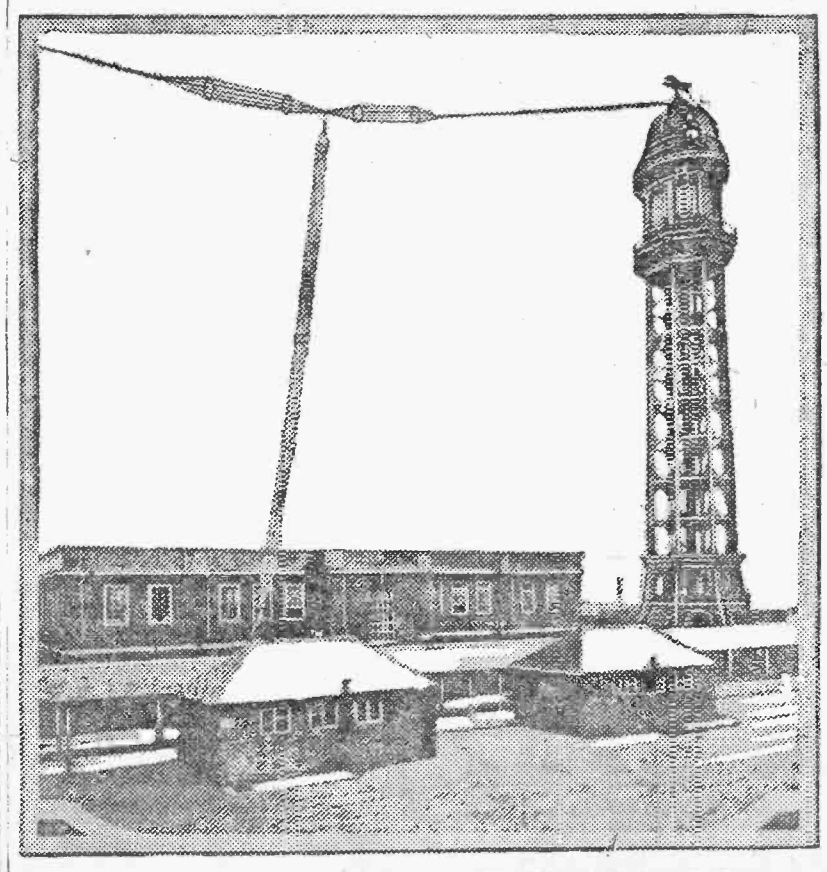
These people did not know that the broadcasts of KDKA were being repeated by the British company and perhaps were deluded into thinking they were hearing more clearly, because of the fact that the messages were originating in America.

The transatlantic repeating of broadcasts is the latest improvement in radio, and it was KDKA, the pioneer broadcaster of the world, which was the pioneer in this achievement just as it has been the pioneer in every radio achievement since it was started away back in November, 1920.









Upper left-hand picture shows a view of the high-frequency transmitter at KDKA. The upper right-hand picture is of the downtown studio of station KDKA. The thirty-five-foot antenna of KDKA is shown below. The gentleman standing before the microphone is H. P. Davis, vice president of the Westinghouse company, who is called "the father of broadcasting," as it was he that was responsible for the first programs. At the bottom is station 2AC at Manchester, England, the first European station to repeat broadcast from America.

Gives Setting-Up Exercises Every Morning by Radio

The morning's "daily dozen" can now be taken by radio. Setting-up exercises directed by P. A. Leonhardt of the central department of the Chicago Y. M. C. A. are broadcast each morning at 7 a. m. thru station KYW.

"The amount of interest shown in the Radio Health league warrants its development," Leonhardt said. "Enrollment is free and will entitle members to free health service by bulletin and personal consultation. Each week these exercises will be arranged in series form. A chart showing the correct position to execute the movements has been prepared."

Plans Better Station

WBS, the broadcasting station of D. W. May & Co., in Newark, is to have a new transmitter, this one to be a 100-watt set. The present transmitter is a 50-watt outfit. WBS transmits on 360 meters.

Woman's Club Leaders to Be Featured Over Radio

Half an hour every Thursday evening for the rest of the radio year has been assigned leaders in the Illinois Federation of Women's Clubs by station WMAQ, Chicago.

Mrs. George Thomas Palmer of Springfield will deliver the first radio talk from 7:30 to 8 o'clock Thursday night, Jan. 24. After that every Thursday, from 4:30 to 5 o'clock, some other leader will talk.

On Jan. 31 Mrs. Charles J. Trainor of Chicago, chairman of the committee on American citizenship, will speak, and the following Thursday, Feb. 7, Mrs. Theron Colton of Chicago, head of the department of conservation. Other speakers will be announced later.

Chicago Radio Fight Phans Hear Greb Bout

Radio fight phans enjoyed one of the best scraps of the season last Friday night, for WJY broadcast Maj. J. Andrew White's description of Johnny Wilson's attempt and failure to wrest his lost middleweight championship from Harry Greb at Madison Square Garden, New York city. Many Chicago phans report having heard the announcement of the fight round by round so plainly and clearly they imagined they actually could see the fighters.

Cracked Insulators Make Trouble for Aerials

Cracked aerial insulators are a "welcome" sign to moisture, and once the cracks are filled, the frost does the rest. Broken insulators mean imperfect reception. Examine every joint carefully whether soldered or not. Where clamps of any kind are used, loosen them, clean off the surfaces and retighten the clamps. If the supporting poles are bent, weakened or twisted, replace them with material stout enough to stand the blasts of winter.

GRID LEAK VALUES.

For all-round work the best value for the grid leak is about two megohms. The actual size for best work varies slightly and the range is from one-half megohm to five megohms. This is why a good variable leak is preferable.

Radio Takes Part in Shenandoah's Rescue

Radio broadcasting stations had a part in aiding the safe return of the dirigible, Shenandoah, when she broke loose from her mooring at Lakehurst, N. J., the other night.

All of the New York city stations discontinued their programs. At the request of the naval communication officer at the Brooklyn navy yard, WEAF sent out a general call to all listeners to be on the lookout for the big airship. Employes at WOR saw the ship directly over Newark. WOR advised the Shenandoah of her location. The Shenandoah replied in code, but was unable to establish communication with WOR.

G. W. Johnstone, one of WEAF'S operators, was off duty at his home in Perth Amboy. He received the Shenandoah's message and sensing the situation transmitted it by telephone to WOR.

You will find the Classified Advertisement Section interesting. See page 15.

Uses Electric Light Socket Minus Plug for His Aerial and Finds It Works Fine

By W. S. ENGLISH.
(Inventor of the "Electrodyne.")

THOUSANDS who live in hotels and rooming-houses, as well as those in apartment-houses, are being denied the wonders of radio because they are denied access to an aerial. With a recent discovery of mine, a small crystal set and pair of headphones, the parts of which cost me $1.60, they are able to listen to a broadcasting station anywhere within ten miles. I do not know how much farther, as I get KDKA at East Pittsburg, ten miles from here, loud and clear every night with this arrangement, as well as either of the other three stations here in Pittsburg.

It has been a wonderful thing for me as a traveling salesman, and I am sure an explanation of this hook-up will prove a boon to thousands as well and increase the sale of radio sets to those who cannot have them now because they are prohibited from having an aerial.

It is now possible for the traveling salesman to carry a small radio set in his grip, and when he reaches a city where a broadcasting station is located to set up his outfit in two or three minutes and listen to the news bulletins, market reports and concerts, and if he so desires, he can lie on the bed and rest while "attending" the concert.

"Goes" to Church in Bed.

On Sunday he can lie in bed and attend the Sunday services at the same time, which is the most comfortable way of going to church I have found, for should the listener go to sleep, there is no one to prod him awake.

In the evening, should one desire, he can lie down on the bed, smoke and rest and listen to the evening concerts, and when the orchestra plays "Drifting Back to Dreamland," he can lay aside his cigar and just "drift" to awaken perhaps an hour or so later to find the broadcasting station silent and the artists' voices gone from the air.

The Electrodyne is an improvement over the wired wireless idea of Maj. Gen. Squeers, who advocated broadcasting over the light and power lines from a central broadcasting station so that one could plug into a lamp socket with a condenser plug and enjoy the evening concerts form the central power station without an aerial.

Our network of electric light wires are now carrying the messages of the broadcast station to every one near an electric light globe if they but know how to utilize them without the necessity of the power company putting in an expensive broadcasting station, and it beats the wired wireless idea, for the listener-in can choose the station to which he wishes to listen, whereas under the wired wireless idea only that station broadcasting over the power line could be heard.

W. S. ENGLISH, a traveling salesman for a fire department supply-house, with headquarters in Pittsburg, and one of The Post readers, says he has discovered a new aerial hook-up that he has named the "electrodyne," that will prove a boon to thousands who live in hotels, apartment and rooming-houses, as well as those who live in their own homes. It enables anyone to use an electric lamp socket without a condenser plug as an aerial. He tells about it in this article.—The Editor.

Discovery Made in Hotel.

Being a traveling salesman and also a radiophan I wanted to carry a radio set with me so that whenever I was in a city where there was a broadcasting station I could "listen in," but this was prohibited by all the methods known to me at that time.

With a small crystal set it was necessary to have an aerial and ground wire to get results, while with the bulb sets it was too much trouble to carry batteries, tubes, etc., to work a loop aerial, in addition to the time necessary to set up and take down a set.

With a small crystal outfit I set about experimenting to find some way of doing without an aerial, and these experiments led to the discovery of the aerial hook-up, which I have named the "Electrodyne."

Being a practical electrician and knowing that the wires running to the electric light in my room were carrying a steady flow of electricity to that filament on a frequency of sixty cycles, I believed that this flow of low frequency current could be made to carry the high frequentcy wave of the broadcasting station operating at 920 kilocycles.

Discovers the Electrodyne.

Several different "hook-ups" were tried without result at first because I was trying to use the gas pipe for a ground wire, and this from the third floor of a hotel was rather imperfect.

I had often heard of utilizing the bed springs of a bed as an antenna and a water or gas pipe as a ground, but this proved too weak a circuit for a crystal set, or at least the one I was using at the time, altho I did make it work with a better set.

I still kept the idea, however, of the electric light wires acting as my carrier, but being an electrician I was educated in the school of the complete metal circuit as being used by electricians.

While still having the idea of using the bed springs for the antennae, I connected the aerial side of my set to them and the ground wire to the electric light conduit that carried the light wires up the wall, across the ceiling to a center light and then down the wall to a switch. I immediately got voices and music, but not loudly, and I decided to try reversing the connections, and the problem was solved and the "Electrodyne" was born to take its place with the other strange things learned about radio.

The idea which had formed in my mind that the low frequency current of the electric light wires could be made to pick up the high frequency current of the local broadcasting stations and bring it into my room was correct.

By attaching the aerial side of my set to either of the three screws that holds the shade over an electric light globe I had no direct connection with the electric light circuit, but the high frequency wave followed these light wires into this point, then jumped across the small space intervening to the screw, down the aerial wire to the set, thru the set and head phones to the ground wire running to the bed springs and out into the air again, as these bed springs were on the third floor of the hotel and had no direct connection with the ground, but thru the atmosphere.

Works With a Bulb Set.

Satisfied I had found the means of carrying a small crystal set in my grip and of being able to hear broadcasting from a broadcasting station within several miles of me in any city where I might be, I tried a single tube set hooked up the same way and it worked just as well and brought the stations in much louder than the crystal set.

Believing that perhaps it was a freak of the room, I tried it out in different rooms, on different floors of the hotel connected to the metal conduit, the screws of the shade holder, and when these were not available, tied the aerial wire around the lamp socket, and without trouble picked up a broadcasting station ten miles from my hotel at will as well as any of three others in the city when they are on the air.

I would be interested in having some of your Chicago readers trying out the idea and reporting to you what success they have with the Electrodyne.

Maj. Gen. George O. Squier, chief signal officer of the army, retired Jan. 1 after forty years of distinguished service as an officer of high scientific attainments. While Gen. Squier is known as an inventor of a number of different things, he is best known for his invention of line radio, popularly known as wired wireless, and ranks as one of the greatest inventions in telephony. Gen. Squier is succeeded at his post as chief signal officer by Col. Charles McK. Saltzman, who is regarded as one of the most proficient officers in the army. Photo shows Gen. Squier seated at desk. Col. Saltzman is standing.

Milwaukee Club Shows Lots of Pep

MILWAUKEE, Jan. 24.—Contrasted with last year, the technical committee of the Milwaukee Radio Amateurs' Club, Inc., no longer is represented by one man investigating and reporting at meetings, but is now the society's largest committee and perhaps its most active.

Reports such as "The Relative Efficiencies of Battery-Charger Rectifiers," by R. E. Lathrop, 9ATX, former vice president of the Waukesha Radio Amateur club; "An Amateur's Notion of the Heaviside Layer Theory," D. H. Doll, 9ALR, West Allis A. R. R. L. city manager, and "The Remotely Controlled System at Station 9AAP," by M. F. Szukalski Jr., are typical of this committee's work. Mr. Doll is chairman.

"Magnetism and Some Original Experiments in Its Manifestation" was the title of an address given before the society by the Rev. John B. Kremer, S. J., A. M., professor of physics and director of station WHAD, Marquette university. Father Kremer, known as an eminent physicist, recently has become a deep student of radio communication and has evolved a new microphone for broadcasting stations.

Clausing Talks on Transmitters.

Another lecture arranged by the program committee was "Tube Transmitter Design," given by Le Roy M. E. Clausing, 9XN, operating engineer at station WJAZ of the Chicago Radio laboratory. As a program feature a contest in defining technical radio terms was held. Great enthusiasm was aroused, the winners being C. R. Griesbacher, 9CYL, and M. H. Doll, 9ALR, who were awarded American Radio league emblems.

On the same evening of the weekly meetings, Thursday, only at 7:15 p. m., a code class for B. C. L.'s is held. This is in the trustees' room of the Milwaukee public museum, and has been quite well attended, among those wishing to learn to receive the international Morse code are two Y. L.'s.

Membership Drive Successful.

Under the leadership of F. W. Catel, 9DTK, a most successful membership drive has been put over. From a large group of Milwaukee county nonmember amateurs a majority have been induced to join the club and the American Radio Relay league, of which the Milwaukee society is a local section.

M. F. Szukalski Jr., 9AAP, the society's vice president, recently has been appointed A. R. R. L. city manager for Milwaukee, and now heads the city's traffic work. An active campaign against spark stations has begun, and attempts to mitigate the spark interference to broadcasting, as caused by commercial transmitters on ship stations, are being made, for it is this interference that is most troublesome to local radiophans.

The traffic committee solicits reports of QRM for investigation. All communications to the club should be addressed to its general office, 601 Enterprise building, Milwaukee, Wis., or its officers may be interviewed at the weekly meetings, which are open to the public.

Gets Radio from Skies

Mr. Ridoux, an amateur of Garches, France, had the luck recently to find a meteorite weighing a number of pounds. In breaking it he noticed a number of sparking particles, resembling the appearance of galena. A small piece of the visitor from the heavens was forthwith inserted in the crystal holder, the cat whisker adjusted—and signals heard. The material proved to be only slightly inferior to regular galena, but seemed to contain fewer sensitive points.

Navy Making Radio Tests

The naval communication service is making extensice tests with radio on three cruisers and a battleship now at sea. The tests are designed to determine the alertness of watch maintained by ship and shore stations, the maximum reliable range of ship's transmitters, the maximum range of reception from shore stations and the efficiency in handling codes.

Some Radio Storm

The radio storm created by WGY in the production of "Peg o' My Heart" as a radio drama was so realistic, according to Martin L. Wyman Jr. of Gaysville, Vt., that his father took off his headphones, saying that he didn't care to listen-in during a thunderstorm.

Africa Hears U. S.

From Grahamstown, Africa, S. W. Watson reports his reception of American broadcasting, saying that amateurs in Capt Town have recently heard music and speeches in a foreign language.

Cross U. S. on One Tube.

Donald S. Reinhardt, a 15-year-old phan who lives in Llanerch, Pa., recently tuned-in KFI, Los Angeles, Cal., while using only a detector tube.

Fishes for Aerial Rope with Kite

Fishing for a broken rope on a lofty pole with a kite and hooks is not only a novel method of repairing an aerial, but also a most efficient one.

George D. Waltman, "Printer for Particular People" of Peru, Ill., was in this office the other day to subscribe for "The World's Best Radio Magazine" and told the following story:

"During an electrical storm one day last summer lightning played a strange prank with my radio outfit. My aerial is fifty-five feet high, suspended between poles 100 feet apart. I had no ground switch at the time, but had the lead-in wire wrapped around an iron rod driven into the ground when not using the set.

Leaves Rope on Pole.

"A bolt of lightning struck the aerial, and instead of following the lead-in to the ground, melted one of the insulators, followed the rope and one of the poles to the ground. The aerial dropped to the ground with one-half of the insulator fastened to it. The other half of the insulator tied to the end of the rope was suspended thru a pulley fifty-five feet in the air, with no seeming way to retrieve it without taking the pole down, as it was not strong enough to permit climbing.

"A few days afterward I noticed a kite flying and an idea which I believed novel struck me. I found the youth who was flying the kite and had him wind it in. I then took him to my yard and had him again fly the kite. To his kite string I tied on a half-dozen fish books about six inches apart with strings about a foot long. I directed the boy to move the kite to where it would cause the string to come in contact with the pole on which the broken insulator was hanging. Then slowly he moved the kite string up and down with the fish hooks even with the insulator.

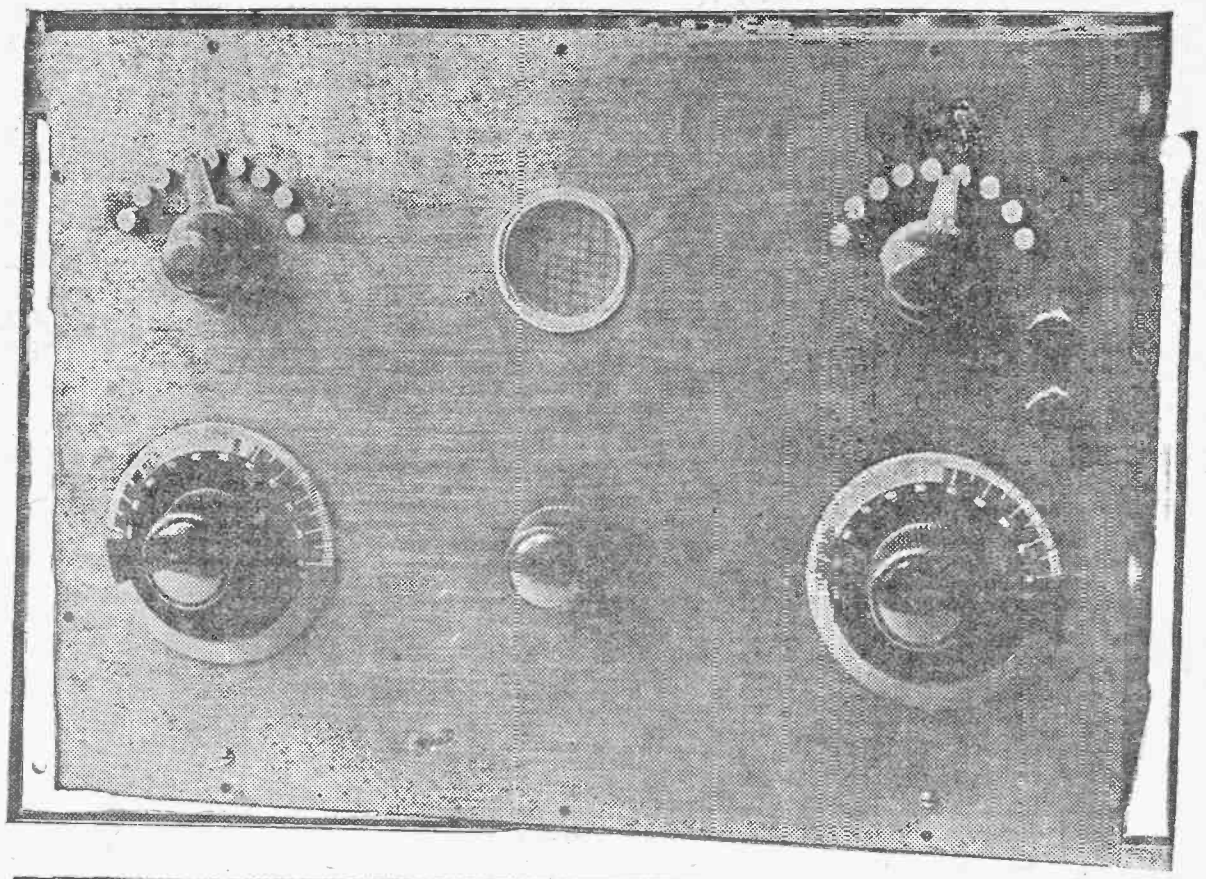
Does the Job Efficiently.

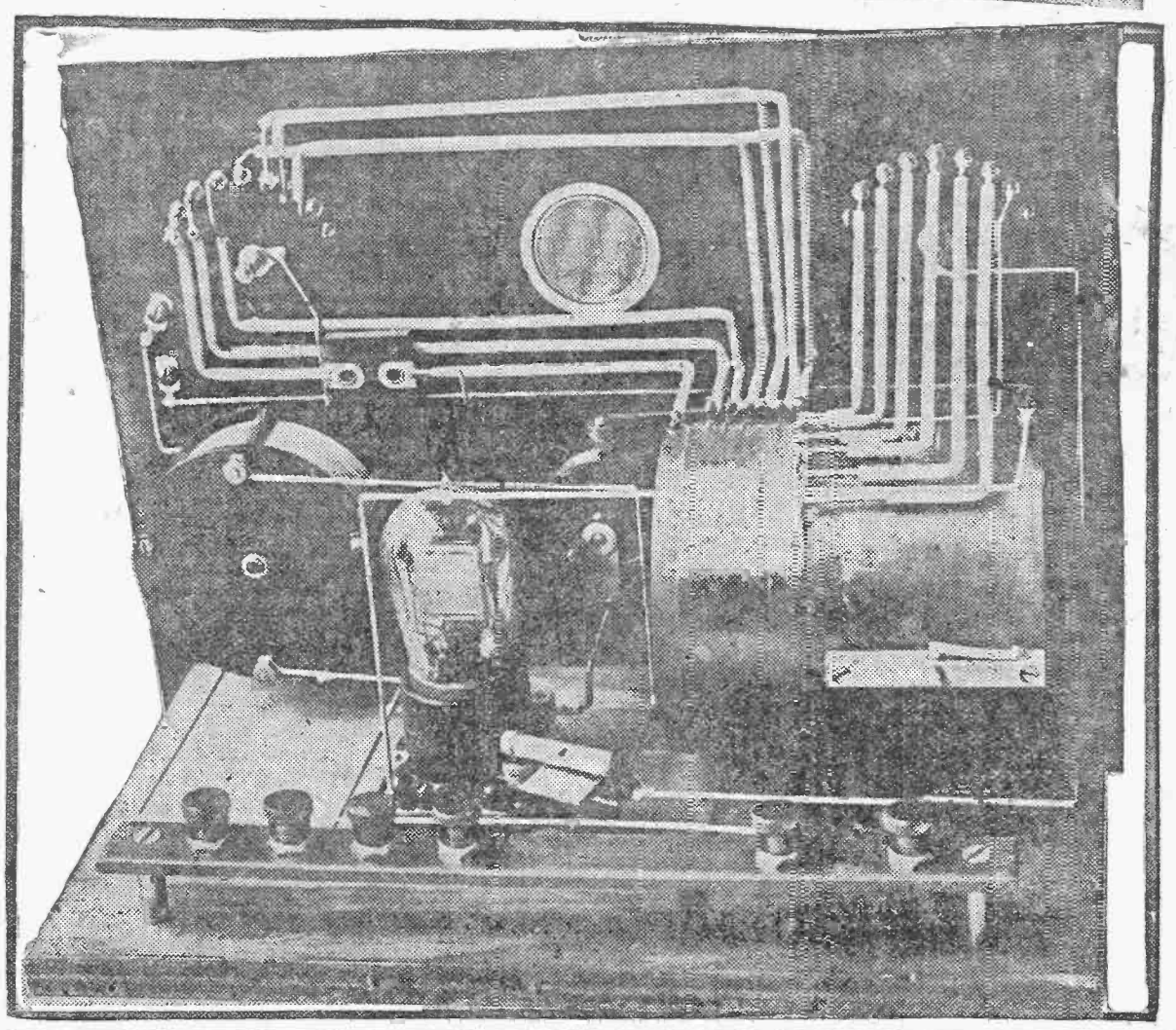
"The hooks at once caught into what I supposed was the frayed end of the rope where it was tied into the ring of the insulator, but imagine my surprise when the boy wound in the kite to find two of the hooks had become fastened in the ring in the insulator alongside of the rope. It was then only the matter of getting another insulator and suspending the aerial again and the set was ready for use. This saved the costly method of lowering one of the poles and having it re-erected. It is needless to say that the youth who retrieved the rope was as elated as I was, and more so when I tendered him a two-dollar bill for his trouble of reflying his kite."

You will find the classified advertisement section interesting. See Page 15.

Compactly Built Regenerative Receiver Set with Range and Selectivity

CONSIDERABLE interest is shown in compactly built one-tube receivers, which, while possessing that qualification, also still retain efficiency. Here is a receiver that answers these requirements in the fullest. It has a coast-to-coast range, and with two stages of audio will give all the volume anyone but a concert-hall manager would demand. It also has unusual selectivity and simplicity of control.—The Editor.





THIS compactly built receiver is a variation of the Armstrong regenerative receiver which has been described in these pages during the last few weeks. It has been referred to as "The Junior Old Reliable."

The circuit really is a single-circuit hook-up, but has characteristics of a two-circuit set. It uses a peculiar type coupler very similar to that used by the "Zenith."

The set was not designed for great distances, altho it has shown some remarkable performances. It is selective, however, and it has developed volume on stations within a range of two to four hundred miles that has given its owners great satisfaction.

Not only is the set compact, but it has the minimum of controls. The receiver here illustrated was designed for L. W. Hunt of Lombard, Ill., and he reports that it brings in practically all of the popular stations, using just one tube, and that it is remarkably free from the usual noises of a regenerative set.

Local stations do not disturb this receiver, as it has been tested within a few blocks of the north side broadcasting stations and pushes thru them without any effort. Two stages of audio may be employed and a loud speaker worked. The volume will be good.

The photograph shows very clearly the arrangement of the parts and mounting scheme.

By reference to the diagram C1 is a variable condenser of the vernier type preferred and .0005 wfd. capacity. It is used to tune the primary circuit. C2 is a grid condenser of .00025 wfd. capacity if C-200 or W-200 tube is used. Otherwise use .0005 wfd. condenser. C3 is a .001 by-pass condenser. It passes the radio-frequency current across the high resistance of the phones and batteries. R1 is a grid resistance, 1 meg. to 2 meg. R2 is a filament control. L1 is a 77-turn coil on four-inch tube, starting at one end tapped every ten turns. Starting with seventieth turn of seventh tap, bring out tap for every turn. This gives a coil that may be varied from 200 to 600 meters, which is its efficient range. L2 variometer coupled inductively to side of tuning coil. This affords a smooth control of the plate circuit and gives regeneration over the entire wave length of from 200 to 600 meters.

No attempt is made to give panel layout, as the builder may fine it necessary to change construction slightly on account of cabinet. The one used here was an old "RC" cabinet, which a dealer had bought in a job lot and sold very cheaply.

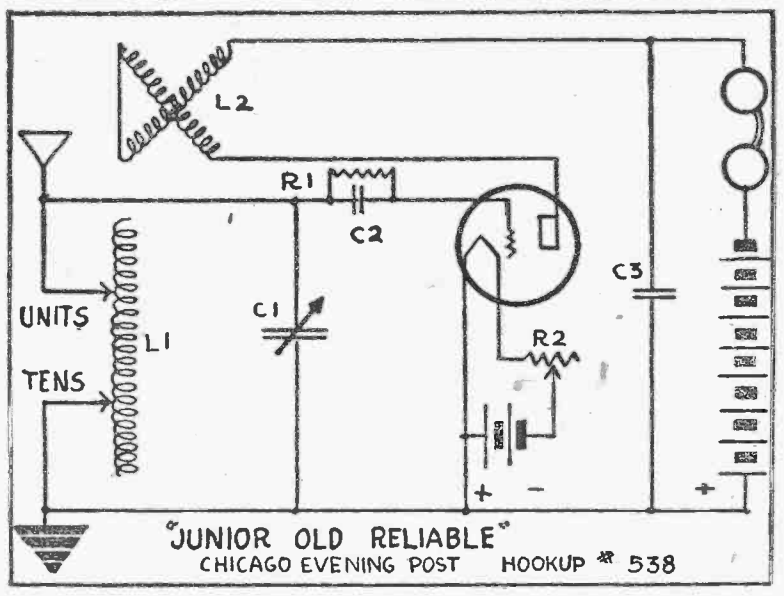
"C" BATTERY ON DETECTOR TUBE.

UV-199 and C-299 tubes, when used as detectors, are oftentimes improved 100 per cent by the addition of "C" bateries in the grid circuit. This may be inserted by connecting the positive of the "C" battery to the tuning inductance and the negative to the grid lead condenser.

DRILLING PANELS.

When drilling a hole in the panel never go completely thru from one side because, if you do, chipping of the panel will result. The proper method is to start from the front. Drill until the bit point shows on reverse side of panel, then turn panel over. By using a small hole as guide, finish by drilling out the remaining bakelite.

Exchange the Radio material you have and do not need for the material you can use that some one else has. Advertise in the Classified Section of this magazine. 5 cents per word. See page 15.



The upper photo shows the general mounting scheme for this simplified form of Armstrong single-circuit regenerative receiver. Note the tuning device and the neat wiring. The lower photo shows the panel of the set with its simple controls.

Figures Radio Voice Develops Horse Power

It is estimated by Dr. Alfred N. Goldsmith that a radio broadcasting station is roughly a one-horse-power voice. This way of regarding a radiophone station is justified by the value of power which leaves the aerial wires. One horse power consists in hoisting half a ton from the ground to the height of thirty-three feet in one minute.

The electrical unit of power used in speaking of a broadcasting station is the "watt." It takes slightly less than 750 watts to make a horse power. The average American broadcasting station radiates from 500 to 1,000 watts. Measurements indicate that the power of a human voice, in loud speech or song, is only about one-one-hundred-millionth of a watt. Yet this minute power is sufficient to be heard by the ear for several hundred feet. The human ear is calculated to be about as sensitive as the eye, so far as the amount of power required to give a definite sensation is concerned. By radio this feeble voice can be built up to a one-horse-power voice. This means that the voice of a speaker broadcasting from WJZ is increased over 50,000,000 times. In other words, if everybody on earth were to get together and shout at once, the voice power produced would still fall far short of the strength of a voice broadcast by WJZ.

Wire Links Radio Station, Studio 100 Miles Apart

A 100-mile broadcast line will tie up the new Boston studio of station WBZ in Springfield, Mass., when projects by the Westinghouse Electric company and the Boston Traveler Herald are completed, it is announced.

This line, which will be the longest span connecting studio and station in the country, has been specially designed for broadcasting, and will be used solely for that purpose. It will be built by the Western Union company, on the poles on the Boston and Albany railroad right of way. To eliminate line noises, the wires will be transposed at frequent intervals, and every precaution will be taken to make it a line as good as similar lines connecting studios and stations only a few miles away.

The Boston studio will be located on the Brunswick hotel, and will be specially built for broadcasting. It will be acoustically as well as artistically perfect. As Boston is the acknowledged center of culture, as well as one of the best musical communities in the country, the location is ideal. The line from Springfield to Boston will also connect with a number of places in that city. The pick-up system around Boston will be as elaborate as a telephone exchange. This will give station WBZ the advantage of a very varied program.

Altho station WBZ has been heard in England, Cuba, and on the Pacific coast, changes in the transmission apparatus are contemplated which will increase the range of the station still more. All of these improvements will make of station WBZ one of the best in the country and increase its utility and value a hundredfold.

Amateur Assists Storm-Ridden Canning Plant

SPOKANE, Jan. 24.—While the waves sweeping to shore in the teeth of a terrific storm on the northwest Pacific coast were gradually eating away the underpinnings of a cannery located in a lonely stretch of woods at Neah bay, A. A. McCue, superintendent of the Neah bay branch of the Northwestern Fisheries company, using an amateur radio telegraph station, sought help from the company's main office at Seattle thru an amateur radio station in this city.

His urgent call, addressed to his father, P. H. McCue, general manager and vice president of the fisheries, was received here and relayed by way of the Western Union by another amateur, Carlos Yerian of this city. The scene at Yerian's station, 7GI, from the moment that he caught the first call, is graphically described by F. M. Curtis.

"Huh, that's a new one on me," muttered 7GI to himself as he turned on the filaments of his two five-watters preparatory to answering 7IP's (McCue's) general inquiry, which was liberally sprinkled with the word urgent. "Wonder who this bird is, anyway? Don't remember hearing his call before. Well, here is where we get acquainted." 7IP, 7IP, 7IP de 7GI, 7GI, 7GI, QRA? QTC? k.

"GM OM QRA, Neah Bay, Wash.," came the answer; "vy urgent, bad storm here—all communication cut off. Must get mainland.

"Hr nrl fm A. A. McCue, Neah Bay, Wash., to P. H. McCue, Northwestern Fisheries company, Seattle, Wash."

There followed a long message giving in detail a description of the damage which was being caused by the storm, added to which was a note saying that the batteries supplying current to the transmitter were giving out.

From his little shack in this city 1GI joined Neah bay to the rest of the world and again gave amateur radio a chance to prove its value in an emergency. The message was forwarded immediately.

Invents New Nine-Tube Receiver, Super-Pliodyne

An interesting competition between two types of extremely sensitive receiving sets was held at the recent annual meeting of the Radio Club of America in Schermerhorn hall, Columbia university, in New York city.

This was a test between a nine-tube super-heterodyne and a new receiver, known as the super-pliodyne. The former was operated by George J. Eltz Jr., and the latter by Paul Godley.

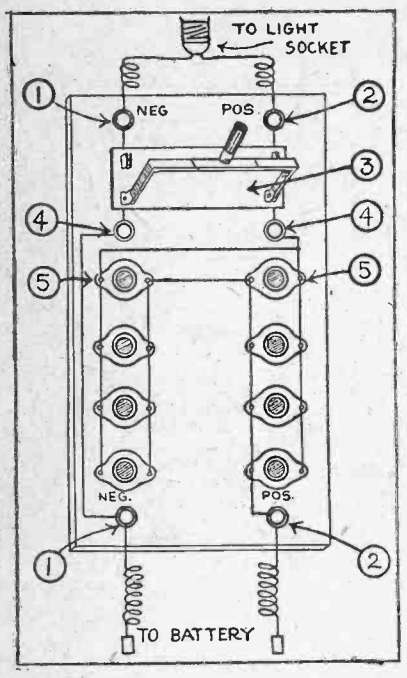
Both of these receivers were used at Garden City in the recent trans-Atlantic tests.

The superpliodyne is an extremely interesting receiver. It employs six stages of tuned radio-frequency so arranged that the whole system is controlled by one dial. Another remarkable feature is the fact that there is no regeneration in the set. There are nine tubes in the receiver. Both sets gave practically the same results.

The super-pliodyne is the invention of Mr. Ferrand, a well-known radio engineer, and the basic facts concerning it will be disclosed in a paper which he will read in the near future.

Be sure to read the Classified Advertisements on page 15.

THE HOME WORKSHOP



This is the lamp bank battery charger to be used on direct current described in the Dec. 27 issue on page 13. The illustration was omitted by error.

Sends Radio to Australia on a Flashlight Cell

SIDNEY, Australia, Jan. 24.—With only one-thousandth of the power required to light an ordinary battery flashlight similar to those used in nearly every home, C. D. Maclurcan, an amateur radio experimenter in this city and member of the American Radio Relay league, has succeeded in transmitting radio signals 1,400 miles. His signals were picked up readily in New Zealand. This is regarded as a marvelous record, far surpassing low-power work of American amateur operators.

In practically every country government regulations have kept the amateur stations on low power and short waves. Far from being discouraged by this practice, the amateur has sought to develop the field allowed him to the utmost. He has taken it upon himself to explore the possibilities of short waves and low power.

The experimenters in Australia, especially in the cities, are allowed only ten watts of power, hence more attention has been given to power here than in other countries. Mr. Maclurcan has made a special study of this problem and the distances covered by his amateur station, 2CM, are regarded as a world's record.

He has made several tests, usually with witnesses present to check him on the results obtained. At one time he exchanged messages with Frank Bell, operator of station 4AA of Waihemo, Shang valley, New Zealand, over land and water, for half an hour, Mr. Maclurcan gradually reduced his plate voltage to 15, thereby securing a plate current of .25 milamp. The in-put was only .004 watts.

The next day an expert in this work certified that the instruments were correct within 1 per cent. The antenna consists of a six-wire cage, T type, with a top 100 feet long and 80 feet high, passed on six hoops four feet in diameter. The counterpoise is fanned out in a circle of 100 feet in diameter, seven feet above ground. Mr. Maclurcan said his success was due entirely to an absolute regard for detail.

As the result of these experiments he believes that low power can be used for commercial purposes at a great saving. His set is to be installed soon on a ship bound for San Francisco, during which the commercial advantages of low power will be determined.

Cap Acity Says:

Joe Hoskins was listening to opera the other night and he thinks he needs a new tube because he couldn't understand a word they said.

Los Angeles to Hold Show

The second annual western radio and electrical exposition will be held at the Biltmore hotel from Feb. 5 to 10. J. C. Johnson, of New York radio fame, will manage the show.

Prize Awards For Useful Suggestions

THE POST offers $1 for every accepted and published suggestion made by readers which will enable the home builder to improve his work.

A special prize of $3 each week is made for the best of these suggestions.

Send your entries to Workshop Editor, care Radio Dept., Chicago Evening Post. Inclose pencil sketch if necessary to convey idea.

Keeps Battery in Cellar

I have found that for the person who has his set in the living-room and wants it to look neat, that a wire running from his set down thru the floor to the cellar, connecting there to the battery, eliminates a nuisance and a homely sight.—EDWARD HASLAM, 3 Fluor court, Oshkosh, Wis.

FRYING NOISES IN TUBES.

The "frying" noises in the detector tube are caused by too much filament current. Turn down the rheostat.

Easy Way to Make Good Rosin Flux for Solder

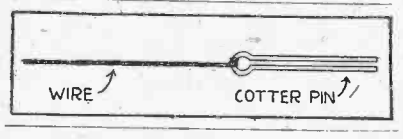
Here is a wrinkle in soldering that is new and comes from a Dr. Spidel of the United States department of commerce. It is a new flux that has rosin as its base, and solves the difficult problem of using rosin without the harmful acid.

Use a piece of clear rosin about the size of a walnut. Dissolve this in an ounce of "Carbona" cleaning fluid. This requires about four to five hours. The resultant flux should have a clear amber color and the consistency of water.

To use this flux apply sparingly with a small brush. Have the tinned soldering iron hot and apply solder in the usual way.

Tip to Make a Tip

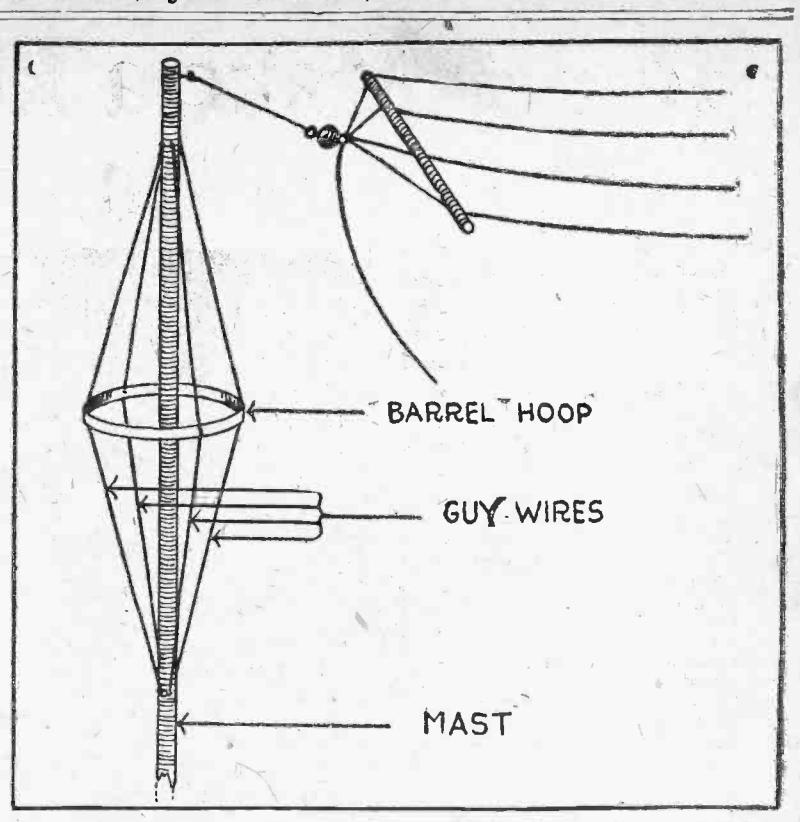
An ordinary cotter pin fastened on the end of a wire makes an excellent tip for the wire, especially if it is stranded. (See diagram.) The cotter



pin easily is inserted in a binding post or clip and makes a neat, positive connection. The cotter pins also can be used as phone cord tips.—LEONARD OSWALD, 1646 West 101st street, Chicago.

Discharged Storage Battery.

Do not permit storage battery to remain discharged for any length of time. Recharge when hydrometer reading is below 1200. Fully charged batteries show reading between 1280 and 1300.



A novel, but efficient method of supporting an aerial with a high mast when the space will not permit the use of guy wires to support the mast can be made quite easily. An ordinary barrel hoop is used, as shown in the illustration, supporting the four strain wires in the manner indicated. These tighten with the bending of the aerial post therefore holding it securely in whichever direction it bends. This plan comes in handy where the radiophan wants to locate his mast on the corner of the roof.—CHESTER WILSON, 6511 Maryland avenue, Chicago.

SCRAPE BATTERY TERMINALS.

Don't permit battery clips or terminals to become corroded. Keep them bright and clean by scraping or sandpapering. Lots of so-called static and phone noises originate at battery connections.

EXAMINE YOUR AERIAL.

Next Sunday examine your aerial carefully. Look at all the wires and see if any have corroded or weakened. If so, replace them with new. If the aerial is tarnished, replace it or use a bit of emery or sandpaper.

How to Make a Three-Tube Superduc Receiver in a Portable Outfit

PORTABILITY in a receiving set is sought by many. This week Mr. Hagerman gives construction details for a portable Superduc and also shows a photograph of one that was made up for a traveling man.—The Editor.

By LEWIS B. HAGERMAN.

I AM showing today a photograph of a three-tube portable Superduc set. The instruments used in this set were selected because of their compactness and efficiency. It is mounted on a 7x14 panel. The parts necessary for its construction are as follows:

1 variometer.
1 43-plate variable condenser.
1 variable grid leak.
1 7x14x3-16-inch panel.
1 25-ohm rheostat.
1 40-ohm rheostat.
3 sockets.
2 dials.
2 audio-frequency transformers, ratio 5 to 1 and 3 to 1.
4 tip jacks.
5 binding posts.
1 piece bakelite (for mounting binding posts.)
1 4½-volt "C" battery.
20 feet No. 14 bus bar wire.
Mounting board, screws, etc.

To construct this set, drill the panel for the instruments to be used, placing them in the arrangement as shown in the accompanying photograph; mount transformers, sockets, etc., on baseboard, placing them so as to make the leads to the transformers short.

Connecting the Variometer.

From aerial tip jack to one side of stator of variometer, from the other side of stator of variometer to the stationary plates of the variable condenser, connect rotary plates of variable condenser to ground jack, one side of variometer rotor to grid leak and condenser, other side of grid leak and condenser to "G" on socket. Then connect the other side of the rotor to "P" on socket and "P" on transformer. Run one wire from "F" on first socket to "F" on second socket to "F" on third socket and also to stationary plates of variable condenser, and second binding post from the right. Connect plus on primary of first transformer to binding post which is second from the left. Connect "G" on secondary of transformer to "G" on second tube socket; "P" on second tube socket to "P" of second transformer; plus of second transformer to first binding post from the left; "G" on secondary transformer to "G" on socket of third tube. Connect "P" on socket of same tube to bottom tip jack. Connect top tip jack to first binding post from the left, the same as plus on second transformer.

How Rheostats Are Wired.

The rheostats are wired a little differently from the diagram given. You now have one "F" on all of the three sockets open. Run wire from first binding post from the right to one side of both rheostats, from other side of 40-ohm rheostat which is directly under the grid leak to the remaining "F" on the detector socket and from the other side of 25-ohm rheostat to both "F's" on the amplifying sockets."

Connect the third binding post from the right to the second binding post from the right. You still have a connection from both "F's" on your transformers. These should be connected together and run to the minus "C" battery. The plus "C" battery connects to the plus "A."

The hook-up from the binding post, going from right to left, looking at the set from the rear, is as follows:

"A" minus, "A" plus, "B" minus, "B" plus, 45 volts; "B" plus, 90 volts.

Notes on Operation.

To operate the set, connect batteries, aerial, ground and phones, turn on detector and amplifier tubes. Entirely enmesh the rotor of your variometer. Tune in a station with the variable condenser. Increase volume with variometer and adjust grid leak and rheostat for clearest reception.

Will H. Wilkins of the "Kiki" company, who is going to carry this set with him on his tours, says that it is the clearest, loudest and finest tuning set he ever has heard. It is to be mounted in a suitcase with compartments for loud speaker, phones, batteries, aerial wire and tools.

We are giving below several letters of comments on the Superduc.

B. L. Rawlins of the Equitable Life Insurance society of the United States, 637 Peoples Gas building, Chicago, says:

"I am sure you will be glad to hear from your readers who have tried out your Superduc circut, and I want to tell you that I am simply 'nuts' about it. Have hooked up several circuits which I have had little to complain about, but this one has them all skinned for simplicity and reliability. It is all and more than you claim for it.

Not having an available variometer, I tried it first with a loose coupler and it gave swell results. Curiosity getting the better of me. I went and bought a variometer and cannot see that it does not do just as well and it is certainly simpler. A fellow does not have much to do in bringing in stations clearly, and keeps thinking he ought to have more knobs to turn.

"In this way I have got more results in tuning with the rheostat than I ever did before and have found that there is a good deal more to be accomplished in tuning on the grid condenser than I had believed possible, as it caused me to construct a variable grid leak for myself in which I am using an arc of three or four inches made with a fine of India ink for the resistance. I find with this I can tune faint stations in and out. But the whole thing is you can get your stations, using only the condenser and variometer, and improve them with the rheostat and variable grid."

The results Mr. Rawlins has obtained are not exceptional. We feel that every one should get the same results.

Has Faint Reception.

R. A. Wilson of the Baush Machine Tool company, 751 Peoples Gas building, Chicago, says:

"We have built the Superduc circuit as described in your Radio Magazine of Jan. 3. This set works very well and we are able to receive distant stations, but they are very faint with two pair of ear phones.

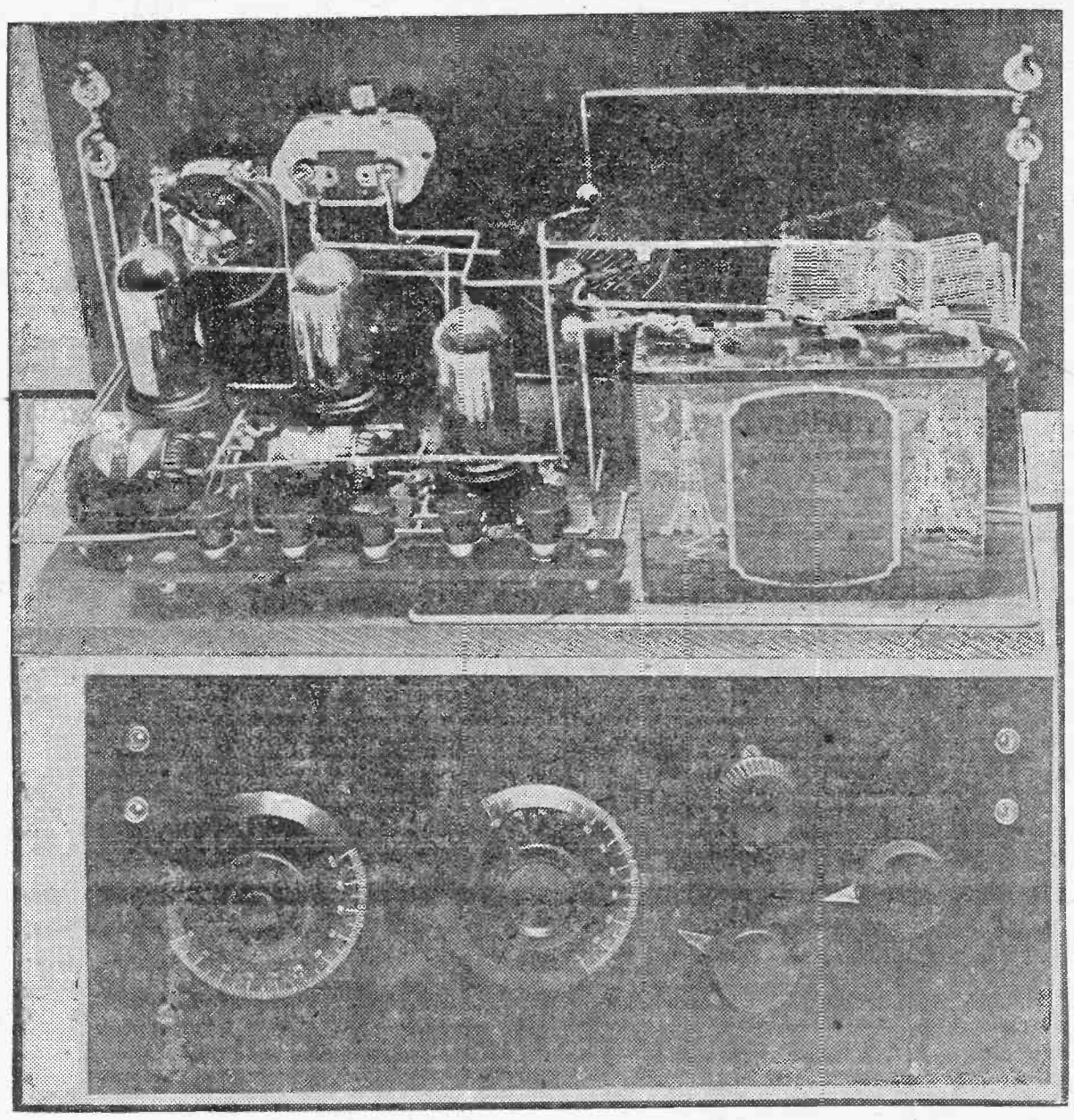
"KDKA comes in fairly clear but very faint and I would like to inquire if it is possible to add one or two stages of amplification to this set. If this is possible I would greatly appreciate your sending any information or diagrams showing how this may be accomplished."

If Mr. Wilson would increase the length of his aerial, say, one wire 150 to 200 feet long in a straight line, six to eight feet above all obstacles, we feel that his volume on distance would be increased greatly.

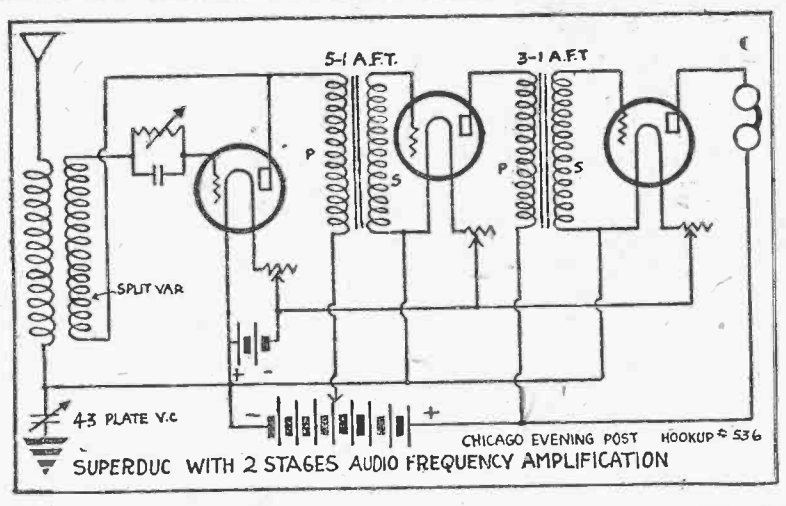
J. W. Goggin, D. D. S., 29 East Madison street, Chicago, says:

"I am interested in making up your Superduc hook-up. I note the trouble you say you had in finding a suitable variable grid leak. Would you give me the name of the grid leak that tubes be satisfactory with your set, using WD-11 tubes. Would these tubes be satisfactory with your set and can two stages of amplification be used with your set? If so, would you give me a hook-up I have a 10 to 1 and a 5 to 1 All-American transformer. Would they be suitable for the amplification? How is the selectivity of the Superduc?"

Dr. Goggin is certainly right about the variable grid leak. Great care must be taken to get one that is efficient. WD-11 tubes can be used with the hook-up as shown for the Superduc Junior. Your audio-frequency transformers are of too high ratio. A 5 to 1 and 3 to 1 should be used. The Superduc is very selective.



Rear view and panel view of Superduc Junior.



SUPERDUC WITH 2 STAGES AUDIO FREQUENCY AMPLIFICATION

Now It's Radio Jag

Some English clergymen think that radio is enough to drive a man to drink. At least, that's the natural conclusion to draw from the fact that in Nottingham the ministers have protested to the authorities against the installation of radio receiving sets in the "public houses" or saloons. The saloon keepers are hurt and indignant, saying that they are trying to elevate the tone of their establishments by means of the radio programs, but the ministers insist that it is but an insidious and evil scheme to get the workingmen to drink more and more.

Hear U. S. in England.

J. Bishop of Norfolk, England, writes that he has heard WGY and other American stations with only four tubes and an indoor aerial, two stages of radio-frequency and one audio.

Leakage in Battery

Spilled acid or water on top of storage batteries is apt to cause leakage. Keep top of battery dry and clean.

Change in Aerial Designed to End Fading of Signal

Another improvement has been introduced in station WBZ (Springfield Mass.), following the attempt of the Westinghouse engineers to make the station as perfect as possible. This particular improvement was made in the antenna, and was introduced in order to reduce the possibility of WBZ's signals swinging out.

Fading, or "swinging" is a very peculiar phenomenon, the exact cause of which has not as yet been accurately determined. It is known, however, that the swinging of aerials—both of the station transmitting and also of the receiving set—can cause fading. Fading is characterized by a complete disappearance of signals which had been received very loud a few seconds before. Even before the operator has the opportunity to readjust his receiver, the signals are heard at the same intensity as previously. Most interference is experienced when receiving long-distance stations.

Altho the antenna system of WBZ is one of the finest of any broadcasting station, further improvements were added when a change was made in the method of connecting it with the transmitter. In this instance, the transmitter is used as a generator of oscillations which are modulated by voice currents. The aerial acts merely as a radiator of these oscillations.

The oscillator is so connected to the radiating system, which is made up of the aerial and the counterpoise system, that the swinging by the wind or other agencies of either one will not disturb it in any way. Thus it will keep up its frequency, and no change will be transmitted from it to the aerial. A steady signal results, free from swinging and fading.

This system was developed by Frank Conrad, assistant chief engineer of the Westinghouse Electric company, and is one of the best methods known to overcome the phenomenon of fading.

CAUSE OF WEAK SIGNALS.

Quite often the cause of weak signals in a receiver that ordinarily works fine is to be found in run-down batteries. This is particularly true with dry cell tube sets. Test your "A" battery as well as your "B" battery.

Be sure to read the classified advertisements on Page 15.

Why Radio Frequency Is Not Popular

What is radio-frequency? Has it any advantages over audio-frequency? How many methods are there of amplifying signals? What is audio-frequency?

These are important questions that seem to feaze thousands of radio amateurs who are dabbling with receivers employing amplification.

There are two distinct methods of increasing or amplifying the strength of incoming signals in a radio receiving set. The first method employs one or more tubes in such a way that incoming oscillations are first detected by the detector tube, then submitted for amplification to the next tube.

The second method utilizes radio-frequency to build up the original signal-frequency, or, in other words, to build up the weak impulses in the antenna circuit until the signal is of sufficient strength to actuate the detector.

Where to Use Either.

Audio-frequency should be used where loudness of signals is desired, while radio-frequency amplifier should be used where distance or range is desired.

The objection to radio-frequency amplification at this time lies in the fact that it is still in a state of experimentation, so far as short wave lengths are concerned.

This is due to two facts. First, the amplification of waves at radio-frequency is critical, particularly on short wave lengths. Second, on these short wave lengths we are not in reality obtaining radio-frequency amplification, but regeneration due to the capacity effect of the vacuum tube itself feeding back into the coils of the radio-frequency transformer.

Another objection that must be overcome in this type of amplifier before it is successful is the development of a transformer that will function properly on short waves where the frequency is extremely high.

Requires Delicate Adjustment.

Because the operation of radio-frequency units is a critical process the utmost care must be taken to adjust the set for correct results. It is imperative also that all radio-frequency apparatus be carefully shielded; otherwise capacity effects will prevent any stable adjustment being obtained.

When radio-frequency transformers are employed only a slight stepping up of voltage is generally feasible because of the capacitance effects.

The inability to step up the voltage between stages, together with the partial short circuiting by capacitance, makes the amplification per tube less than in audio-frequency amplifiers. More stages, therefore, are needed in radio-frequency amplifiers to give the same over all amplification.

Lessens the Effect.

The effect of tube capacitance may be neutralized somewhat by employing transformers or coupling reactances that are tuned to the frequency of the incoming wave. The tuning may be very broad so as to amplify over a considerable range in frequency without the necessity for adjustment or it may be sharply tuned so as to increase selectivity.

Radio-frequency amplifiers, particularly those for very high frequencies, generally exhibit marked regenerative properties due to the inherent capacities between stages. Unless care is taken to minimize these coupling capacitances by separating the circuits and surrounding them with shields, the regenerative effect will produce strong continuous oscillations that will interfere with the amplification.

TUBE PRICES REDUCED.

Radiatrons and Cunningham amplifying tubes have been reduced to $5.50. The soft, or detector tubes, C-300 and UV-200 have not been reduced.

HOME RADIO OPERATION

This department is conducted with the idea of assisting owners of radio receiving sets to operate them more efficiently. Believing that most of the complaints made by broadcast listeners against interfering stations are due mainly to lack of knowledge in tuning receivers properly, The Post will present here from time to time constructive articles on the operation of sets.

How to Tune Regenerative Sets to Make Them More Selective

By WALKER C. IRWIN.

TWO of the most common causes for inability in getting long-distance signals are not in the receiving set itself, but in its operator.

Either the operator tunes for a signal too impatiently and passes over it without hearing it at all, or he does not understand how to control his regeneration and brings in a distorted signal or just a series of howls and whistles.

Most beginners, having found it easy to tune in a local or near-by broadcasting station, make the mistake in believing that the far-away station also comes into the set in the same manner.

Because of proximity the local station sends into your receiver a signal with such crushing intensity it practically "covers the entire dial." In other words "its wave band overlaps."

The signal for a distant station, altho that station may be transmitting on identically the same wave length, has lost much of its energy in its travels thru space to your set and comes in weak.

Controls Are Limited.

In single-circuit receivers it is difficult to tune out the local station even with the most careful and intelligent tuning because there usually is no way to tighten up or loosen the coupling.

By the addition of a wave trap, selector or eliminator, the single-circuit receiver is given sharper tuning and it is possible for the operator to push thru local interference and pick up the distant signal. However, even with an efficient wave trap or separator, unless the operator knows how to use it, he is scarcely any better off for it.

The double or three-circuit regenerative set is more selective partly because it employs a variocoupler, the adjustment of which "tightens" or "loosens" the coupling and permits sharper tuning.

Still, even with the most selective double or three-circuit receivers, unless the operator knows how to handle the various controls he is no better off than his single-circuit neighbor.

Fault is With Operator.

It simmers down to my first statement: The fault usually lies with the operator rather than with the receiving set.

The owner of a "Zenith" receiver asked me the other day to suggest some way of converting his set to a more selective one without tearing it down completely or changing his cabinet.

His complaint was that he could not tune out any of the local stations and bring in a distant station, and that even on "silent" nights he was unable to bring in any of the outside stations. And yet this receiver has an established reputation for selectivity.

The trouble with this owner was in his lack of knowledge in tuning. When some of his most common faults were corrected his receiver became not only a long-distance set, but also a selective one.

Assuming that your receiver is one that is or will be made selective, here are a few notes on tuning that may help you:

Begin With the Tubes.

First turn on your filament current until the tubes burn just a little above their proper brightness. Let them "heat up" for a few moments. Now turn down the amplifying tubes to their proper degree of brightness. In the case of the 201-A, 301-A, 199 and 299 tubes, this should be a dull, cherry red. The WD-11 or 12 tubes burn just a shade brighter.

Leave the detector tube still burning a trifle brighter than its proper color.

Now adjust the dials or switches that control your wave length to the one under which you expect to work.

The controls for regeneration should be set about at the half way point on the dial.

You should now hear a rushing, frying sound in your phones which indicates that the set is in regeneration. If the noises are very intense, the tube is in oscillation and should be turned down until just below this point. But don't go too far or you will have weak signals.

By listening very carefully and turning the tube up just a little brighter you will soon discover a point where the maximum of regeneration is obtained without distortion.

Now turn to the tuning control—the grid condenser or the grid variometer in the case of a three-circuit regenerative set. Move it SLOWLY from zero toward the 180 degree mark.

When to Find Stations.

Usually the lower-wave stations will be found somewhere between zero and 25 degrees on the dial. The higher-wave signals come in from 25 up to 60 and 80, as a rule. These conditions, however, depend upon your antenna system and your receiver.

Turn slowly—very slowly, until you hear a signal, which will be in the nature of a whistle.

In the case of a local station or even with one of the high-powered stations within a range of 200 miles, this whistle probably will be strong.

In the case of distant stations, whether high powered or not, the signal probably will be weak—so weak, in fact, you may pass over it entirely if you turn the dial too fast.

If local interference persists, tighten up the coupling. In the variocoupler this means moving the dial so that the rotor and the stator approach right angles to each other.

Where Eelectivity Originates.

It is right here where regenerative sets become selective or nonselective, according to the will of the operator.

Tight coupling makes sharper but more difficult tuning. Loose coupling brings in the stations much easier, but if there is a tendency for interference you will find difficulty in separating the signals.

Tune with tight coupling. Keep your set keenly alive to the faintest signals. Some stations on highly sensitive sets come in with just a faint click. Stop there and begin to build up the regeneration.

But proceed slowly. Force regeneration up to the point where the tube is ready to oscillate. If you go too far and the tube oscillates, turn back the regeneration control below that point and start once more to build up. Lowering and raising the filament control on the detector will assist you in getting the signal in strong, too.

The tuning dial should be turned slightly backward at this point when the music or voice should be heard.

By coaxing regeneration still further with the regeneration dial and, if one is used, by moving the variocoupler dial forward or backward, the signal should come in at its maximum.

Regulation of the filament rheostat often keeps increasing signal strength.

Clear Signals Best to Seek.

Distortion usually comes, however, when regeneration is forced too much. Better have a moderate volume and a clear signal than extreme volume so distorted as to be unpleasant.

The various steps in tuning a regenerative set are many. A sensitive set is a difficult one to tune. However, after the art of tuning is mastered it comes "by second nature" and as soon as you have learned the eccentricities of your own receiver and located the various "spots" on the dials where signals come in best, tuning selectivity is a small job.

Radio Hogs Become Radio Scouts by Good Tuning

By H. A. BREMER.
(Chief Engineer Bremer-Tully Manufacturing Company.)

THE greatest obstacle to good radio reception within a city at present is the radiophan himself. This is, of course, due to the fact that practically all receiving sets are transmitting sets when improperly operated.

One receiving set, improperly operated, may make it impossible for any other set in the neighborhood to receive the signal on which the disturbing operator is trying to receive. The tendency of design in the better receiving sets at present is to make them nontransmitting. However, such receivers are yet in the great minority.

It is the duty of every operator of a radio receiving set to learn the fundamentals of tuning. The old saying, "free as the air," is no longer applicable. A careless operator can "hog the air" of many square blocks.

Single Wire Aerials Best.

The first requirement of a radio scout is to use a single-wire antenna. There is practically no gain in reception on tube sets by the use of more than one wire. However, transmission increases greatly with the use of more than one wire. Two or more wires will pick up static noises and reduce selectivity out of proportion to any possible gain.

Antenna, preferably, should be of No. 12 or No. 14 copper wire. The important factors for strong reception are height above ground and distance in a straight line from the receiver to the insulated end of the antenna. If you must have a high-capacity antenna, use a stranded wire, but a single wire is better, considering quality of reception. Use a single-wire antenna. Be a radio scout. Don't "hog the air" in your neighborhood.

How to Tune Properly.

Tuning any radio receiver is a very simple operation when the purpose and effect of each control dial is understood. The average operator is not versed in high-frequency electrical formula or terms, and I believe analogy is, therefore, the best means of picturing the action of a receiving set and its controls.

Crystal sets do not cause interference, and tuning consists simply in tuning to resonance with the station desired. The phones absorb all the energy supplied by the antenna and no batteries are used to supply additional energy.

Practically all sets now in use are of the regenerative type, all of which are capable of transmitting with various intensity, depending on the circuit used.

All radio receiving sets have a wave length, or tuning control, which is used to bring the receiving set (including the antenna) into resonance, or tune, with the particular transmitting station desired, just as the peg on a violin is turned to bring the violin string into resonance with a certain key of the piano, as, for example, "middle C" or "station C." It is evident that by turning the violin tuning peg, or dial, the string may be tuned to key "A," "B," "C" or "D," corresponding to transmitting station of "A," "B," "C" or "D."

As to the Tuning Dial.

This control dial usually is marked "tuner," "wave length," secondary," "primary" or "antenna condenser." In some cases, two such wave-lengths, or tuning controls, occur and both must be tuned to the transmitting station. The purpose of two controls for wave-length, or tuning, is to make the set more selective by tuning the antenna (primary) with one of these controls, then transferring the energy into another coil (secondary), which also must be tuned. This will be explained later in detail.

The first step in tuning, therefore, is to determine which of the dials controls the wave-length. Keep in mind that this is the fundamental, or tuning control. All other controls will be considered as adjustments. This tuning, or wave-length control, is used only for selecting the station desired and is the only control used for this purpose. This control may consist of switch and points in addition to the main tuning dial. Such switch is used to vary wave-length roughly over various bands or ranges only.

Must Tune Both Controls.

Some receivers have both "primary" and 'secondary.' As mentioned above, such sets are difficult to tune because both of these controls must be tuned to the station signal. Locate the wave-length, or tuning control, on the receiver and keep in mind that this dial is used only to tune the receiver to resonance with the station desired.

Your antenna is picking up thousands of signals of different frequency, but just as with the tuned violin string, it responds only to the frequency to which it is tuned, and only signals of this frequency are delivered with strength to the vacuum tube.

Think of the tube as a valve which is controlled by the signal which is delivered to it by the tuned antenna. An extremely weak signal acting on this valve controls an enormously greater energy supplied by the "B" battery acting through the phones, just as slight pressure on the throttle of your auto controls the correspondingly great power of the motor.

Tuning the Feedback Circuit.

This action takes place in all tube-receiving sets. In regenerative sets part of this amplified signal, or energy, is fed back to the antenna or tuned coils, to boost up the weak signals, and it is possible by this means to greatly strengthen the signal and resultant volume. The dial which controls this amount of energy fed back will be referred to as the feedback control. It is also known as "tickle," "reaction" or "plate."

This control is the mischief maker in regenerative sets, and the trouble is always due to too much "feed back," the natural result of trying to increase the volume beyond the limit of the receiver.

As the energy fed back to the antenna, or tuned coils, is increased, the volume of the signal increases up to a certain limit. If increased beyond this limit, the tube will feed energy into the antenna, and the wave-length, or frequency, will be that at which the antenna is tuned. In other words, the tube is oscillating and is, in fact, a transmitter, sending out a carrier wave of the wave-length, or frequency, at which the set is tuned.

Miniature Broadcaster Station.

If a microphone were connected to modulate this carrier wave, it would be quite possible for neighboring sets to tune in within a few blocks or miles, depending on the receiver and antenna and receive your voice.

If a signal or station is tuned in with the set in exact resonance, the signal still would be fairly clear, and neighboring sets, even crystal sets, would receive stronger signals if tuned on the same station. It is, however, practically impossible to secure exact resonance, and, consequently, the wave of the station and that of the set are of slightly different frequency, which results in a "beat," or note, the pitch of which depends upon the difference of frequency between the two waves.

Notice that as your tuning approaches the frequency of the station the beat becomes audible as a shrill note, which decreases in pitch to zero at resonance and occurs again

Continued on Page 13.

Selectivity Depends on Your Aerial

The antenna system is a very important part of a radio receiving station. Poor selectivity and lack of volume quite often are due to faulty construction.

The ideal aerial is one that has a straight stretch of a single wire, 150 to 175 feet, a twenty-five foot or less lead-in and being twenty-five to thirty feet above all grounded surfaces, such as the earth, the roof or trees.

Conditions in Chicago, however, too often prohibit the construction of the ideal aerial. Many owners of sets must "keep on the roof" and this quite often is less than fifty feet long.

Because of the limitation, the constructor frequently makes the mistake of using two or more wires fifty feet in length each in parallel, believing that this gives him 100 feet, which it does not. However many wires are in parallel the aerial's length, so far as its effectiveness as a collector of radio broadcasting signals is concerned, only is as long as the length of one of the wires.

How to Solve Problem.

There are several ways of getting sufficient stretch to an aerial, even where space is limited.

One may run his wire around two sides of the roof forming an "L" shape aerial. This won't be quite so good an aerial, but 150 feet of it would be better than fifty or sixty on a straight stretch.

The recent appearance of stranded wire and ribbon aerials is solving the problems of many, altho their cost deters some from using them.

The stranded wire aerial, especially of the flat-braided type, is very effective. Seventy-five feet of this aerial is almost as good as twice that length of single wire.

The ribbon aerial is a narrow band of thin copper about a half inch wide. This also is quite effective, it requiring about half the stretch of a single wire.

If either the braided or the ribbon aerial is used, it is advisable to give it several twists when installing.

This distributes the surface more evenly to the incoming radio waves, which some experimenters report increases strength of signal and selectivity.

Making Selective Aerial.

Where receiving sets are not very selective and the owner prefers selectivity to distance and volume, short aerials will assist him to a considerable extent. A single wire aerial, however, should not be shorter than fifty to sixty feet.

In seeking selectivity, however, thru the aerial, do not overlook the fact that you are sacrificing the range of the set and also its volume to some extent.

It is better to rebuild your receiver so it will be selective, learn how to tune it properly and use a standard aerial. Then you can have both selectivity and range.

When installing an aerial bear in mind these points:

The lead-in should be kept as short as possible. It should be of No. 14, insulated wire. It should not touch the roof or any portion of the building on its way to the receiver, being kept clear with insulators.

Be Sure of Insulation.

The aerial wire should be stretched tight enough to keep it from swaying in the wind. It should be well insulated at both ends. The open end, or the one farthest from the receiver should be pointed toward the west (here in Chicago), and the lead-in should be taken on from the east end where possible. This is because there is a slight directional factor in the aerial, and you should take advantage of it. All wires should be well soldered.

The ground wire should be installed with the same care as you give the aerial. The shorter it is the better. Use No. 14 insulated wire and attach it to a running water pipe if possible. Radiators will answer for a ground, but are apt to be poor conductors.

Lightning arresters should be installed and care used to see that all connections are soldered.

Cuban Broadcasting

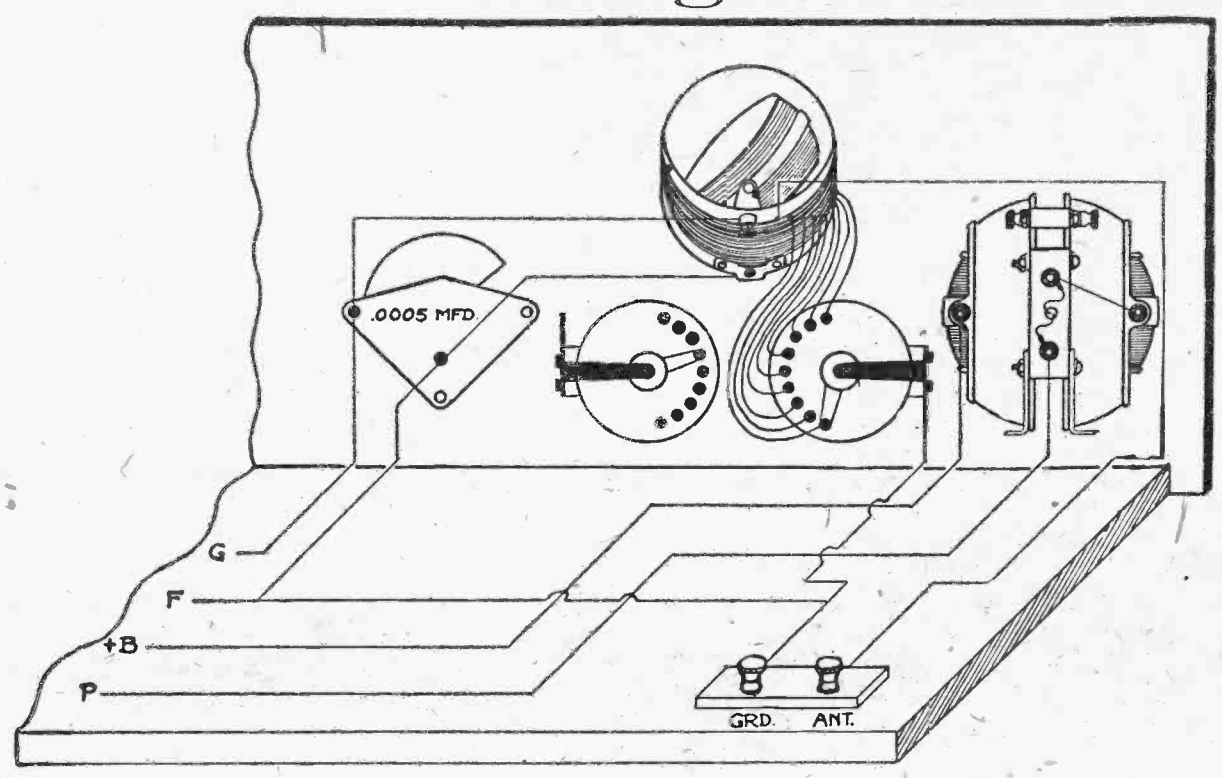
Cuba boasts of twenty-seven radiophone broadcasting stations, of which six are rated at 500 watts. Four other stations have an output of 100 watts. The principal stations are PWX, the Cuban Telephone company; 6KW, Frank H. Jones; 2CX, Frederick W. Barton, and 6DW, Eduardo Terry.

Universal Panel Converted Into a Complete Three-Circuit Regenerative Set

THIS week Mr. Freund takes his experiments into his workshop and, using the "Universal" panel which he designed, converts last week's Reinartz receiver, into an Armstrong three-circuit regenerative set, which is the "Old Reliable" described in previous issues.

—THE EDITOR.

By BENJAMIN E. FREUND.
(Chief Engineer Radio Division Crossland Pfaff Engineering Laboratories.)



Benjamin E. Freund

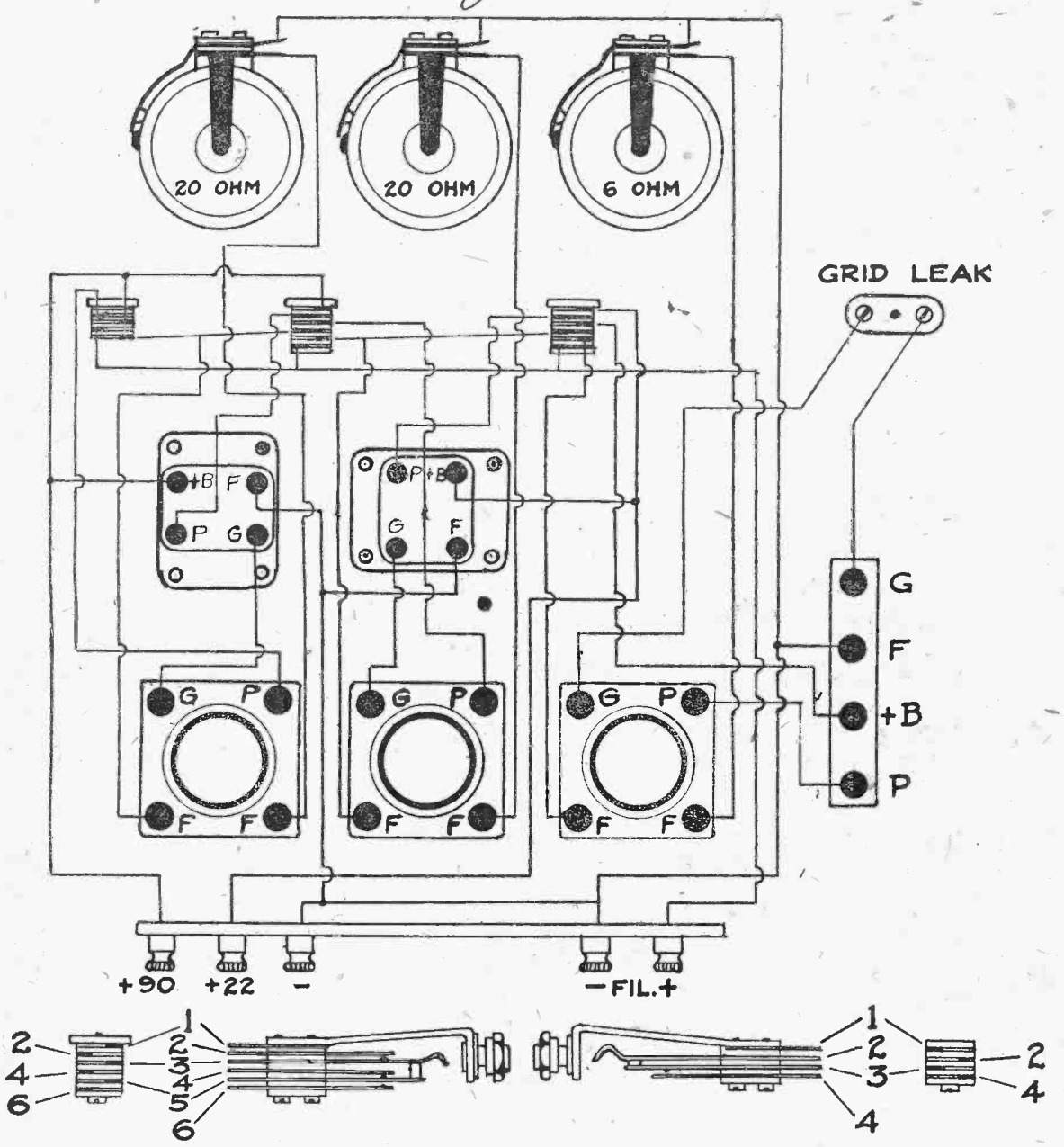
FOR the benefit of those who did not read the two preceding articles I will repeat that portion which is necessary to make one understand the purpose of today's article.

On Jan 10 there was published in these columns the dimensions for the laying out and drilling of a panel which could be used for an infinite number of different circuits.

The arrangement of this panel was designed so that ten of the most popular circuits that have proven meritorious could be assembled and wired on this "universal" panel in the conventional form that they were intended for with the arrangement of instruments necessary for each circuit in their proper sequence.

Each week there will be described a different circuit with both constructional and wiring information describing and illustrating in a most simple manner the necessary alterations for changing from one circuit to another.

Last week I described the construction of the detector and two-stage amplifier unit which is assembled on the same panel with the tuning unit. The detector and two-stage amplifier were wired as a separate unit so that in changing from one circuit to another it would not have to be changed. The arrangement and wiring of apparatus pertaining to the tuning unit as necessaray for the construction of a Reinartz receiver was also described last week.



№ 105 CARTER FILAMENT CONTROL JACK

№ 103 CARTER FILAMENT CONTROL JACK

Use "Old Reliable" This Week.

This week's article shows just how an Armstrong three-circuit regenerative receiver ("Old Reliable") can be constructed.

Fig. 1 illustrates the arrangement of apparatus in their proper sequence looking at the receiver from the rear.

In order to design the panel so that the various circuits could be assembled without any extra or unused holes being exposed and keeping within the conventional form of arrangement of apparatus special makes of apparatus are specified.

The parts selected as necessary to construct and wire the entire ten circuits amount to a little over $68.

This is the attractive feature of the "universal" panel, as the parts necessary to construct any one of the ten circuits would amount to $40 or $50.

This series of articles shows you how to build all of those circuits that you have longed to try out but could not on account of their cost. This panel was designed especially for those who wish to try out all the new circuits with the cost aggregating a little more than the cost of one.

List of Parts Necessary.

The parts necessary for the ten circuits and used by the writer are as follows:

One 8x24x3-16 Formica panel.
One Columbia triple coil mounting.
One 35-turn honeycomb coil (mounted).
One 50-turn honeycomb coil (mounted).
One 75-turn honeycomb coil (mounted).
One 100-turn honeycomb coil (mounted).
One Columbia split variometer.
One Columbia variocoupler.
Three Carter induction switches.
Two Howard or Carter rheostats (20 ohm).
One Howard or Carter Vernier rheostat (6 ohm).
Two Comsco or Na-Ald condensers .0005 MFD.
One 21-tap Reinartz coil.
Three .006 MFD. fixed condensers.
One .00025 MFD. fixed grid condenser.
One .001 or 002 fixed phone condenser.
Three 1-inch Erla bezels.
Two No. 105 Carter filament control double circuit jacks.
One No. 103 Carter filament control single circuit jack.
Three Firco or Erla indestructible sockets.
Seven binding posts.
One variable Bradleyleak.
One baseboard for mounting.
One Stark-Ko Cockaday four-circuit tuner coil.
Three Na-Ald dials.
Two Thordarson low-ratio transformers (3½ to 1 ratio.)

Explains About Parts.

As it was not possible for the writer to try all the different brands of apparatus being manufactured, it is quite all right to use products other than those specified here providing that they are adaptable for the arrangement of all the circuits to be constructed.

In figure 1 on the right end of the panel is a Columbia split variometer. A split variometer is requested as some of the other circuits which are to be described later necessitate the use of a variometer whose stator and rotor windings can be used independently.

At the left of the panel a 23-plate (.0005 MFD.) condenser is shown. The first article in this series showed the drilling as necessary for a Comsco or Na-Ald condenser. In the center at the top of the panel is a Columbia 180 degree varicoupler. This coupler has ten taps. The first tap at the top of the winding is connected to the antennae binding post. The remaining nine taps are connected to the points of the nine-point induction switch which is shown immediately below the variocoupler. If nine-point switches are not obtainable one with a larger number of points will do. The other induction switch, which is shown, need not be used unless a coupler having two sets of taps is used. In the Reinartz circuit both are used.

In connecting the .0005 MFD. (23 plate) condenser to the secondary or rotor of the variocoupler be sure that the rotor (movable plates) of the condenser and the front end shaft connection of the variocoupler are connected to the "F" lead which connects to the "F" binding post on the terminal strip of the detector—amplifier unit.

Knocks Out Body Capacity.

This must be adhered to carefully as the "F" lead is also connected to the ground binding post.

It is the grounding of the two shafts that eliminates body capacity which, when present, are bothersome. The induction switch lever is also grounded, which makes all shafts which have a tendency to promote capacity effects grounded.

The variometer used by the writer is pigtailed, which eliminates the use of having the shaft in the conductive circuit of the set. But if a variometer is used which uses the shaft as a means of connection, be sure that the front shaft is connected to the plus "B" lead or binding post of the terminal strip.

I believe that with the aid of figures 1 and 2 there should be little difficulty encountered in the construction of this circuit.

In figure 2 a .00025 grid condenser should be connected across the grid leak. This is not shown in the illustration because in some of the circuits to be described later the relative connection of grid leak and condenser is different.

The next article will describe the third of the ten circuits which have been the most popular with the radio public.

Be sure to read the classified advertisements on Page 15.

Questions You Ask and Answers We Give

NO DIAGRAM.

1119—CHICAGO: I have trouble in getting KYW. I cannot get them unless I hold the aerial. I have a wave trap as was described in The Post Radio Magazine, but this tunes them out entirely. Last night while listening to the opera "Cleopatra" I switched the ground and aerial on the binding post and got KYW with volume enough for a loud speaker. How can you account for this? Also can you give me plan for 3-tube set, using one 43-plate variable (not vernier) condenser, 1 vernier part (separate) and one tickler, with battery connections on back of cabinet; also using jacks and plugs? As I do not understand much about radio, I would like it in the simplest terms possible. Want to use a glass panel. I have a one-tube regenerative set. Enjoy your magazine very much. Have every copy. The magazine is the finest going.

You do not enclose a diagram of your set, therefore, we cannot explain the phenomenon you describe. The hook-up for a three-tube set you request is shown.

DOUBTFUL HOOK-UP.

1121—CHICAGO: I have a one-tube regenerative set, but cannot get out of town; my set does not regenerate. I have tried several hook-ups with the same results. What do you advise? I use about a twenty-foot ground wire and a 100-foot aerial. My tube is a WD-11 and works fine on my friend's set. He claims to have gotten ninety-three stations with this hook-up. Is it correct?

The hook-up you show in your letter is doubtful. If you will rebuild it as per the diagram we can assure you of great success.

TOO MUCH PLATE BATTERY.

762—CHICAGO: I am taking the liberty, as one of The Post radiophans, of asking you to help me solve my difficulties with my hook-up. As per The Post circuit No. 51, as disclosed in The Post Radio Magazine of Dec. 27, referring to the Armstrong (Old Reliable) circuit. I use a plain 43-plate .001 condenser and a Kellogg 43-plate vernier condenser, a variocoupler with twelve taps, twenty-point switch, a moulded variometer, a [illegible] microstat detector rheostat, one fixed condenser. I also have two steps of amplification controlled by one rheostat of six ohms resistance, using All-American transformers, 10 to 1 ratio in first step and a 5 to 1 in second step. I use WD-12 tubes in detector and amplification, using 1½-volt dry cell "A" battery. I use 135 volts of "B" battery, using Everready batteries. I use a Bradleyleak, with .00025 condenser.

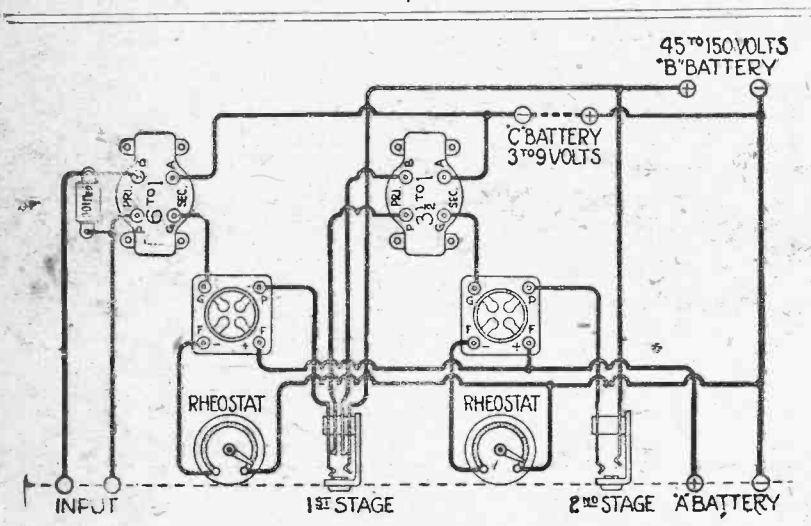
I followed up your hook-up to the letter. I have a double ground wire, one to the water pipe and another to a gas pipe driven in the ground about six feet. My aerial is as per submitted sketch.

My aerial runs from one chimney on rear building twenty-five feet across to other chimney on same building (all well insulated) and diagonally across to chimney on front building, as shown, a distance of about forty feet, then back to place of beginning on first chimney of rear building, about thirty feet, and then down to window on first floor about twenty feet to set; insulated from building with covered wire for lead-in.

This aerial worked on ultra-audion and I could get outside stations very nicely, with trouble, of course, of tuning out local stations. With my Old Reliable Armstrong I can easily tune out local station, but cannot get anywhere else.

Last night being silent night, all I could get was WTAS and Hastings, Neb., with two steps of amplification and nothing more. I cannot understand why. Also I must almost turn my rheostat control of the amplification to the end before I can hear the hum of the amplifiers working and I barely see a light in the tubes.

It would seem that the plates on your amplifying tubes are paralyzed thru too much "B" battery. The WD-11 and WD-12 tubes are rated by the makers not to take more than ninety volts safely. You are using 135 volts. You could use 100 volts, but it would shorten the life of the tubes, altho it would give great volume in the output. Cut your amplifying voltage down to 90 volts and use 3 to 4½ volts of bias or "C" battery. On your WD-12 detector tube do not use more than 22½ volts of "B" battery. It won't detect on more than that. The rated plate voltage on WD-12 as detectors is from 16½ to 22½ volts. All three of your tubes, probably are ionized. The makers claim that often they may be restored by shutting off the plate voltage and turning on only the filament current. This should be allowed to pass thru the filament for several hours. The tubes may recover. When tubes get too much plate voltage they sound a warning by turning blue. They may not be injured for a few minutes under this condition, but they ionize rapidly and it is advisable to make haste to reduce the voltage. Your aerial is not an ideal one, as the open end—the one farthest from the set, and the lead-in end, are too close. Your aerial is far too short also. If space limits you why not use one of the ribbon aerials advertised in The Post? One hundred feet would be equal to 200 feet, which would make you a fair aerial with your twenty-foot lead-in. Could you not also run the aerial in an "L" shape on the roof instead of the triangle you are using? It would give you much better reception. Try to have the lead-in end point in the direction of the stations you most prefer to reach.



Q. & A.—1134: The pictorial diagram of a two-stage amplifier above is made especially for those who cannot read schematic diagrams.

POOR AERIAL.

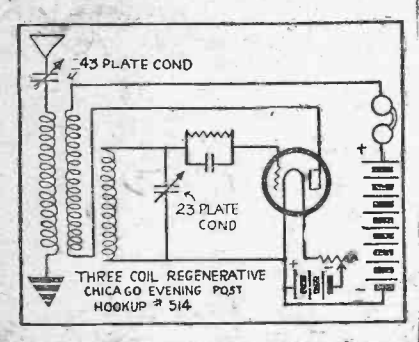
1287—CHICAGO: I have a WD-11 tube set which gets Chicago stations loud enough to be heard ten feet from the phones but will not pick up out-of-town stuff. Will you please help me? My aerial is 250 feet long in the shape of a triangle. The lead-in is fifty feet long, and the ground is ten feet. I have set grounded to radiator. Would a vernier on the rheostat help any. Would a variable grid leak help? Please tell me what changes are necessary if any are.

Your aerial is impractical. One wire, 100 feet long in a straight line, six to eight feet above all obstacles, would give better results. A vernier rheostat and a variable grid leak would be a great aid to tuning. Your hook-up is the best possible for the parts used.

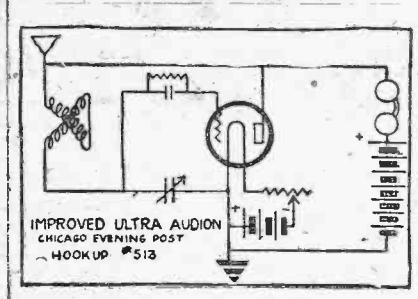
THREE-CIRCUIT HOOK-UP.

1110—CHICAGO: I read a great deal of your paper every night, mostly radio news and would like very much if you would send me directions as to the best way to hook up my radio set. I have a variocoupler with twenty switch points. A 23-plate condenser and a variometer.

The hook-up you request, using the parts mentioned, has been mailed.



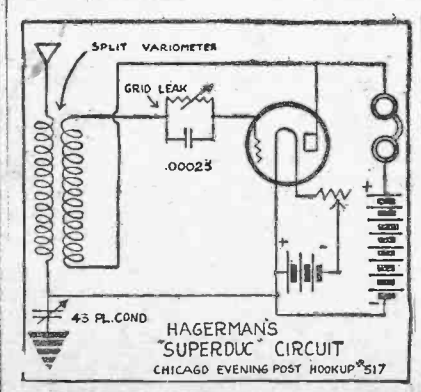
Q. & A.—1141: The three-honeycomb-coil set above is another "Old Reliable."



Q. & A.—1138: The ultra-audion shown above is a distinct improvement over the fixed inductance type.

INCORRECT HOOK-UP.

1112—CHICAGO: Please check up on this circuit and see if it is O. K. It consists



Q. & A.—1137: The one-tube Superduc shown above is giving very good results.

FREE SERVICE

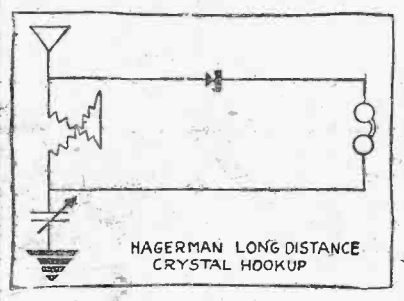
QUESTIONS asked on any subject pertaining to radio will be answered in this department in either the daily edition or the Radio Magazine published each Thursday. No charges are made for this service.

Due to the immense volume of letters being received by the Question and Answer department, the following restrictions must be made:

All letters must be plainly written in ink and perferably typewritten, and only on one side of the paper.

Drawings, hook-ups, etc., must be on a separate sheet from question and clearly drawn, showing values of parts.

Do not ask for panel layouts, construction details, etc., for a set unless they have appeared in the columns of this magazine. Self-addressed and stamped envelope must be inclosed. Address all your letters to Radio Questions and Answers Department, The Chicago Evening Post, 12-14 South Market Street, Chicago.



Q. & A.—1137 and 1111: Above is the famous Hagerman crystal hook-up. This is the perfect crystal set.

of detector, two stages of audio and two stages of radio-frequency.

Hook-up mailed up of five-tube set is incorrect. Use one shown.

OUR ERROR.

1111—CHICAGO: Will you please tell me if I need a ground in this hook-up? I found it in your Radio Magazine Thursday, Dec. 27, 1923. Is this the 1 or the 10-turn switch? Will you please send me the answer as soon as possible? And also send me the hook-up of Hagerman long-distance crystal set?

An error was made in drawing the crystal hook-up you referred to. The ground connection came off the switch lever that leads to the detector. The switch you refer to is a 1-turn switch. Hook-up of Hagerman crystal set is shown.

MORE INFORMATION.

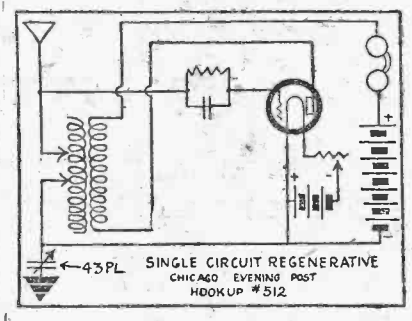
1115—CHICAGO: I would like to know full facts concerning Mr. Howard E. Graebke's crystal set, which brings in DX stations. Kindly advise how six taps are made on one turn.

We have no more information on Graebke's set than that which we published. Six taps are not taken off of one turn, but six taps are taken off of six turns, a tap to each turn.

BATTERY CHARGING.

1116—CHICAGO: The instructions with my tubes say to use a 110-volt, 10-watt bulb to protect the filaments. Would a 115-volt, 10-watt be all right? How often and how long should a 100-ampere battery be charged at the rate of seven amperes? How long an aerial can be used with a three-circuit regenerative set (three stages of audio) to get maximum volume, and still be able to tune out the locals for long distance?

We do not understand the statement you make in your first paragraph. A 100-ampere battery should be charged when the specific gravity reading on the hydrometer is below 1100. At that time it should be charged for about ten hours at seven amperes, altho it would be much better for your battery to charge longer at a lower amperage. A suitable aerial for a three-circuit regenerative set is one wire 100 feet long in a straight line 6 to 8 feet above all obstacles.



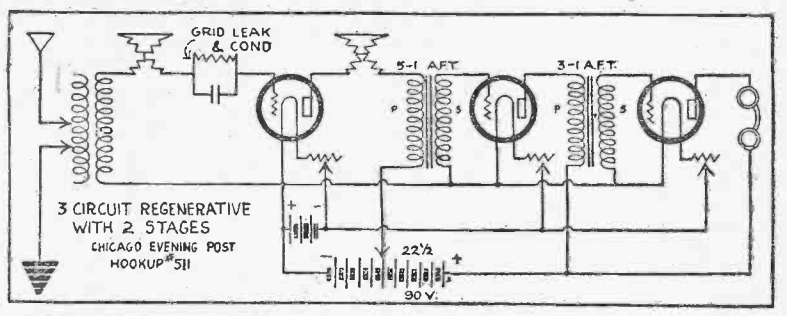
Q. & A.—1127: The above is one of the simplest forms of obtaining regeneration by feed-back.

IMPOSSIBLE RECEIVER.

1213—CHICAGO: I wish to construct for a friend who lives in "the loop," a simplified tube receiving set, without adjustments, but arranged with three phone jacks, marked WDAF, WJAZ and KYW, respectively, so that to get anyone of these local broadcasting stations he will simply "plug-in" the phones in the proper hole just like on a telephone switchboard.

I don't know any better place to get this information than from your excellent radio department.

Cost is not important, compactness is desirable, to operate on ground connection



Q. & A.—1119: The original three-circuit set with two stages of A.F. appears above.

only is highly preferable, and dry battery operation is essential.

If you can supply me with a hook-up that will come somewhere near meeting the above conditions (or specifications) the favor will be much appreciated.

It is impossible to construct a set such as you request. We know of no method whereby you could do so.

USE OF LOADING COILS.

1118—CHICAGO: I have purchased Kellogg parts for the "Old Reliable" set that I am building. Would you advise using the Kellog Diamond-Wound coil on the variocoupler? Would this coil improve or help in any way? I have the coil and don't know what to do with it. I am very anxious to pick up King Tut's grandfather.

The Kellogg Diamond Wound coil is of no use on the "Old Reliable."

WRONG POLARATIES.

1136—CHICAGO: I am inclosing a hook-up that I can only get Chicago stations on. I would like to know if it is correct and how far I ought to be able to receive on it. Have you a better hook-up with the same instruments I am using? If so, could you please send me one? Congratulations on the good work of The Post Radio Magazine.

In your digram mailed us you show the negative "B" connected to the positive "A," which goes thru the rheostat. This is incorrect. Connect as per diagram inclosed.

1137—CHICAGO: Please send me on request a hook-up for a crystal set using a wood variometer and a 23-plate condenser.

The hook-up you request for a crystal set is shown.

SUPERDUC HOOK-UPS.

1137—CHICAGO: Inclosed please find self-addressed envelope for return postage. I would desire to know what the best hook-up is, using the following equipment: One 23-plate variable condenser, 1 11-plate variable condenser; 1 variometer, may be used as a split varoimeter; 1 poterliometer, 1 rheostat, 1 C-299 tube, 2 .002 fixed condensers, 1 .00025 fixed condenser.

The hook-up for your equipment, as per your request, is shown.

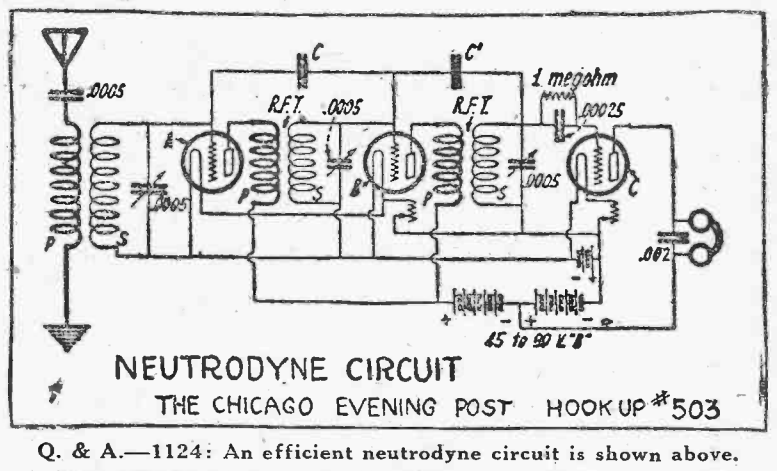
1140—CHICAGO: I am using the set hook-up for the following parts, and oblige: One 23-plate Vernier condenser; 1 Estru variometer (please advise what size), 1 Howard rheostat, 1 grid condenser, 1 grid leak, 1 WD-12 tube, 1 WD-12 socket; 1 "A" battery, 1½ volts; 1 "B" battery, 22½ volts; binding posts, etc.

A hook-up for the parts mentioned in your letter is shown. Use a variable grid leak and .00025 condenser.

OLD RELIABLE VS. 3-HC.

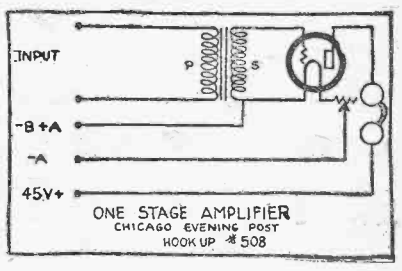
1141—CHICAGO: Will you kindly send me a blueprint or sketch of a 3-honeycomb coil Armstrong set? No variometer or variocoupler used. Two stages of amplification. Stamped envelope. Do you consider the Old Reliable or 3-honeycomb the best? If Old Reliable is best, could you say why? Thank you for your fine magazine.

The hook-up you request for 3-honeycomb coil set is shown. This set is just as good as the "Old Reliable," but is not popular because of the fact that the inductances must be mounted on the front of the panel and are, therefore, unstable and subject to body capacity.

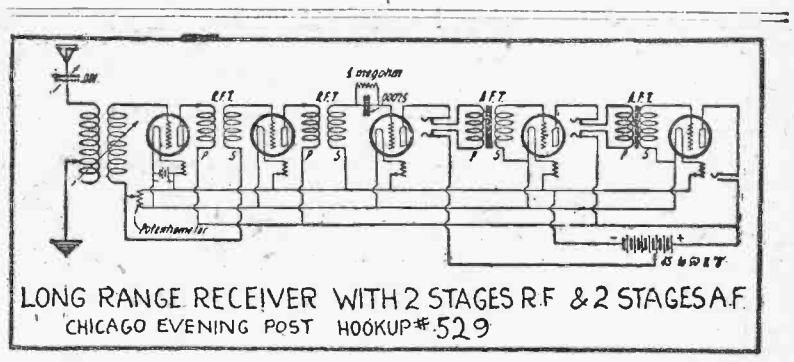


NEUTRODYNE CIRCUIT
THE CHICAGO EVENING POST HOOKUP * 503

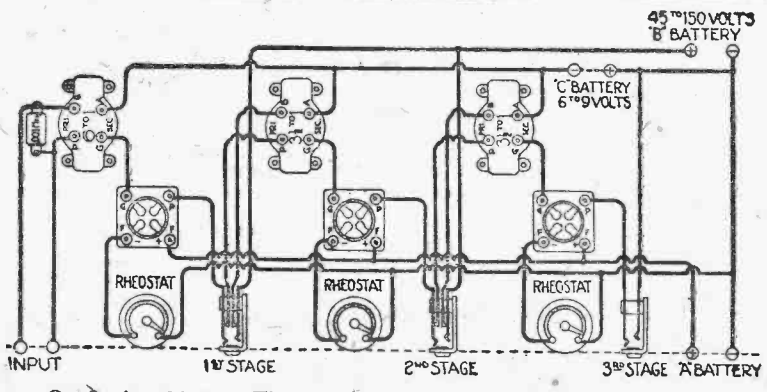
Q. & A.—1124: An efficient neutrodyne circuit is shown above.



Q. & A.—1286 and 1133: Above is a simple one-stage amplifier. A 5-1 transformer is used.



Q. & A.—1112: For extreme long distance and selectivity the above set is ideally suitable.



Q. & A.—1109: The amplifier above is suitable for those who wish to obtain the maximum volume from a circuit.

ULTRA-AUDION CIRCUIT.

1138—CHICAGO: Please send me a good hook-up for the parts mentioned in your letter, and oblige: One 23-plate Vernier condenser; 1 Estru variometer (please advise what size), 1 Howard rheostat, 1 grid condenser, 1 grid leak, 1 WD-12 tube, 1 WD-12 socket; 1 "A" battery, 1½ volts; 1 "B" battery, 22½ volts; binding posts, etc.

known as the "SP-2" receiver and find it impossible to get any outside stations while the Chicago stations are going. Is there any way of making this set more selective? Is this set supposed to be very sensitive? If a wave trap would help this situation any, kindly send me the hook-up and list of parts needed for The Post wave trap. On silent nights I have pretty good luck with my set, but when the local stations are operating, I am out of luck. I certainly enjoy your Radio Magazine every Thursday. It is great and far ahead of any I have ever seen.

The hook-up of a wave trap that you request has been mailed.

Today's Radio Programs and Schedules

Continued from Page 3.

financial talk by Roy Munger of the Daily News financial department; talk by Mrs. George Palmer, president Illinois Federation Women's Clubs; 7:45 p. m., Mr. and Mrs. Marx E. Oberndorfer introduce the opera, "Carmen"; 8 p. m., opera "Carmen," with Mary Garden.

WJAZ—Located on Edgewater Beach hotel; 447.5 meters; E. Warren Howe, program director.

Day—This station has no regular day schedule.

Evening—10 p. m. to 2 a. m., Oriental band of Medinah temple; Gus Palmer, tenor; Dr. L. O. Green, cornet; Elmer S. Lott, tenor; Oriole orchestra; "Harem Strains" (Sylvester O'Brien) "Camel Driver's Trot" (Dr. Geo. Madill), Oriental band; novelty horn solo, by Harry Culver; Turkish Mussette solo, "Oh! What a Night" (Wade), "Turkish Slumber Rugs" (Neynaber), by John Woollett; "Trees" (Joyce Kolmar-Oscar Rusbach), by Gus Palmer; a few minutes of good stories, by Harry Goodwin Bartruff; "Asleep in the Deep," "Turkey in the Straw," by Art Adair; "A Perfect Day" (Carrie Jacobs Bond), "Sunshine of Your Smiles" (Lillian Ray), by Dr. L. O. Green; "Just Awearyin' for You" (Carrie Jacobs Bond). "Danny Boy" (Fred E. Weatherly), by Elmer S. Lott; "Follow the Fez" (Geo. B. Smith), "Semiter Fox Trot" (Elmer E. Codner), by Oriental band; "The Sands of the Desert Do Blow" (Warren B. Buckley), "Two Hump Camel" (Si W. Weber), Dr. Lee Hedges; "Open the Passage to the Desert" (John W. Swatek), "Es Selam Aleikum" (Edward L. Johnson), Oriental band; "Call Me No More" (Eberhart-Wakefield Cadman). "Joy" (Winter Watts), by Gus Palmer; Oriole numbers, "Pekin," "Dream Daddy," "Sobbing Blues," "My Dream Moon," "Back in Hack an' Sack New Jersey," "Wonderland of Dreams."

WDAP—Chicago Board of Trade, located at Drake hotel; 390 meters.

Day—9:30 a. m., 10 a. m., 10:30 a. m., 11 a. m., 11:30 a. m., 12 noon, 12:30 p. m., 1 p. m., 1:30 p. m., quotations and market reports direct from the Chicago Board of Trade.

Evening—10 p. m., Emma Starman, soprano; Hugh Marshall, tenor; Jack Chapman's orchestra.

WPAD—Formerly on W. A. Wieboldt & Co.'s School street and Ashland avenue.

Notice—This station has closed and is being moved to Armour Institute, where it will be operated by the radio department of that institution.

WSAH—Located at 4801 Woodlawn avenue; 248 meters.

WSAX—Located on Chicago Radio laboratory; 268 meters.

SUBURBAN STATIONS

(Central Time Is Shown.)

WCBD—Zion, Ill.; 345 meters; J. H. Depew, station manager.

Day—2:30 p. m. to 3:45 p. m., sacred solos and duets, and an address either by Wilbur Glenn Voliva, general overseer of the Christian Catholic Apostolic church in Zion, or one of his representatives.

WCAY—Milwaukee, Wis.; 261 meters: No silent nights.

Day—1 p. m. to 4:30 p. m., special concert; novelty and test programs as announced.

Evening—7:30 p. m., regular concert program.

WHAD—Marquette university, Milwaukee, Wis.; 280 meters:

Wednesdays—At 7:30 p. m. only.

WIAB—Rockford, Ill.; 252 meters: Monday and Friday evenings; Monday evening; 9 p. m., MacDonald's Melody orchestra, in latest hits; Friday evening, 8 p. m., vocal and instrumental selections; Sunday, 12:30 p. m., religious services by the Rev. Toykmann and choir of the Mission Tabernacle church.

WJAN—Peoria, Ill.; 280 meters; Daily except Sunday.

Day—9 a. m., live stock market; 9:15 a. m., weather; 11:30 a. m., Chicago, Peoria and St. Louis live stock and grain markets; 1:30 p. m., Chicago and Peoria grain and produce markets; United States agriograms.

Evening—Tuesday and Thursday, special musical program to be announced by radiophone.

WRM—Urbana, Ill., University of Illinois; 360 meters: 8:50 to 9:30 p. m., lectures and news.

WTAS—Elgin, Ill.; 286 meters.

FOREIGN STATIONS

CKAC—Montreal, Canada; 430 meters:

Day—3 p. m., news, weather and stock reports; 3:15 p. m., studio entertainment.

Evening—6 p. m., kiddies stories in French and English; 6:30 p. m., Rex Battle and his Mount Royal hotel concert orchestra; 7 p. m. program by Canadian National railways; 10:30 p. m., Joseph C. Smith and his Mount Royal hotel dance orchestra; 11:30 p. m., news.

CYL—Mexico City, D. F. "El Universal"; 500 meters: Reul Azcarraga, director; G. Obregon, Jr., announcer (Spanish); Sendel Hodges, announcer (English).

Daily, 12:54 p. m., news and weather; 8:24 p. m., war bulletins from the war and navy departments; Tuesday and Fridays, 8:24 to 8:54 p. m., music. Sunday, 7:24 p. m., war bulletins.

PWX—Havana, Cuba; 400 meters: Jose Isquierdo, chief operator; Urbano del Castila, program director; Remberto O'Farril, announcer; regular broadcasting nights, Wednesday and Saturday, 7:30 to 10 p. m., central standard time.

TSF—Paris, France; French Post and Telegraph department, 103 Rue de Grenelle. Director, M. G. Valenst; assistant, M. Chanton; 400 meters; 500 watts.

Daily except Tuesday at 2:21 p. m., Tuesday at 1:51 p. m., music, classical theater and a course in English literature; Tuesdays, a course in the Morse code. Every ten days, scientific lectures.

OUT-OF-TOWN STATIONS

Eastern Programs.

(Central Time Is Shown.)

KDKA—East Pittsburg; 326 meters:

Day—8:45 a. m., Union live stock market reports from National Stockman and Farmer; 10:55 a. m., Arlington time signals; 11 a. m., weather forecast and United States bureau of market reports from National Stockman and Farmer; 11:10 a. m., concert by Daugherty's orchestra, from McCreery's dining-room, Pittsburg, Pa; 5 p. m., concert arranged for rebroadcasting in England, by the KDKA Little Symphony orchestra, Victor Saudek director, assisted by the Cycle quartet and the MacDowell quartet, artists from the studio of Lyman Almy Perkins, Pittsburg, Pa.; Mrs. Marie Shaner, soprano; Caroline Bracey, soprano; Mrs. Brabazon Rutherford, contralto; Mrs. L. Wallace Ohl, contralto; Arthur C. Stott, tenor; Arthur Ray Davis, tenor; Joseph Rogers, bass; E. Clair Anderson, bass. Program: Selections by orchestra, "National Anthem"; overture, "Egmont" (Beethoven); Suite "Valse Grieuse" (German); (a) "Souvenir"; (b) "Gypsy Dance"; "Prairie Sketches," (1) "Dawn"; (2) "Yuccas"; (3) "Legend of the Plain"; (4) "Whispers of Night" (Cadman); selection by Cycle and MacDowell quartet, "My Love Dwells in the North (and (a capella), (Elgar); ensemble and orchestra selections: "Sextet" from "Lucia de Lammermoor" (Donizetti); "Land of Hope and and Glory" (Elgar).

Evening—7 p. m., concert by the Fort Pitt Hotel orchestra, Harry Hochle conductor; 7:30 p. m., weekly chat with the farmers, by Frank E. Mullen, radio editor National Stockman and Farmer; 6:45 p. m., The children period; 7 p. m., National Stockman and Farmer market reports; 7:15 p. m., farm feature; 7:30 p. m., addresses from the Traffic and Transportation association banquet at Hotel Schenley, Pittsburg, Pa. Speakers, J. C. Davis, director general of railroads, Washington, D. C.; F. A. Butterworth, assistant general freight agent Pere Marquette Railroad company, Chicago, Ill.; toastmaster, S. S. Butler, freight traffic manager; music by "Gene's American Seven"; 8:55 p. m., Arlington time signals and weather forecast; 10:30 p. m. special late evening concert.

WBZ—Springfield, Mass.; 337 meters:

Day—10:55 a. m., Arlington time signals; weather reports, Boston and Springfield market reports; dinner concert by WBZ quintet.

Evening—7 p. m., lecture, music.

WCAE—Pittsburg, Pa.; 462 meters:

Day—11:30 a. m., news, weather reports, reading of program for the day; 1 p. m., piano recital by Fred Rosenfeld, exclusive WCAE artist; 2:30 p. m., latest news bulletins; 3:30 p. m., stock market reports; Sunshine Girl and Uncle "Kaybee"; 5:30 p. m., dinner concert transmitted from William Penn hotel.

Evening—6:30 p. m., Uncle "Kaybee"; 7 p. m., silent period; 7:30 p. m., musical program.

WEAF—New York city; 492 meters:

Day—10 to 11 a. m., Eleanor Boykin of Vogue to speak on "Everyday Essentials in Good Manners"; "Filet Crochet," by Mrs. Frances A. Harris of the O. N. T. Cotton company; market reports by American Agriculturist, and United States department of agriculture; 3 to 4:30 p. m., Henry Lange, pianist, and others.

Evening—6 to 11 p. m., midweek services under the auspices of the New York Federation of Churches; United Cigar Stores daily sport talk, by Thornton Fisher; Dr. Owen Lovejoy of the National Child Labor association; talk by the Bank of America; musical program direct from Hunter college, New York by the Adolph Lewisohn free public course in chamber music; musical program direct from the studio of the Columbia Phonograph company; talk by the Louisiana Gulf Coast club; Gene Branscombe, pianist; Louise Hubbard, soprano; Katherin Platt Gunn, violinist, and Earle Tuckerman, barytone; Joel Coffey, pianist; program by Gimbel Brothers; Vincent Lopez and his orchestra, direct from the grill of the Hotel Pennsylvania.

WHN—New York city, Lowe's State broadcasting station; 360 meters:

Day—1 p. m., music.

Evening—6 p. m., music.

WGI—Medford Hillside, Mass.; 360 meters:

Day—11 a. m., noon day program; 11:40 a. m., New England weather forecast furnished by the United States weather bureau; 11:45 a. m., closing report on farmers produce market report; 2 p. m., Amrad Women's club program; 2:35 p. m., "Tear Time Talk"; 4:30 p. m., closing stock market reports furnished by Elmer H. Bright and company, members of the New York and Boston Stock exchange, government reports, live stock market report; 5 p. m., Boston police reports, Boston police headquarters; 5:15 p. m., code practice, lesson No. 221; 5:30 p. m., meeting of the Big Brother Amrad club; 5:50 p. m., message to Camp Fire Girls, by Charles W. Casson—"Big Smoke."

Evening—7 p. m., (1) "Stories for Parents," by the Children's Aid association, entitled "David's Escape" and read by Mr. Alfred Whitman, executive secretary; (2) concert by the Saugus High School Glee club, C. Francis Wood, director.

WHAZ—Troy, N. Y.; 330 meters: This station broadcasts only on Monday evenings.

WGY—Schenectady, N. Y.; 380 meters; Silent night Wednesday.

Day—10:55 a. m., time signals; 11:30 a. m., stock market report; 11:40 a. m., produce market report; 11:45 a. m., weather report; 1 p. m., music and address, "The Problem of Child Labor," Mrs. James Boyle, Schenectady Board of Education; 5 p. m., produce and stock market quotations; news bulletins; 5:30 p. m., dinner music by Romano's orchestra, New Kenmore hotel, Albany, N. Y.

Evening—7:45 p. m., radio drama, "The Passing of the Third Floor Back," by Jerome K. Jerome, presented by WGY Players. A few moments with new books, L. L. Honkins, assistant librarian of the General Electric company; instrumental selection, "Adagio" (Rimsky-Korsakow), by WGY orchestra; drama, "The Passing of the Third Floor Back," a play in three episodes, by Jerome K. Jerome. Episode 1—The prolog. The characters in the prolog: a satyr, a coward, a bully, a shrew, a hussy, a rogue, a cad, a cat, a snob, a slut, a cheat and a passer-by, WGY Players. Note—The entire action of the play takes place in the "First Floor Front" of the house at 13 Bloomsbury place, London. Time, the present. Instrumental selection, "Sostenuto" (Karganoff), by orchestra. Episode 2—The play: Joey Wright, a retired bookmaker, Charles S. Baumes; Christopher Penny, a painter, Edward E. St. Louis; Maj. Tompkins, retired, Frank Oliver; Mrs. Tompkins, Ruth Bentley-Snow; Vivian, the major's daughter, Rose Cohn; Jape Samuels, of the city, Jerome Lovenheim; Harry Larcomb, his jackal, Barrington Havens; Miss Kite, Ciara Swanker; Mrs. Percival de Hooley, cousin of Sir George, Margaret V. Smith; Stasia Flavey, Lola Sommers; Mrs. Sharp, the landlady, Helen Campbell; "The Third Floor Back," Edward H. Smith; instrumental selection, "Andante Sostenuto" (Bendel), by orchestra. Episode 3—The epilogue: The characters in the epilogue: Two lovers, you and me, a husband and wife, a Jew, an entertaining party, a maiden lady, a rich aunt, an important person, the lady of the house and a friend; instrumental selection, "Meditation" (Glazounow), by orchestra.

WGR—Buffalo; 319 meters:

Day—9:45 p. m., weather forecast for Buffalo and western New York; 11 a. m., weather, produce and live stock market reports, and agriograms from the United States department of agriculture, George Albert Bouchard; program, Valse Chromatique (Godard), "Shepherd's Pipes" (Hubbard W. Harris), "A Lady Picking Mulberries" (Edgar S. Kelley); 1:30 p. m., closing prices of Chicago Board of Trade; 2:30 p. m., closing prices of New York Stock exchange; 3 p. m., teatime music, Palm room, Hotel Statler; Miss Martha Gomph, harpist; Miss Catherine Stang, violinist; 5:30 p. m., dinner music, Vincent Lopez, Hotel Statler Dance orchestra.

Evening—6:30 p. m., digest of the day's news; second broadcasting of all daily reports; Indeustrial Employment bulletin; the American Boy story.

WJY—New York city; 405 meters:

This station broadcasts only on Sundays at 2:30 p. m. to 6 p. m.

WJZ—New York city; 455 meters: No silent night.

Day—2 p. m., afternoon auditorium concert direct from the Wanamaker auditorium; 3 p. m., "The Natural Equipment of the Child," by Dr. Charles E. Benson, a New York university radio extension course lecture; 3:15 p. m., recital by Mrs. John Dalton, soprano; 4 p. m., Carlyle Straub, poems; 4:30 p. m., closing reports of the New York state department of farms and markets; farm and home reports; closing quotations of the New York Stock exchange; foreign exchange quotations; Evening Post news; 6 p. m., "Jack Rabbit Stories," by David Cory; 6:45 p. m., the World's Work; 8 p. m., evening organ recital on the auditorium organ, direct from the Wanamaker auditorium; 8 p. m., "Adventures in Scandinavia," by Wirst W. Varnitz; 8:15 p. m., recital by Margaret Manierre, soprano; 8:45 p. m., concert by Vincent Coppola, pianist; 9:30 p. m., dance progrm by the Hotel Commodore orchestra under the personal direction of Bernhard Levitow, direct from the grill room of the Hotel Commodore.

WOO—Philadelphia; 509 meters: Silent Sunday, Tuesday, Thursday, Friday and Saturday evenings.

Day—10 a. m., grand organ; 10:30 a. m., United States weather forecast; 10:55 a. m., United States naval observatory time signals; 11 a. m., luncheon music by the Tea Room orchestra; 3:45 p. m., grand organ and trumpets; 4 p. m., sports results and police reports.

Evening—Silent.

WOR—Newark, N. J.; 405 meters:

Day—1:30 p. m., Sara Schuyler Butler, chairman Republican committee, New York, will speak on "Woman, the Citizen"; 1:45 p. m., Helen Stone in soprano solos; 2 p. m., Gertrude Boyle, sculptress; 2:15 p. m., continuation of soprano solos by Helen Stone; 2:40 p. m., Edward Farley, 12-year-old pianist; 5:15 p. m., "Vocational Education," a talk by W. T. Mullally of the educational committee, Young Men's Christian association of New York city; 5:30-6:30 p. m., "Music While You Dine," by Tom Cooper's Country Club orchestra.

WRC—Washington, D. C.; 469 meters: Silent Tuesday, Thursday and Saturday evenings.

Day—2 p. m., fashion developments of the moment prepared by Women's Wear; 2:10 p. m., song recital by Edna Gibson, soprano; 2:25 p. m., current comments by the editor of the Review of Reviews; 2:35 p. m., Bradstreet's financial report; 2:50 p. m., piano recital by Edith Grey; 3 p. m., the Magazine of Wall Street; 4:15 p. m., instruction in international code practice; 5 p. m., children's hour by Peggy Albion.

Evening—Silent.

WRW—Tarrytown, N. Y.; 273 meters:

Evening—8 p. m., Westchester county police reports.

WDAR—Philadelphia, Pa.; 395 meters:

Day—10:45 a. m., WDAR daily almanac; 11:02 a. m., organ recital from the Stanley theater; features from the studio; Arcadia Concert orchestra, Fery Sarkozi, director; 1 to 2 p. m., Arcadia Concert orchestra; artist recital from the studio; 3:30 p. m., artist recital.

Evening—6:30 p. m., "Dream Daddy" with the Boys and Girls.

Midwest Programs.

WCAL—Northfield, Minn., St. Olaf college, P. Skifter, director; Ellu Bjertass, program director; 360 meters.

Sunday, 11 a. m. and 8:30 p. m.; Thursday, 9 p. m.; Friday, 7 p. m.; Saturday, 12 noon.

WCX—Detroit, Mich.; 517 meters:

Day—1 p. m., news bulletins; 1:15 p. m., stock quotations; 1:50 p. m., government weather forecast; 3:15 p. m., music; 5 p. m., dinner concert, broadcast from Hotel Tuller.

Evening—8:30 p. m., musical program under direction of George H. Lancey.

WJAX—Cleveland; 390 meters: Silent every night except Tuesday and Thursday.

WLAG—Minneapolis, Minn.; 417 meters: No silent nights.

Day—9:30 to 10:45 a. m., announcements, news and market reports at half-hour intervals; 10:45 a. m., household hints; 11:35 a. m., surprise program; 1:30 p. m., market reports; 3 p. m., talk by Dean F. J. Wulling, college of pharmacy, University of Minnesota; weekly dancing lesson by Tess Cooperman; 2:30 p. m. market report; 2:40 p. m., daylight concert by Ronning's Air Raiders; 4 p. m., short story by Mildred Simons; 4:30 p. m., market report; 5:30 p. m., children's hour, Tess Cooperman.

Evening—6 p. m., sport hour, Dr. J. S. Dick Jr., "Dogs"; 6:15 p. m. Osborn's Minneapolis Athletic Club orchestra; 7:30 p. m., farm lecture program; 9:15 p. m., weather and time report.

WLW—Cincinnati; 309 meters: Silent Friday and Saturday.

Day—10:30 a. m., weather forecast and business reports; 1:30 p. m., business reports; 3 p. m., market reports; 4 p. m., piano solos by Adelaide Apfel; representing the League of Women Voters, Mrs. J. A. Ridgeley; subject, "Why the League of Women Voters Supports the National Child Labor Amendment."

Evening—10:30 p. m., scenes from Oscar Wilde's "Lady Windemere's Fan," directed by Helen Schuster-Martin; music from the Cincinnati Conservatory of Music; in the cast, Mrs. Erlynne, Norma Gerdsen; Lady Windemere, Evelyn Lilly; Lord Windemere, Willard Crain; Bord Darlington, Joseph Flick; Lord Augustus, Joseph Schreck; Cecil Graham, Maynard Babbs; Mr. Dumby, Robert Sprague; musical selections, violin solos by Freda Slauter, "Serenade Espagnole" (Chaminade-Kreisler), "From the Canebrake" (Gardner); songs by Lillian Dent, "Il est doux, il est bon" (Massenet), "Trees" (Rasbach); piano solos by Marjory Garrigus, "Cadiz" (Albeniz), "Spinning Song" (Mendelssohn), "The Banjo Picker" (Powell); songs by Lillian Dent, "Spirit Flower" (Campbell-Tipton), "Hard Trials" (Burleigh); violin solos by Freda Slauter, "Farewell to Cucullain" (Kreisler) "Ghost Dance" (Levy); 11 p. m., entertainment by the Justin Huber Dance orchestra playing "Sunshine of Mine," "Marcheta," "Georgia Mammy" and other numbers.

WOC—Davenport, Iowa; 484 meters: Silent Tuesdays.

Day—10 a. m., opening market quotations; 10:55 a. m., time signals; 11 a. m., weather and river forecast; 11:05 a. m., market quotations; 12 noon, chimes concert; 2 p. m., closing stocks and markets; 3:30 p. m., educational program and concert; 5:45 p. m., chimes concert; 6:30 p. m., Sandman's visit.

WSAI—Cincinnati, United States Playing Card Company; 309 meters:

Evening—8 p. m., program by Church of the Advent choir; 8:45 p. m., bass solos, Stanley Johnson; 9 p. m., address "Recent Tendencies in American History." Prof. Beverly Bond, department of history, University of Cincinnati; 9:15 p. m., mixed quartet.

WTAM—Cleveland; 390 meters: Broadcasts only Wednesday and Saturday evenings at 7 to 8 p. m.

WWJ—Detroit, Mich.; 517 meters: Silent Saturday.

Day—12 noon, dance music by Jean Goldkette's orchestra, broadcast from the Graystone ballroom.

Evening—Music.

WOI—Ames, Iowa, Iowa State college; 360 meters.

Southwest Programs.

KSD—St. Louis; 546 meters: Silent Friday.

Day—Opening midseason and closing quotations on the St. Louis grain markets; live stock conditions; Liverpool and New York cotton market; New York stocks, bonds and money market; metal markets, weather reports, forecast and news bulletins are broadcast at 8:40, 9:40, 10:40, 11:40, 12:40, 1:40, 2:40 and 4 daily.

Evening—8 p. m., Dorothy Jacobson, pianist; Abe Jacobson, violinist; Carl Rosenbaum, tenor.

WBAP—Fort Worth, Texas; 476 meters:

Day—10 a. m. to 4 p. m., markets and financial review.

Evening—7:30 to 8:30 p. m., concert by the Junior Euterpean club, Mrs. J. Edward Cooley director (E. L. O. announcing); 9:30 to 10:45 p. m., concert by artists from Howard Payne college, Brownwood, Texas (G. C. A. announcing).

WDAF—Kansas City, Mo.; 411 meters:

Day—3:30 to 4:30 p. m., musical matinee; D. Ambert Haley's dance and concert orchestra.

Evening—6 to 7 p. m., piano tuning in number on the Duo Art; marketgrams; weather forecast, time signal and road report; address, speaker from the William Jwell college, Liberty, Mo.; address, Dr. Ray Palmer, "What Think Ye of Christ?" address, J. H. Mercer, Kansas Live Stock association; the children's story and information period; music, Fritz Hanlein's Trianon ensemble, Hotel Muehlebach; 11:45 p. m., to 1 a. m. (Nighthawk frolic), The "Merry Old Chief" and the Coon-Sanders Novelty-singing orchestra, Plantation grill, Hotel Muehlebach; pipe organ recital by Miss Norma Mannering at the Newman theater.

WFAA—Dallas, Texas: 447 meters: Silent Wednesday.

Day—10:30 a. m., United States weather bureau report and forecast and C. A. M. A. A. highway condition bulletin for the southwest followed by Dallas produce market quotations, early cotton market report and Wall street review; 12:30 p. m., address; 2:30 to 2:45 p. m., Dallas live stock market, late general markets, sport news; 3:30 to 4 p. m., agriograms, health bulletins, Texas market news; 5:30 to 6 p. m., bedtime story and fairy tale, told by Miss Mary C. Tooney.

Evening—8:30 to 9:30 p. m., musical program by the Wednesday Morning Choral club, Mrs. Ralph C. Smith, program chairman.

WGV—New Orleans; 359 meters.

WHAS—Louisville; 400 meters: Silent Mondays.

Day—4 to 5 p. m., selections by the Walnut theater orchestra; Walter Davison, conductor; selections by the Strand theater orchestra, Harry S. Currie, conductor.

Evening—9 to 10:30, music.

WHB—Kansas City, Mo.; 411 meters: Silent Monday, Wednesday and Friday.

Day—8:25 to 8:30, estimated live stock receipts; 9:25 to 9:40, live stock, grain quotations; 10:25 to 10:40, live stock and grain quotations, weather and shippers' forecast, road conditions and foreign exchange; 11:25 to 11:40, live stock, grain quotations; 12:35 to 1 p. m., popular dance music by request, Sweeney Radio orchestra; 1:25 to 1:50 p. m. closing grain and live stock quotations; 2 to 3 p. m., ladies' hour program of classical and popular musical selections by the Sweeney Radio orchestra; 3 p. m., grain market, weather, news.

Evening—7 to 7:45 p. m., educational program; piano solo, selected, George Parrish; "Better Homes and Buildings," second of a series of talks on this subject; trombone solo, "My Heart at Thy Sweet Voice" from "Samson and Delila", by James Sell; reading of agriograms and press news from the department of agriculture; 8 to 10 p. m., program given by the Co-operative club of Kansas City assisted by the following members of the faculty of the Horner Institute of Fine Arts, Kansas City, Mo., Miss Beulah Marty, violinist; Paul Snyder, pianist; Stanley Deacon, barytone; "Raymond Overture" (Thomas), by Sweeney Radio orchestra; "Two Preludes" (Chopin), by Mr. Snyder; "Thy Beaming Eyes" (MacDowell), "Crying of Water" (Campbell-Tipton), by Mr. Deacon; "Londonderry Air" (Kreisler), "Scherzo Tarentelle" (Wieniawski), by Miss Marty; "March Militaire" (Schubert), by Sweeney Radio orchestra; address by International Co-operative Club president, Charles A. Moore, Topeka, Kan.; "Perpetual Motion" (Weber), by Mr. Snyder; "From the Cane Brake" (Samuel Gardner), "Negro Chant" (Cameron White), by Miss Marty; "Colleen o' My Heart" (Bemm), "Drake Goes West" (Sanderson), by Mr. Deacon; selections by the Sweeney Radio orchestra until close.

WMC—Memphis; 500 meters: Silent Wednesday.

Day—Stocks and news every half hour from 9 a. m., to 10 p. m.

Evening—8:30 p. m., the Cbisca Hotel Philharmonic orchestra in their weekly recital.

WOAI—San Antonio, Texas; 385 meters: Silent nights, Mondays, Wednesdays and Thursdays.

WSB—Atlanta, Ga.; 428 meters.

WHAB—Galveston, Texas; 360 meters:

Pacific Coast Concerts.

KGO—Oakland, Cal.; General Electric company; 312 meters.

KDZE—Seattle, Wash.; 455 meters: Silent nights, Tuesdays, Thursdays and Sundays.

KFDR—San Francisco; 509 meters.

Evening—Music.

Day—1 p. m., weather forecast.

KWG—Portland, Ore.; Portland Oregonian; 492 meters.

Day—1:30 p. m., weather forecast; 5:30 p. m., woman's story program; 9:30 a. m., weather forecast and market reports; 10 p. m., dramatic program by Doris Smith; 12 m., dance music by George Olsen's Metropolitan orchestra of the Hotel Portland.

KHJ—Los Angeles: 395 meters.

Evening—10:45, 11:30 p. m. to 1 a. m.

KPO—San Francisco; 425 meters; 500 watts: Crair F. Morrison, station director; Ada Morgan O'Brien, program director. Friday night silent.

Day—2 p. m., time signals from the naval observatory; 3 to 4 p. m., Rudy Sieger's Fairmount Hotel orchestra by remote control.

Evening—8 to 9 p. m., dinner program by George Lipschultz and music masters from the Loew's Warfield theater; Lela Johnstone, dramatic soprano, soloist; 10 to 11 p. m., organ recital by G. Herold Montague Schulteis; 11 to 12 p. m., an attractive program will be given by talented artists, who are: Vladimir Rassouchine, Russian pianist and composer; Mrs. Dorothy McClure Hunt, soprano; Leonida Coroni, celebrated barytone; 12 m. to 1 a. m., Palace Hotel Dance orchestra, by wire telephony.

Broadcasting Stations and Schedule of Programs

Continued from Page 2.

WCBA—Allentown, Pa., 1015 Allen street, Charles W. Heimbach, 280 meters.
WCBB—Greenville, Ohio, K. & K. Radio Supply company (Charles H. Katzenberger), 240 meters.
WSBD—Zion, Ill., Wilbur G. Voliva, 345 meters.
WCE—Minneapolis, Minn., Findley Electric company, 360 meters.
WCK—St. Louis, Mo., Stix, Baer & Fuller Dry Goods company, 360 meters.
WCM—Austin, Texas, University of Texas, 360 meters.
WCX—Detroit, Mich., Detroit Free Press, 517 meters.
WDAD—Lindsborg, Kans., Central Kansas Radio Supply company (Wm. L. Harrison), 360 meters.
WDAE—Tampa, Fla., Tampa Daily Times, 360 meters.
WDAF—Kansas City, Mo., Kansas City Star, 411 meters.
WDAG—Amarillo, Texas, J. Laurance Martin, 360 meters; J. L. Martin, director and operator; broadcast Tuesday and Thursday at 8 p. m.
WDAH—El Paso, Texas, Trinity Methodist church (South), 268 meters; station director, A. C. Arnold; announcer, John Burke; Sunday, 8:30 a. m., and 12 midnight; Thursday, 8:30 p. m., concert.
WDAI—Syracuse, N. Y., Hughes Radio corporation, 246 meters.
WDAK—Hartford, Conn., the Courant, 261 meters.
WDAL—Jacksonville, Fla., Florida Times-Union, 360 meters.
WDAO—Dallas, Texas, Automotive Electric company, 360 meters.
WDAP—Chicago, Ill., Board of Trade, 300 meters.
WDAR—Philadelphia, Pa., Lit Brothers, 395 meters.
WDAS—Worcester, Mass., 692a Main street, Samuel A. Waite, 360 meters.
WDAU—New Bedford, Mass., Slocum Kilburn, 360 meters.
WDAX—Centerville, Iowa, First National bank, 360 meters.
WDAY—Fargo, N. D., Radio Equipment Corporation, 244 meters; director, L. W. Hamm; daily, 9:30 a. m., weather; Tuesday, Thursday, Saturday, 7:30 to 8:30 p. m., music; Sunday, 4 to 5 p. m., orchestra.
WDBC—Lancaster, Pa., Kirk, Johnson & Co., 58 meters.
WDBF—Youngstown, Ohio, 254 West Federal street, Robert G. Phillips, 261 meters.
WDM—Washington, D. C., Church of the Covenant, 360 meters.
WDT—Stapleton, N. Y., Ship Owners Radio Service, 405 meters.
WDZ—Tuscola, Ill., Star Store building, James L. Bush, 278 meters.
WEAA—Flint, Mich, Fallain & Lathrop, 280 meters.
WEAB—Fort Dodge, Iowa, Standard Radio Equipment company, 360 meters.
WEAF—New York, N. Y., American Telephone and Telegraph company, 492 meters.
WEAG—Edgewood, R. I., Nicholas-Hinelline-Bassett Laboratory, 231 meters.
WEAH—Wichita, Kan., Wichita Board of Trade, 244 meters.
WEAI—Ithaca, N. Y., Cornell university, 286 meters.
WEAJ—Vermillion, S. D., University of South Dakota, 360 meters.
WEAM—North Plainfield, N. J., Borough of North Plainfield (W. Gibson Buttfield), 250 meters.
WEAN—Providence, R. I., Shepard company, 273 meters.
WEAO—Columbus, Ohio, Ohio State university, 360 meters.
WEAP—Mobile, Ala., Mobile Radio company, 360 meters.
WEAR—Baltimore, Md., Baltimore American and News Publishing company, 360 meters.
WEAS—Washington, D. C., Hecht company, 360 meters.
WEAU—Sioux City, Iowa, Davidson Brothers company, 360 meters.
WEAY—Houston, Texas, Iris theater (Will Horowitz Jr.), 360 meters.
WEB—St. Louis, Mo., Benwood company, 360 meters.
WEV—Houston, Texas, Hurlburt-Still Electrical company, 360 meters.
WEW—St. Louis, Mo., St. Louis university, 261 meters; 9 a. m., estimated receipts of live stock at public stockyards; opening trend of hog market; opening futures, wheat for St. Louis and Kansas City; opening trend of market; Liverpool cables; 10 a. m., official weather reports, river stages; 2 p. m., closing market quotations, live stock, grain markets, fruits and vegetables, eggs and poultry; 5 p. m., special weather and river bulletins, agrigrams, etc.; other special musical program will be announced previously.
WFAA—Dallas, Texas, Dallas News and Dallas Journal, 476 meters.
WFAB—Syracuse, N. Y., 802 McBride street, Carl F. Woese, 234 meters.
WFAF—Poughkeepsie, N. Y., H. C. Spratley Radio company, 360 meters.
WFAH—Port Arthur, Texas, Electric Supply company, 360 meters.
WFAJ—Asherville, N. C., Hi-Grade Wireless Instrument company, 360 meters.
WFAM—St. Cloud, Minn., Times Publishing company, 360 meters.
WFAN—Hutchinson, Minn., Hutchinson Electric Service company, 360 meters, 100 watts; daily 12 noon to 12:05 p. m., Twin City radio programs; 12:05 to 12:20 p. m., long distance radio discussion; 12:20 to 12:25 p. m., markets; 12:25 to 12:30 p. m., news; Tuesdays, 8:10 p. m., entertainment.
WFAQ—Cameron, Mo., Missouri Wesleyan college, 360 meters.
WFAT—Sioux Falls, S. D., Daily Argus-Leader, 360 meters.
WFAV—Lincoln, Neb., University of Nebraska, department of electrical engineering, 360 meters.
WFI—Philadelphia, Pa., Strawbridge & Clothier, 395 meters; 9:15 a. m., produce market and live stock reports; 12 m., Meyer Davis Bellevue Stratford hotel concert orchestra; 12:50 p. m., agricultural report; 1 p. m., concert by Louisa Knowlton, cellist; Strawbridge & Clothier male quartet; John Owens, tenor; Edayfed Lewis, tenor; Harold Simonds, barytone; John Vandersloot, bass; Loretta Kerk, pianist and accompanist; 5:30 p. m., Meyer Davis Bellevue Stratford Hotel concert orchestra; 6 p. m., "Snowball" talks to the children.
WGAL—Lancaster, Pa., Lancaster Electric Supply and Construction company, 248 meters.
WGAN—Pensacola, Fla., 216 West Romana street, Cecil E. Lloyd, 360 meters.
WGAQ—Shreveport, La., Glenwood Radio corporation (W. G. Patterson), 360 meters.
WGAR—Fort Smith, Ark., Southwest American, 360 meters.
WGAU—Wooster, Ohio, Radio Monufacturing and Service company (Marcus G. Limb), 226 meters.
WGAW—Altoona, Pa., 1918 West Chestnut street, Ernest C. Albright, 261 meters.
WGAY—Madison, Wis., Northwestern Radio company, 360 meters; daily, 1 to 4:30 p. m., concert and tests; 7:30 p. m. concert; Sunday, 7:30 p. m., radio chapel, sacred music.
WGAZ—South Bend, Ind., South Bend Tribune, 360 meters.
WGI—Medford Hillside, Mass., American Radio and Research corporation, 360 meters.
WGL—Philadelphia, Pa., 2303 North Broad street, Thomas F. Y. Howlett, 360 meters.
WGR—Buffalo, N. Y., Federal Telephone and Telegraph company, 319 meters.
WGV—New Orleans, La., Interstate Electric company, 360 meters.
WGY—Schenectady, N. Y., General Electric company, 380 meters.
WHA—Madison, Wis., University of Wisconsin, 360 meters.
WHAA—Iowa City, Iowa, State University of Iowa, 283 meters.
WHAB—Galveston, Texas, Clark W. Thompson, 360 meters.
WHAC—Waterloo, Iowa, Cole Brothers Electric company, 360 meters.
WHAD—Milwaukee, Wis., Marquette university, 280 meters; J. B. Kremer, program director; L. E. Coodes, H. P. Warring, Wednesday, 7:30 p. m.
WHAG—Cincinnati, Ohio, University of Cincinnati, 222 meters.
WHAH—Joplin, Mo., Hafer Supply company, 360 meters.
WHAI—Davenport, Iowa, Radio Equipment and Manufacturing company, 360 meters.
WHAK—Clarksburg, W. Va., Roberts Hardware company, 360 meters.
WHAL—Lansing, Mich., Lansing Capital News, 248 meters.
WHAM—Rochester, N. Y., University of Rochester (Eastman School of Music), 360 meters.
WHAP—Decature, Ill., Otta & Kahn, 360 meters.
WHAQ—Washington, D. C., Semmes Motor company, 360 meters.
WHAR—Atlantic City, N. J., Paramount Radio and Electric company (W. H. A. Paulus), 231 meters.
WHAS—Louisville, Ky., Courier-Journal and Louisville Times, 300 meters; silent Monday night; daily, 4 to 6 p. m., music; 5 p. m., news; 7:30 to 9 p. m., music, lectures.
WHAV—Wilmington, Del., Wilmington Electrical Special company, 360 meters.
WHAZ—Troy, N. Y., Rensselaer Polytechnic Institute, 380 meters.
WHB—Kansas City, Mo., Sweeney School company, 411 meters.
WHD—Morgantown, W. Va., West Virginia University, 360 meters.
WHK—Cleveland, Ohio, Radiovox company (Warren R. Cox), 360 meters.
WHN—Ridgewood, N. Y., George Schubel, 360 meters.
WIAB—Rockford, Ill., Joslyn Automobile company, 252 meters. Monday and Friday, 8 to 930 p. m. Sunday, 12:30 p. m.
WIAC—Galveston, Texas, Galveston Tribune, 360 meters.
WIAD—Ocean City, N. J., Ocean City Yacht club (Howard R. Miller), 254 meters.
WIAF—New Orleans, La., 139 North Alexander street, Gustav A. DeCortin, 234 meters.
WIAH—Newton, Iowa, Continental Radio and Manufacturing company, 258 meters.
WIAI—Springfield, Mo., Heer Stores company, 360 meters.
WIAJ—Neenah, Wis., Fox River Valley Radio Supply company (Quinn Brothers), 224 meters.
WIAK—Omaha, Neb., Journal-Stockman company, 278 meters.
WIAO—Milwaukee, Wis., School of Engineering of Milwaukee, 360 meters.
WIAQ—Marion, Ind., Chronicle Publishing company, 226 meters.
WIAR—Paducah, Ky., Paducah Evening Sun, 360 meters.
WIAS—Burlington, Iowa, Home Electric company, 360 meters.
WIAT—Tarkio, Mo., Leon T. Noel, 360 meters.
WIAU—Le Mars, Iowa, American Trust and Savings bank, 360 meters.
WIK—McKeesport, Pa., K. & L. Electric company (Herbert F. Kelso and Hunter J. Lohman), 360 meters.
WIL—Washington, D. C., Continental Electric Supply company, 360 meters.
WIP—Philadelphia, Pa., Gimbel Brothers, 509 meters.
WJAB—Lincoln, Neb., American Electric company, 360 meters.
WJAD—Waco, Texas, Jackson's Radio Engineering laboratories, 360 meters.
WJAF—Muncie, Ind., Press Publishing company, 360 meters.
WJAG—Norfolk, Neb., Norfolk Daily News (Huse Publishing company), 360 meters.
WJAK—Greentown, Ind., Clifford L. White, 254 meters.
WJAM—Cedar Rapids, Iowa, 302 3d Avenue West, D. M. Perham, 268 meters.
WJAN—Peoria, Ill., Peoria Star, 280 meters.
WJAQ—Topeka, Kan., Capper Publications, 360 meters, 100 watts; director, J. A. Machel; weather, news, roads, etc.; daily, 9 to 9:45 a. m., bond gossip, financial news and grain markets; 10 to 10:45 a. m., quotations upon foreign exchange, live stock, grain, bonds and stocks, financial news bulletins and weather reports; 2 to 2:45 p. m., quotations upon grain, stock, butter, eggs, poultry, foreign exchange and bonds, financial news bulletins and weather reports; 3 to 3:45 p. m., quotations upon fruits and vegetables, butter, eggs and poultry, live stock, hay and grain, flour and feed, foreign exchange, bonds and stocks, weather reports.
WJAR—Providence, R. I., The Outlet company (J. Samuels and Brother), 360 meters.
WJAS—Pittsburg, Pa., Pittsburg Radio Supply House, 360 meters.
WJAT—Marshall, Mo., Kelly-Vawter Jewelry company, 360 meters.
WJAX—Cleveland, Ohio, Union Trust company, 360 meters.
WJAZ—Chicago, Ill., Chicago Radio laboratory, 448 meters.
WJD—Granville, Ohio, Richard H. Howe, 229 meters.
WJH—Washington, D. C., White & Boyer company, 273 meters.
WJX—New York, N. Y., Deforest Radio Telephone and Telegraph company, 360 meters.
WJY—New York, N. Y., R. C. A., 405 meters.
WJZ—New York, N. Y., R. C. A., 455 meters.
WKAA—Cedar Rapids, Iowa, 1444 2d avenue, East, H. F. Paar, 268 meters.
WKAD—East Providence, R. I., Charles Loof (Cresent park), 240 meters.
WKAF—Wichita Falls, Texas, W. S. Radio Supply company, 360 meters.
WKAN—Montgomery, Ala., United Battery Service company, 226 meters.
WKAP—Cranston, R. I., Dutee W. Flint, 360 meters.
WKAQ—San Juan, P. R., Radio Corporation of Porto Rico, 360 meters.
WKAR—East Lansing, Mich., Michigan Agricultural college, 280 meters.
WKAS—Springfield, Mo., L. E. Lines Music company, 360 meters.
WKAV—Laconia, N. H., Laconia Radio club, 254 meters.
WKAW—Beloit, Wis., Turner Cycle company, 242 meters.
WKAX—Bridgeport, Conn., 1789 Park avenue, William A. MacFarlane, 231 meters.
WKAY—Gainesville, Ga., Brenau college, 280 meters.
WKC—Baltimore, Md., Joseph M. Zamoiski company, 360 meters.
WKY—Oklahoma City, Okla., WKY Radio shop, 360 meters.
WLAC—Raleigh, N. C., North Carolina State college, 360 meters.
WLAG—Minneapolis, Minn., Cutting and Washington Radio corporation, 417 meters.
WLAH—Syracuse, N. Y., 425 Brownell street, Samuel Woodworth, 234 meters.
WLAJ—Waco, Texas, Waco Electrical Supply company, 360 meters.
WLAK—Bellows Falls, Vt., Vermont Farm Machine corporation, 360 meters.
WLAL—Tulsa, Okla., Naylor Electric company, 360 meters.
WLAN—Houlton, Maine, Putnam Hardware company, 283 meters.
WLAP—Louisville, Ky., 306 West Breckenridge street, W. V. Jordan, 360 meters.
WLAQ—Kalamazoo, Mich., 108 Elm street, Arthur E. Schilling, 360 meters.
WLAT—Burlington, Iowa, Radio and Specialty company, 360 meters.
WLAV—Pensacola, Fla., Electric Shop, 254 meters.
WLAW—New York, N. Y., police department, City of New York, 360 meters.
WLAX—Greencastle, Ind., Putnam Electric company (Greencastle Community Broadcasting station), 231 meters.
WLB—Minneapolis, Minn., University of Minnesota, 360 meters.
WLW—Cincinnati, Ohio, Crosley Manufacturing company, 309 meters.
WMAB—Oklahoma City, Okla., Radio Supply company, 360 meters.
WMAC—Cazenova, N. Y., Fernwood street, J. Edw. Page (Olive B. Meredith), 261 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WMAH—Lincoln, Neb., General Supply company, 254 meters; H. C. Harvey, station director; Monday and Friday, 9 to 10:30 p. m., dance music.
WMAJ—Kansas City, Mo., Drovers Telegram company, 275 meters; J. E. Cook, operator; daily, 8:15 a. m., to 2:25 p. m., markets and news.
WMAK—Lockport, N. Y., Norton Laboratories, 360 meters.
WMAL—Trenton, N. J., Trenton Hardware company, 266 meters.
WMAM—Beaumont, Texas, Beaumont Radio Equipment company, 360 meters.
WMAP—Easton, Pa., Utility Battery service, 246 meters.
WMAQ—Chicago, Ill., Chicago Daily News, 448 meters; Miss Judith C. Waller, director; program announced daily.
WMAV—Auburn, Ala., Alabama Polytechnic institute, 250 meters; Sunday morning and afternoon church services; evening, lectures.
WMAY—St. Louis, Mo., Kingshighway Presbyterian church, 280 meters.
WMAZ—Macon, Ga., Mercer university, 268 meters.
WMC—Memphis, Tenn., "Commercial Appeal" (Commercial Publishing company), 500 meters, George D. Hay, announcer; F. Y. Root, operator.
WMH—Cincinnati, Ohio, Precision Equipment company, 248 meters.
WMU—Washington, D. C., Doubleday-Hill Electric company, 261 meters.
WNAC—Boston, Mass., Shepard stores, 278 meters.
WNAD—Norman, Okla., University of Oklahoma, 360 meters.
WNAL—Omaha, Neb., 5019 Capitol avenue, R. J. Rockwell, 242 meters.
WNAM—Evansville, Ind., Ideal Apparatus company, 360 meters.
WNAN—Syracuse, N. Y., Syracuse Radio Telephone company, 286 meters.
WNAP—Springfield, Ohio, Wittenberg college, 231 meters.
WNAQ—Charleston, S. C., Charleston Radio Electric company, 360 meters.
WNAR—Butler, Mo., C. C. Rhodes, 231 meters.
WNAS—Austin, Texas, Texas Radio Corporation and Austin Statesman, 360 meters.
WNAT—Philadelphia, Pa., Lemmig Brothers company (Frederick Lemmig), 360 meters.
WNAW—Fort Monroe, Va., Peninsular Radio club (Henry Kunzmann), 360 meters.
WNAX—Yankton, S. D., Dakota Radio Apparatus company, 244 meters.
WNJ—Albany, N. Y., Shotton Radio Manufacturing company, 360 meters.
WOAA—Ardmore, Okla., Dr. Walter Hardy, 360 meters.
WOAC—Lima, Ohio, Maus Radio company, 266 meters.
WOAD—Sigourney, Iowa, Friday Battery and Electric corporation, 360 meters.
WOAE—Fremont, Neb., Midland college, 360 meters.
WOAF—Tyler, Texas, Tyler Commercial college, 360 meters; Director, A. B. Chenier; a. m., markets; afternoon, music; evening service Sunday.
WOAG—Belvidere, Ill., Apollo theater (Belvidere Amusement company), 224 meters.
WOAH—Charleston, S. C., Palmetto Radio corporation, 360 meters.
WOAI—San Antonio, Texas, Southern Equipment company, 385 meters.
WOAJ—Parsons, Kan., Ervins Electrical company, 258 meters.
WOAK—Frankfort, Ky., Collins Hardware company, 240 meters.
WOAL—Webster Groves, Mo., 4 Jefferson road, William E. Woods, 229 meters.
WOAN—Lawrenceburg, Tenn., Vaughn Conservatory of Music (James D. Vaughn), 360 meters; 8 p. m., music.
WOAO—Mishawaka, Ind., Lyradion Manufacturing company, 360 meters.
WOAP—Kalamazoo, Mich., Kalamazoo college, 240 meters.
WOAQ—Portsmouth, Va., Portsmouth Kiwanis club, 360 meters.
WOAR—Philadelphia, Pa., 360 meters; director, J. E. Lit; program director, C. Stephens.
WOAT—Wilmington, Del., 215 Market street, Boyd M. Hamp, 360 meters.
WOAV—Erie, Pa., Pennsylvania National Guard, 2d Battalion, 112th Infantry, 242 meters.
WOAW—Omaha, Neb., Woodmen of the World, 526 meters; evening entertainment every night.
WOAX—Trenton, N. J., 600 Ingham avenue, Franklyn J. Wolff, 240 meters.
WOAZ—Stamford, Texas, Penick Hughes company, 360 meters.
WOC—Davenport, Iowa, Palmer School of Chiropractic, 484 meters.
WOI—Ames, Iowa, Iowa State college, 360 meters.
WOK—Pine Bluff, Ark., Pine Bluff company, 360 meters.
WOO—Philadelphia, Pa., 13th and Market streets, John Wanamaker, 509 meters; director, Gordon H. Cullen.
WOQ—Kansas City, Mo., Western Radio company, 360 meters.
WOR—Newark, N. J., L. Bamberger & Co., 405 meters.
WOS—Jefferson City, Mo., Missouri State Marketing bureau, 441 meters.
WPAB—State College, Pa., Pennsylvania State college, 360 meters.
WPAC—Okmulgee, Okla., Donaldson Radio company, 360 meters.
WPAD—Chicago, Ill., W. A. Weiboldt & Co., 360 meters.
WPAH—Waupaca, Wis., Wisconsin department of markets, 360 meters.
WPAJ—New Haven, Conn., Doolittle Radio corporation, 268 meters.
WPAK—Agricultural College, N. D., North Dakota Agricultural college, 360 meters.
WPAL—Columbus, Ohio, Superior Radio and Telegraph Equipment company, 286 meters.
WPAM—Topeka, Kan., Auerbach & Guettel, 360 meters, 100 watts; W. A. Beasley, director; markets; special programs 6:15 p. m.
WPAP—Winchester, Ky., 222 Lexington avenue, Theodore D. Phillips, 360 meters.
WPAQ—Frostburg, Md., General Sales and Engineering company, 360 meters.
WPAR—Beloit, Kan., Ward Battery and Radio company, 360 meters.
WPAT—El Paso, Texas, St. Patrick's cathedral, 360 meters.
WPAU—Moorhead, Minn., Concordia college, 360 meters.
WPAZ—Charleston, W. Va., Dr. John R. Koch, 273 meters.
WPG—New Lebanon, Ohio, Nushawg Poultry farm, 243 meters.
WQAA—Parkesburg, Pa., Horace A. Beale Jr., 360 meters.
WQAB—Springfield, Mo., Southwest Missouri State Teachers' college, 236 meters.
WQAC—Amarillo, Texas, 108 East 8th street, E. B. Gish, 360 meters.
WQAD—Waterbury, Conn., Whitall Electric company, 242 meters; 6:30 to 7:45 p. m., Monday, Wednesday and Friday.
WQAE—Springfield, Vt., Moore Radio News station (Edmund B. Moore), 275 meters.
WQAF—Sandusky, Ohio, Sandusky Register, 240 meters.
WQAH—Lexington, Ky., Brock-Anderson Electrical Engineering company, 254 meters.
WQAL—Mattoon, Ill., Coles County Telephone and Telegraph company, 258 meters.
WQAM—Miami, Fla., Electrical Equipment company, 300 meters. Director, R. H. Horning. Tuesday, 7 to 8 a. m., 9 to 10 a. m., Sunday.
WQAN—Scranton, Pa., Scranton Times, 280 meters.
WQAO—New York, N. Y., Calvary Baptist church, 360 meters.
WQAQ—Abilene, Texas, West Texas Radio company, 360 meters.
WQAS—Lowell, Mass., Prince-Walter company, 266 meters.
WQAV—Greenville, S. C., Huntington and Guerry (Inc.), 258 meters.
WQAW—Washington, D. C., Catholic university, 236 meters.
WQAX—Peoria, Ill., Radio Equipment company, 360 meters.
WQAZ—Greensboro, N. C., Greensboro Daily News, 360 meters.
WHAA—Houston, Texas, Rice institute, 360 meters.
WRAD—Marion, Kan., Taylor Radio shop (G. L. Taylor), 360 meters.
WRAF—Laporte, Ind., The Radio club (Inc.), 224 meters.
WRAH—Providence, R. I., Stanley N. Read, 231 meters.
WRAI—St. Croix Falls, Wis., Northern States Power company, 248 meters.
WRAN—Waterloo, Iowa, Black Hawk Electrical company, 236 meters. Director, H. R. Plowman; 5 to 6 p. m. week days; 8:15 to 9:15 p. m. Monday, concert.
WRAO—St. Louis, Mo., Radio Service company, 360 meters.
WRAP—Winter Park, Fla., Winter Park Electrical Construction company, 360 meters.
WRAU—Amarillo, Texas, Amarillo Daily News, 360 meters.
WRAV—Yellow Springs, Ohio, Antioch college, 360 meters.
WRAW—Reading, Pa., Avenue Radio shop (Horace D. Good), 238 meters.
WRAX—Gloucester City, N. J., Flaxon's garage, 268 meters.
WRAY—Scranton, Pa., Radio Sales corporation, 280 meters.
WRAZ—Newark, N. J., Radio Shop of Newark (Herman Lubinsky), 233 meters.
WRC—Washington, D. C., Radio Corporation of America.
WRK—Hamilton, Ohio, Doron Bros. Electric company, 360 meters.
WRL—Schenectady, N. Y., Union college, 360 meters.
WRM—Urbana, Ill., University of Illinois, 360 meters.
WRR—Dallas, Texas, City of Dallas (police and fire signal department), 360 meters.
WRW—Tarrytown, N. Y., Tarrytown Radio Research laboratory, 273 meters.
WSAB—Cape Girardeau, Mo., Southeast Missouri State Teachers' college, 360 meters.
WSAC—Clemson College, S. C., Clemson Agricultural college, 360 meters.
WSAD—Providence, R. I., J. A. Foster company, 261 meters.
WSAG—St. Petersburg, Fla., City of St. Petersburg (Loren V. Davis), 244 meters.
WSAH—Chicago, Ill., 4801 Woodlawn avenue, A. J. Leonard, Jr., 248 meters.
WSAI—Cincinnati, Ohio, United States Playing Cards company, 309 meters.
WSAJ—Grove City, Pa., Grove City college, 360 meters.
WSAK—Middleport, Ohio, Foster Egner (Daily News, Pomeroy, Ohio), 258 meters.
WSAL—Brookville, Ind., Franklin Electric company, 360 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WSB—Atlanta, Ga., Atlanta Journal company, 429 meters. No silent night. Day schedule 12-1 p. m., musical program; 2:30 p. m., weather; 5-5:30 p. m., bedtime story. Evening—8-9 p. m., popular concert.
WSL—Utica, N. Y., J. & M. Electric company, 360 meters.
WSY—Birmingham, Ala., Alabama Power company, 360 meters.
WTAC—Johnstown, Pa., Pennsylvania Traffic company, 360 meters.
WTAS—Elgin, Ill., Charles E. Erbstein, 275 meters. Evening schedule—7:30 p. m., musical program.
WTAU—Tecumseh, Neb., Ruegy Battery and Electric company, 360 meters.
WTAW—College Station, Texas, Agricultural and Mechanical college, 360 meters.
WTG—Manhattan, Kan., Kansas State Agricultural college, 485 meters.
WWAD—Philadelphia, Pa., Wright & Wright, 360 meters.
WWAX—Laredo, Texas, Wormser Brothers, 360 meters.
WWB—Canton, Ohio, Daily News Printing company, 360 meters.
WWI—Dearborn, Mich., Ford Motor company, 360 meters.
WWJ—Detroit, Mich., Detroit News, 580 meters. Silent Saturday. Day schedule—8:30 a. m., household hints and talks for women; 9:25 a. m., weather; 10:55 a. m., time signals; 2 p. m., concert. Evening schedule—8:30 p. m., concert.
WWL—New Orleans, La., Loyalo university, 360 meters.
WWT—Buffalo, N. Y., McCarthy Brothers & Ford, 360 meters.
WWZ—New York city, Wannamaker's department store, 360 meters.

Radio Hisses Unheard.

One of the advantages of radio oratory is that the speaker never knows when he is hissed.

See Classified Ads. on page 15.

Opinions of Radiophans

DEFENDS BROADCASTING STATIONS.

RADIO EDITOR: I wish to thank you for putting out your weekly Thursday Radio Magazine sections, as I surely appreciate them.

I would like to give my DX record, as I noticed many radio fans have sent theirs. Having constructed a three-circuit regenerative Armstrong set ("Old Reliable"), with two steps of audio, and, in addition, inserted a variable condenser across the primary and another across the secondary of the coupler, and also a 400-ohm potentiometer, I have received 165 stations, including such distant stations as Calgary, Canada; Los Angeles, San Francisco, Maine, Havana, Cuba; New York, etc., subdivided as follows: Ninety-three cities, forty-two states and two countries, which I think is a fairly good record for one year. The majority of these stations were heard on a loud speaker.

I have noticed in The Post Radio Magazine section many radiophans complaining about our Chicago stations taking all the ether or being too loud so that they are unable to receive distant stations, which I think is an injustice to our local broadcasters, for they are doing all they can to please the radio public. Instead of complaining, why not invest more money and make your set sensitive or selective or buy a selective set, as do the broadcasters when they spend money and make their apparatus efficient?

In my own personal experience I have regularly picked up distant stations while Chicago stations were on the ether, such as WGY, WFAA, WBAP, and all distant stations within approximately 400 miles radius.

Instead of us complaining let us boost our Chicago stations, and send letters of appreciation to the various local stations, for they are trying their utmost to please us, and it is our own fault if we live near a station, as practically all listeners live near one or more powerful stations.

GEORGE KLAWIKOWSKI,
5441 South Wood Street.

"OLD RELIABLE'S" OLDER BROTHER.

RADIO EDITOR: Congratulations on the finest, most interesting and most instructive radio publication it has ever been my pleasure to read.

I don't know very much about the radio science, but I do know that you said something when you termed the "Armstrong Three-Circuit Regenerative" hook-up, the "Old Reliable." I have one, home-grown, and "rliable" is its middle name.

Your DX lists prompts me to enter the field, but, first let me give the list of my parts (radio, of course), for the benefit of any reader who might be interested in building a set like it. I have one 23-plate variable condenser, two variometers, one variable grid leak, two UV-199 tubes, two rheostats, one transformer and dry cells, "B" batteries and headphones. With this mess put together, I have a set with which I have picked up about 100 different stations, including Havana, Cuba, New York City, Washington, D. C., Baltimore, Md., Charlotte, N. C., Atlanta, Ga., New Orleans, La., (a 10-watt station, WIAF), Birmingham, Ala., all over Texas, Los Angeles and San Francisco, Cal., Portland, Ore., five or six Canadian cities, including Edmondton, Alberta province, and plenty of others. "Old Reliable"?" I'll say so! Old reliably yours.—LEO E. MAIMAN, 806 North Jackson Street, Waukegan, Ill.

POST WAVE TRAP HELPS.

RADIO EDITOR: I feel that I owe my thanks to your Radio Magazine for the wonderful help you have been to me. I had built a Post wave trap, but had very little success with it until the night of Jan. 13, when I hooked it up to my machine as described in that week's issue. On that evening, with three Chicago stations broadcasting, I brought in seventeen outside stations, and most of them on the loud speaker, and for the first time was able to entirely eliminate any local station at will. Success to the Radio Magazine.—D. A. HAYES, 443 North Albany Avenue, Chicago.

NEUTRODYNE GETS TEN.

RADIO EDITOR: On Dec. 17 last I purchased a neutrodyne receiver and have logged a total of 130 stations since that time. I have been watching the DX records in The Post, but there has been a scarcity of reports from neutrodyne receivers. In order that this circuit may have representation in your records I am inclosing a list of the stations heard at my home in Hinsdale Jan. 14. All but a half a dozen of these are heard regularly on the loud speaker: CFCF, Montreal, Quebec, 7:10; CFCR, Sudbury, Ontario, 7:15; WOR, Newark, 7:18; WDAR, Philadelphia, 7:19; WGY, Schenectady, 7:20; WCK, St. Louis, 7:21; WJAS, Pittsburg, 7:28; KDKA, Pittsburg, 7:29; WPAB, State College, Pa., 7:31; WOS, Jefferson City, 7:41; WJZ, New York, 7:48; WCAE, Pittsburg, 7:55; WBAP, Fort Worth, 7:57; WEAF, New York, 8; WWJ, Detroit, 8:03; WOO, Philadelphia, 8:14; WCBD, Zion, 8:17; WHA, Madison, 8:28; WHN, New York, 8:31; WHAZ, Troy, 8:34; WTAS, Elgin, 8:35; WNAC, Boston, 8:45; WEAN, Providence, 8:50; WJAD, Waco, Texas, 9; KSD, St. Louis, 9:10; WOAW, Omaha, 9:25; WOC, Davenport, 9:30; WFAA, Dallas, 9:31; WNAD, Norman, Okla., 9:50; KFAF, Denver, 9:55; WLW, Cincinnati, 10; WDAF, Kansas City, 10:10; WMAH, Lincoln, Neb., 10:35; KFKX, Hastings, Neb., 10:50; WGR, Buffalo, 11:05; WSB, Atlanta, 11:10; KGW, Portland, Ore., 11:15; 8XT, Cleveland, 11:20; 5MM, Oklahoma City, 11:29; KFMQ, Fayetteville, Ark., 11:33; KFI, Los Angeles, 11:50; 9BML, Chicago, 12:15; CHBC, Calgary, Alberta, 12:25.—W. L. BLACKMAN, Hinsdale, Ill.

ONE-TUBE ULTRA WORKS FINE.

RADIO EDITOR: Here is the DX loggings I have made: WOC, Davenport; KSD, St. Louis, WOAW, Omaha; WBAH, Minneapolis; KFKX, Hastings; WOAI, Milwaukee; WFAA, Dallas; WBAP, Fort Worth; WGY, Schenectady; KDKA, Pittsburg; WOR, Newark; WEAF, New York; WDAF, Kansas City; WCAE, Pittsburg; WOO, Philadelphia; WHAZ, Troy; WCBD, Zion; WTAS Elgin; WHD, Kansas City; WCAL, Minneapolis; WMC, Memphis, WSB, Atlanta; WTAM, Cleveland; WRC, Washington, D. C.; WLW and WSAI, Cincinnati; WGR, Buffalo; WCX, WWJ and KOP, Detroit; WMAK, Lockport, N. Y.; WHAS, Louisville; WABA, Lake Forest, and WWAE, Joliet. I have a one-tube ultra audion.—CASPER FINDLAY.

LEARN HOW TO TUNE, BROTHER.

RADIO EDITOR: I agree with H. A. Weddell's statements in last Thursday's (Jan. 10) Post Radio Magazine that a certain station in Chicago (no need to mention any names) is a nuisance to local radiophans.

The regular evening programs are boresome enough without "horning in" on New Year's Eve and morning. If even their programs were of as high standing as the hotel we would perhaps like them, but far be it from such. It's one soprano solo after another the whole evening. I, too, note the "tired-voiced announcer" and his statements about selectivity. This alone suggests that this station must have received numerous complaints.

I have made three successful long-distance sets and have used wave traps and all size and length aerials and no aerials or ground, but this station is nearly all over the dials. My "tuning in" pleasure is from 7 to 10 p. m., then I might as well sign off as far as radio is concerned. I could get hundreds of petitions for this station to close about six nights a week. I live five blocks away, and have not heard of any sets that can tune them out.

Will some one kindly give some light on how I may enjoy my radio set more during the desirable hours (10 to 2) for Canadian and western coast stations.

I am using a three-tube modified Reinartz, a Bremer-Tully hook-up No. 2, recommended for its selectivity.—A. H. KENNEDY, 5206 Glenwood Avenue, Chicago.

GOOD IDEA, MR. HEINEMAN.

RADIO EDITOR: I have been reading your articles in the Radio Magazine of The Chicago Evening Post with interest.

Let me suggest with reference to your articles on air interference that some effort be made to prevail upon the different Chicago broadcasting stations to confine their daily broadcasts to an hour and a half.

A great deal can be said and done in this period of time, and if each station would broadcast at a different period, everybody would be happy.

As it is now some of our stations here run along for four hours at a period. Let's not have a monopoly of the air.—EDWARD T. HEINEMAN, Harris Trust building, Chicago.

OAK PARK AMATEURS.

RADIO EDITOR: Is there nothing that can be done to stop those fellows out in Oak Park who seem to take a veritably devilish delight in cutting in on the Zion City services with all kinds of would-be telegraphy, usually just holding down the key and giving a few dots and dashes, others, who have an amateur broadcasting outfit, chattering away into the air?

I understand that it is against regulations for amateurs to operate during broadcasting hours and especially during church services.

I do not believe any genuine amateur would carry on like these fellows out here are doing. They must be just a bunch of irresponsible kids. But isn't it possible to do something to stop them, and if so, won't you kindly start something that will stop these fiends?—RADIOPHAN.

(NOTE—You are right, the Oak Park crowd are the worst offenders in all of Chicago and its suburbs. The writer recently moved to the suburb and between the horde of single-circuit novices trying to tune-in and reradiating and the sparkers and the crowd you mention, he has been having a merry time. Unless Mr. Beale, the district inspector, does a little sleuthing, there isn't much to be done.—THE EDITOR.)

MINER'S SUPERDYNE CIRCUIT.

RADIO EDITOR: I have been a very enthusiastic reader of your Radio Magazine and think it carries more real stuff in its columns than magazines selling for 25 cents a copy.

I was very much interested in the Miner's superdyne article and have thought quite a lot about it. I would like to see you publish a complete article on how to build and operate same as this outfit seems to have all the best points of the neutrodyne and will cost less to construct and operate. —JOHN D. JACOBSON, 3435 South Dearborn street, Chicago.

(NOTE—We published complete construction details of this circuit in the Dec. 27 issue.—THE EDITOR.)

LIQUID FLUX CORRODES.

RADIO EDITOR: For your information will say that I finally located the continuous whistle in my set. It was caused by loose soldered connections from spider web coil to taps. I used a so-called noncorrosive liquid fluid. But it did cause corrosion or rather unclean connections, altho carefully made at the time, and I have used a soldering iron for years, even to soldering brass nipples to thin lead pipe tubes for heat control thermostats.

I found all connections tight and couldn't believe taps could be loose until, as a last effort, I investigated. I laid blame, first, on year-old "B" batteries, until I procured new one then on second step transformer new one, then on my loud speaker. Set is now working fine.—J. H. M'LAUGHLIN, 3208 Armitage Avenue, Chicago.

WANTS NEW DEPARTMENT.

RADIO EDITOR: Your radio section is the best of any paper. The others print just enough to catch the advertisers. The Post considers its readers first.

Our local stations are among the best in the land. If some of the knockers were a thousand miles away they would be straining their ears to catch them. Would suggest, however, that WJAZ remain silent during the opera broadcast from WMAZ and that all local stations remain silent Monday night.

Would suggest another department in your radio section if you have the room: "Readers' Experiences." In his space we could pass on to fellow phans our ideas in regard to operating a set or experimenting and those kinks we discover. In this connection a diagram is often better than a long wordy explanation.—RALPH BERDEL, Evanston, Ill.

(NOTE—The department will be started, Mr. Berdel, if you and other radio phans send in your contributions.—The Editor.)

ONLY NEARLY SO?

RADIO EDITOR: Your Thursday evening Radio Magazine section is fine, nearly as good as the New York World and Mail.

I would suggest that you feature the radio programs on pages 8 and 9 with pictures at the top center. Also where is your news of the local amateurs? Amount of traffic and comments? Are there no Chicago radio clubs? Where is their news? If you can get a good amateur operator he can get all the news for you about the amateurs.—VERNON LITTLE, 431 South Ashland Avenue, La Grange, Ill.

(NOTE—We will be glad to print a special department for the local clubs, especially the amateurs. The Post prints considerable news as it is, altho it is not segregated.—The Editor.)

WHY NOT OPERATE, DOCTOR?

RADIO EDITOR: Why not start a move to have the following radio stations observe silent Mondays: Elgin, Zion City and the Great Lakes, as they are a menace to Chicago radio receivers on Monday night. I cannot see why this cannot be done.—DR. HARRY KLINK, Chicago Athletic Association.

(NOTE—Better perform a surgical operation on your receiver. Those stations should not cause Chicagoans interference.—THE EDITOR.)

The Chicago Evening Post Radio Magazine

RADIO EXCHANGE

Radio Classified Advertisements will be inserted in this section at 5c per word per insertion. Minimum 10 words. Two initials count as one word. No display type, cuts or borders allowed.

5c a Word

If box number is desired, allow four extra words. Box answers will be mailed to advertisers free of charge. Address The Chicago Evening Post, Radio Department, 12 South Market-st.

SETS FOR SALE.

MAKING LARGER SET—Will sell distance-getter 3-Circuit Armstrong with tubes, $75. Call after 6:30 p. m. 5233 S. Maplewood-av.

3-TUBE RADIO—Tubes, phones, "B" batteries, storage battery, oak cabinet, only $70. HENRY BAUMANN, Mendota, Ill.

LARGE 4-TUBE EISMANN SET—With batteries, tubes and beautiful mahogany cabinet, $135. Mansfield 5237.

NEUTRODYNE RECEIVER—New, for $75, or complete with tubes, batteries, phones, loud speaker, etc., $125; nothing else needed; will make any set at low cost. SCHMALZIGAN, 218 E. Garfield-blvd. Ken. 1317.

$50 BUYS ATWATER-KENT 5-tuber, with nation-wide range; record of 45 stations in single evening. Telephone MUNN, Superior 5980, during day.

SUPER-HETERODYNE—In wonderful working order, including loop, 8 UV-199 tubes, 4-volt storage battery, with rectifier; head phones and Music Master loud speaker; price $210; without tubes, etc., price $130. D-202, Chicago Evening Post.

2-TUBE ATWATER-KENT SET, $20; distance getter; bargain. Kildare 4646.

3-TUBE SET COMPLETE—Including everything, batteries, horn, etc.; will install, $80. GUNDEL, 3228 W. North-av.

SETS MADE TO ORDER.

NEUTRODYNE SETS

ON ORDER ONLY—Other types if desired; sets made of parts of demonstrated worth, using only best materials; cheap parts waste your time and hurt our reputation; our overhead is small, yet experts will make your set at reasonable cost; if you want RADIO, with a minimum of annoyance, call us. Sheldrake 1408 or Graceland 1387.

5-TUBE NEUTRODYNE, 3-CIRCUIT REGENERATIVE (Old Reliable); all sets made to order; call evenings. Phone Spaulding 2377, or S. KALWASINSKI, 2744 N. Troy-st., Chicago.

SALES AND SERVICE.

I HAVE SOME BIG BARGAINS in radio sets, cabinets and parts; new lots every few days; sets repaired. SMITH, 3968 Drexel-blvd.

EXCHANGE.

FOR SALE OR EXCHANGE—1,200 selections of the best operatic, classical and old-time songs, vocal and instrumental, in the Victor Red Seal catalog, by Caruso, Galli-Curci, Gluck, Heifetz, Paderewski, etc.; all brand new, dealers' stock, in original envelopes; will exchange at big discount for radio sets or first-class radio parts if in good condition. Phone Irving 6641 after 7:30 p. m., or write H. SMITH, 4200 N. Crawford-av.

EXCHANGE.

BUILD UP YOUR COLLECTION of Red Seal records at small cost; all brand new copies from dealers' stock; over 1,200 selections of the best music in the Victor catalog to select from at such a big reduction in price it will pay you to investigate; will exchange records for good radio set or parts; let me know what you have to exchange. H. SMITH, 4200 N. Crawford-av.

WILL EXCHANGE art or sign work for radio parts. ZAHN, 7547 RIDGE-blvd.

CONSTRUCTION.

LET ME BUILD YOUR SET and save you money; write or call after 6:30 p. m. 5152 South Park-av. FLOYD E. SWINK.

REPAIRS.

RADIO SETS REPAIRED—Rewired or rebuilt; satisfaction guaranteed or no fee asked; charges reasonable. SIDNEY H. STONE, 5233 Glenwood-av. Edgewater 0805.

PARTS FOR SALE.

PARTS FOR 3-STAGE REINARTZ, $12. Call evenings. W. ROSS, 3211 Indiana-av.

AERIALS.

FIRST-CLASS AERIALS—Constructed reasonable. MR. SCHULZ. Hyde Park 0072.

Long-Distance Records of Phans

WAITS FOR COLD MONDAY—GETS IT!

RADIO EDITOR: I was waiting for a cold Monday night in January to put a list of stations in my diary. And this is what I received Monday, Jan. 21, thru my tuning theory: WGX, Schenectady, N. Y.; WWJ, Detroit, Mich.; WOAW, Omaha, Neb.; WOR, Newark, N. J.; WDAR, Philadelphia, Pa.; WCAE, Pittsburg, Pa.; WHB, Kansas City, Mo.; WOO, Philadelphia, Pa.; WDAF, Kansas City, Mo.; WCBD, Zion City, Ill.; WOC, Davenport, Iowa; WBAP, Fort Worth, Texas; WOS, Jefferson City, Mo.; WSB, Atlanta, Ga.; WTAS, Elgin, Ill.; WHAZ, Troy, N. Y.; KDKA, Pittsburg, Pa.; KSD, St. Louis, Mo.; WFAA, Dallas, Texas; WLW, Cincinnati, Ohio; KFKX, Hastings, Neb. My set is a one-tube Armstrong, consisting of a coupler and condenser.—RAYMOND R. BERNHARDT, 5449 Michigan Avenue.

GET THIS HOOK-UP QUICK!

RADIO EDITOR: I am submitting the following for your consideration. If you deem it worthy the space you may publish it. While not a phenomenal record, it demonstrates the entertainment possibilities of a small investment in radio equipment. All of the following stations were heard quite distinctly at any point in the room when the set was attached to a Victrola thru a loud speaker:

WSAI, Cincinnati, Ohio; KDKA, Pittsburg; Pa.; KYW, Chicago, Ill.; WOR, Newark, N. J.; WOAW, Omaha, Neb.; WOC, Davenport, Iowa; WDAM, New York, N. Y.; WJAX, Cleveland, Ohio; WGY, Schenectady, N. Y.; WDAF, Chicago, Ill.; WBAP, Fort Worth, Texas; WOS, Jefferenson City, Mo.; WRM, University of Illinois, Urbana, Ill.; WHB, Kansas City, Mo.; WSB, Atlanta, Ga.; KSD, St. Louis, Mo.; WWJ, Detroit, Mich.; CKCK, Regina, Canada; KFKX, Hastings, Neb.; KLZ, Denver, Colo., and WNAD, University of Oklahoma, Norman, Okla.

The above stations were logged on a single circuit, regenerative, home-built set, using a Rector coil as the principal tuning unit, detector and two stages of audio-frequency amplification with U. V.-199 tubes.

Reception was on the evening of Jan. 17, between the hours of 6:30 and 10:15 p. m., with one hour out for dinner. The set was in operation two hours and forty-five minutes. A total of twenty-one stations was identified by their call letters. Two additional stations were picked up, one delivering a radio talk and one broadcasting a play, but these were not identified by call letters on account of the length of their program between announcements.

This set is a Dxer that will step out with any of them, as I have heard PWK, KHJ, KFI and KPO on it at various times. Long live the Radio Magazine Section of The Post. —J. C. SMITH, 1805 South 7th Street, Springfield, Ill.

IT'S THE "CAT'S WHISKERS."

RADIO EDITOR: Just to let you know what success I am having with the "Old Reliable." For the last four or five weeks I have given this set a thoro test, and I think it's the "cat's whiskers." Last night (Jan. 15) being silent night I tuned in the following stations: WDAF, 6:58; WGY, 6:59; WOAW, 7:01; WCX, 7:13; KDKA, 7:24; WCK, 7:29; WTAS, 7:54; WCAE, 8; WOC, 8:03; WRC, 8:05; WCBD, 8:08; WHAZ, 8:14; WWJ, 8:38; WFAA, 8:57; KSD, 9:11; WOR, 9:19; WDAR, 9:26; KFKX, 9:30; WBAP, 9:52; WLW, 10:29; WSB, 10:53; WGR, 11:37.

I am certainly glad that I have followed the directions on construction of this set and am very much pleased with the results I get.

Let's hear from some of these phans that have built an "Old Reliable."—MARTIN DOMZALSKI, 8227 Coles Avenue, South Chicago.

Loop Aids Selectivity

The loop antenna may be used to eliminate much of the interference encountered with a regular outside aerial. The loop should be so devised to rotate so that its position may be set for reception from a particular station. It is very directional, but about 25 per cent efficient compared with a good outside aerial. If outside stations within a radius of 100 miles are desired, radio-frequency cascade amplification must be added to the set. It would be an unusual circuit that would give any satisfactory service with a loop antenna.

Mail Orders Address Dept. P-6, Chicago

Phone Wabash 4183

CHICAGO SALVAGE STOCK STORE

509 S. STATE ST.

Mail Orders Address Dept. P-6, Chicago

Phone Wabash 4183

Save at Salvage

Here Are Bargains in Radio Supplies That Will Make Every Fan Sit Up and Take Notice

Another score for our enormous buying power! Can you find radio bargains to equal these anywhere—not only as to price, but quality as well? Don't forget this: Lowest price is only the first of our many attractive features. Brand new merchandise; the latest ideas in Radio; absolute GUARANTEE of satisfaction, are others.

SALVAGE MEANS:
SAVE — SERVICE — SATISFACTION

Complete parts for Wave Trap

Consisting of	Our Price.
6x6½ Mission Finished Oak Cabinet	$ .95
6x6½ Formica Panel, Drilled and engraved	.50
Specially Wound Wave Trap Coil	1.95
23-Plate Variable Condenser	1.35
Bakelite Dial	.25
4 Binding Posts	.20

Construction Sheet FREE

Very Special $5.25

Complete parts for Power Amplifier

1 Set of Push and Pull Thordarson or All-American Power Transformers.
1 Double Firth Socket.
1 Howard Power Rheostat.
8 Binding Posts.
5 Switch Points and Stops.
1 Switch Lever.
1 Cutler-Hammer Filament Switch.
1 7x9 Panel.
Baseboard and instructions for assembling and mounting.

$25.00 Elsewhere

Our Price $16.95

Complete parts for Erla Reflex

Consisting of	Our Price.
1 Variocoupler	$3.45
23-Plate Variable Condenser	1.45
2 Erla Sockets	1.30
1 Erla Reflex No. 1 Transformer	4.45
1 Erla A. F. Transformer	4.85
1 Erla .002 Mica Condenser	.30
1 Erla .001 Mica Condenser	.30
1 Erla .00025 Mica Condenser	.25
1 Erla Fixed Crystal Detector	1.00
1 Howard Rheostat	1.00
2 Bakelite Dials	.50
8 Binding Posts	.40
1 Dozen Switch Points & 4 Stops	.30
2 Switch Levers	.50
1 6½x14x⅛-inch Formica Panel	1.37

Our Price $20.90

Complete parts for 2-Stage Amplifier

To amplify Ultra-Audion, Reinartz, Flewelling, Knocked-Down, Short-Wave Receiver, Crystal or any receiving set so that loud speaker or phonograph can be used in place of headset.

1 7x9 Formica Panel (other suitable size).
1 High-Ratio All-American or Thordarson Transformer.
1 Low-Ratio All-American or Thordarson Transformer.
2 Howard Rheostats.
2 Bakelite Sockets.
3 Double Pacent Jacks.
13 Binding Posts.
1 Baseboard.

$21.00 Value

Our Price $12.95

Complete Parts for All Receivers HERE!

Herald-Examiner Set	$ 5.95
Short-Wave Tuner	10.50
Columbia Freak	39.95
Haynes DX	9.95
Flewelling	12.45
Supertuner	43.95
Honeycomb Receiver	17.95
Ultra-Audion	8.95
Overland Circuit	8.25

EVEREADY 108-VOLT "B" BATTERIES

Regular value $15.00. Guaranteed Fresh. $5.95

COUPLER COIL SETS FOR SUPERDYNE $4.50

Bradleystats and Bradleyleaks UNIVERSAL New Type— $1.25

2,000 Ohm HEAD SETS $5 Value, $2.45

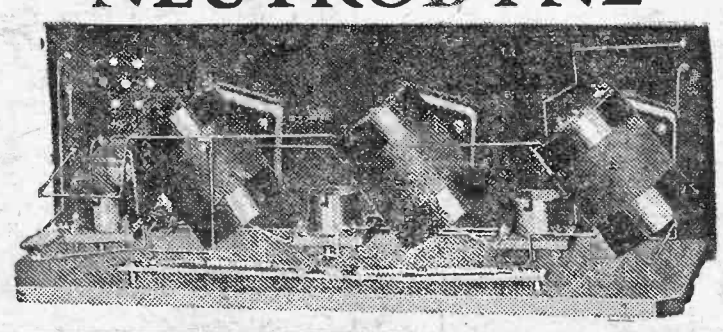
Automatic Electric

Long Range Headsets

$10.00 VALUE

$3.65

NEUTRODYNE



Build Your Own Radio

You Don't Need to Be an Expert to Do It

The complete instructions and blue prints which are included in all of our radio outfits are written so that any one can understand them. No special skill or technical knowledge is required. A few hours and you are ready to tune-in New York, Los Angeles on the set that you yourself have built!

Important

Any individual part (except the drilled panels in any of the outfits listed here) may be purchased separately at the special reduced prices listed under column headed "Our Price."

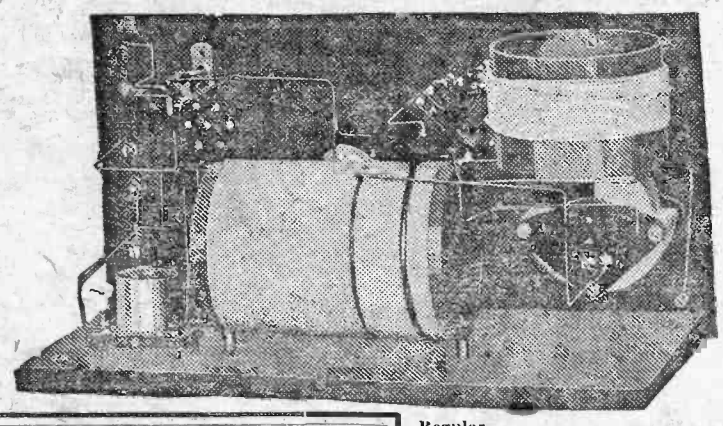
Panels Drilled FREE

Specially drilled panels are included with each of the sets illustrated and described below. We give this free service only on panels included with complete sets.

Easy to Build

Complete instructions of assembling and blueprints for wiring are included with each outfit. Instructions written so everyone can understand them. No special skill or technical knowledge required—a few hours and you're ready to tune-in New York, Los Angeles—any of 'em!

COCKADAY



Freed-Eiseman or Fada Licensed Parts

1 7x21x3-16 drilled Formica Panel.
1 Howard Rheostat.
3 4-Inch Radion Dials.
3 John Firth Bakelite Sockets.
8 Binding Posts.
3 23-Plate Variable Condensers.
1 Wave Control Neutroformer.
2 Radio-frequency Amplifying Neutroformers.
2 Grid Neutralizing Condensers.
1 .00025 Micon Grid Condenser.
1 Marco Variable Grid Leak.
1 Baseboard for mounting.
25 Feet Tinned Copper Bus Bar Wire and complete instructions for assembling and wiring.

3-TUBE Our Price $28.60

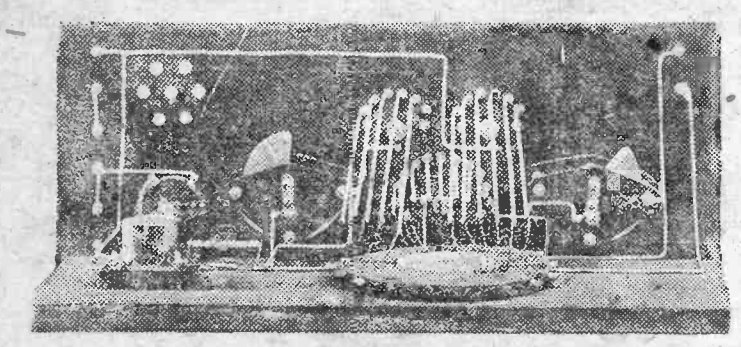
4-Tube $44.65
5-Tube $46.25

Complete parts for Autoplex

9½x13¼x⅛-inch Formica Panel, drilled and machined		$1.89
9½x13¼x⅛-inch Mahogany Cabinet with hinged top		2.95
1	John Firth Socket	.35
1	Frost Plain Rheostat	1.00
2	Moulded Autoplex Variometers	7.30
2	3-Inch Bakelite Dials	.50
6	Binding Posts	.30
1	Single Circuit Pacent Jack	.35
1	1,250 or 1,500 Turn Honeycomb Coil	1.50
1	4x4x¼-inch Formica sub base panel, drilled	.25
1	2¼x2¼x⅛-inch Formica Panel, Coil, clamp drilled	.07
1	Complete set machine screws for assembling various parts (no charge).	
1	Hook-up for assembling and wiring (no charge).	
4	Lengths square bus bar wire	.10

Our Special Price $16.45

REINARTZ



Reg. Price.		Consisting of	Our Price.
$1.89		7x18 Formica Panel	$1.70
1.00		Bakelite Socket	.45
1.50		Howard Vernier Rheostat	1.35
3.30		23-Plate Variable Condenser	1.45
3.10		11-Plate Variable Condenser	1.35
3.00	1	Schoonhoven Reinartz Coil	1.95
1.00		Freshman Variable Grid Leak and Condenser combined	.75
1.50	3	Switch Levers	.75
.80	8	Binding Posts	.40

Reg. Price.		Consisting of	Our Price.
$ .80	2	Dozen Switch Points	$ .40
.30		25 Feet Tinned Wire	.15
.50		Baseboard for mounting	.25
1.00		Blueprint with complete instruction for assembling and wiring	.50

Regular Price, $21.69 Our Price $11.45

Regular Price EACH		Consisting of	Our Price EACH
$3.00	1	Cockaday Coil	$1.95
1.00	2	Bakelite Dials	.25
1.00	1	John Firth Socket	.45
1.00		Freshman Grid Leak and Condenser	.65
1.50	1	Howard Vernier Rheostat	1.35
1.00	1	Pacent Double Circuit Jack	.50
.80	8	Binding Posts	.05
.02	7	Switch Points	.01
.50	1	Switch Lever	.25
	1	7x14x⅛ Formica Panel	1.44
		Blueprint and Wire	1.00
	1	Baseboard	.25
3.30	2	23-Plate Condensers	1.45

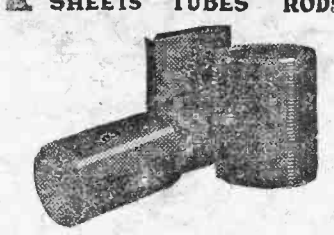
Our Price $11.95

Honeycomb Coils

1,500 Turns	$1.50
1,250 Turns	1.50
1,000 Turns	1.25
750 Turns	1.00
250 Turns	.75
150 Turns	.60
100 Turns	.50
75 Turns	.40
50 Turns	.40
35 and 25 Turns	.40

FORMICA

Made from Anhydrous Redmanol Resins
SHEETS TUBES RODS



We are prepared to furnish promptly and saw Formica panels of any dimensions. Cutting charge is included in the following prices:

3-16-inch Formica, square inch ... 2c
⅛-inch Formica, square inch ... 1½c
Tubing (2 to 4-inch diameter), per running inch ... 10c

Prices Smashed Kellogg Parts

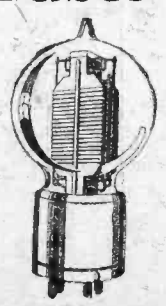
11-Plate Vernier Condenser with 4-inch bakelite dial and knob	$4.95
23-Plate Vernier Condenser with 4-inch bakelite dial and knob	5.95
43-Plate Vernier Condenser with 4-inch bakelite dial and knob	6.45
3-Inch Bakelite Dials	.65
4-Inch Bakelite Dials	.95
Bakelite Sockets	.55
Grid Condensers	.55
Double Mountings	.60
Transformers (high or low ratio)	2.95

Western Electric VT-2 Tubes

5-Watt "E" Type CW-931

$12.00 VALUE

$7.45



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6.00 value, 11-Plate Vernier	2.95
1.75 value, 3-Plate Vernier	1.15
4.30 value, 43-Plate, NOW	1.65
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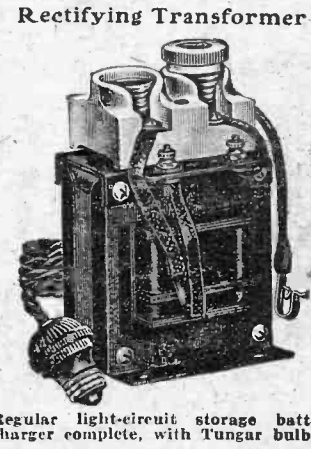

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48,000-Ohm Lavite Resistance, $1.50

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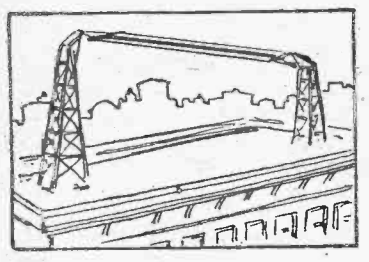
THE CHICAGO EVENING POST

RADIO MAGAZINE

Published Every Thursday



THURSDAY, JANUARY 31, 1924.

Issued as a Supplement to
The Chicago Evening Post

BROADCASTING

HOME RADIO

RADIO SETS

HOOK-UPS

AMATEUR RECEPTION

HOME-WORKSHOP

RADIO SCIENCE-

RADIO PROGRAMS

LOCAL NEWS

U.S. RADIO NEWS

HOME LABORATORY

AMATEUR TRANSMISSION

RADIO STATIONS

INVENTIONS

D.X. RECORDS

RADIO PRACTICE-

COMMERCIAL

GLORIA SWANSON, who is now playing in her latest Paramount screen success, "The Humming Bird," at McVickers, is a radio fan. She tuned in on KYW last Wednesday night from her Hollywood home and wired her appreciation of the program.

FOREIGN RADIO NEWS

MANUFACTURERS NEWS

NEW EQUIPMENT

DEALERS NEWS

JOBBER NEWS

IN THIS ISSUE

New "Long 45" Circuit and Tuner Described in Detail—More Notes on Construction and Operation of Miner's Superdyne Receiver—Two-Element Tube Reflex Hook-up—Story of First Radio Church of the World and Its 100,000 Congregation.

RADIO ANNOUNCEMENT

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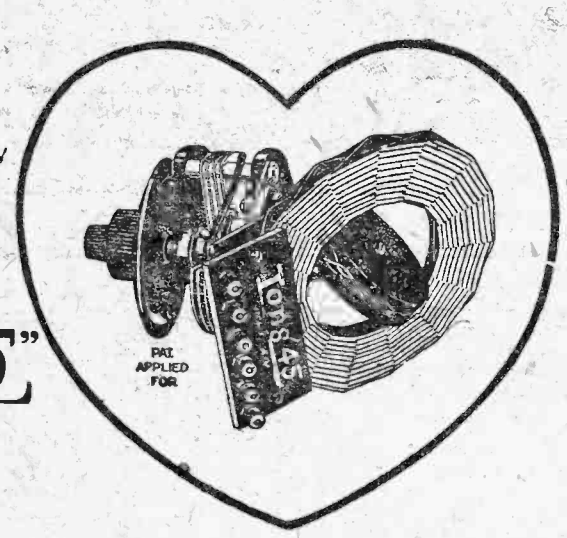

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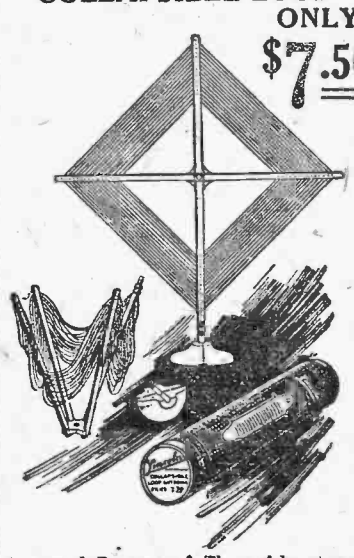

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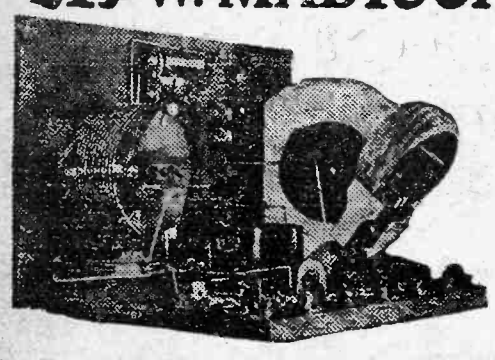

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Blueprints for Set Only 25c.

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$2.95	$5.95		$11.25	$2.95

"B" BATTERIES	CABINETS				PANELS	COCKADAY
22½-volt .75	7x 9 ..... $2.25	7x18 ..... $3.75			7x14x3-16 $1.00	Complete Parts Drilled Panel Diagram
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Edited by a Staff of Regular and Special Contributing Writers.

The RADIO MAGAZINE Section is edited with the view of giving authentic news of the radio broadcasting field and authoritative information on the subjects of home construction of receiving and transmission sets, of the operation and maintenance of apparatus, and as an exchange of opinion for its readers.

THE CHICAGO EVENING POST

RADIO MAGAZINE

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THURSDAY, JANUARY 31, 1924.

Weekly Subscription $1.35 Per Year.

Long 45 Tuner Is Big Aid to Sets

"The Long 45," a new tuner, which has been upsetting the east for several weeks, struck Chicago the last week and is gripping local home builders in a way that would indicate that its maker has struck "something worth while."

Contrary to the popular idea, "The Long 45" is not a circuit. It is a tuner that can be used with any circuit of the regenerative type. However, the manufacturers have tested out a number of hook-ups and offer one that works exceptionally well with the device and, at the same time, makes for simplicity in construction and low cost of production.

With this particular circuit, and using the tuner, it is possible to get fair long-distance reception and excellent local reception by using the ground only, or by employing an inside aerial. This is due to the extreme sensitiveness of the tuner. Of course, with a suitable outside aerial much greater volume will be had and a wider range.

The new tuner gets its name from the forty-five circuits with which it will work efficiently. These include all the single, two and three circuit Armstrong hook-ups, including "The Old Reliable," which has been described in these pages.

What the Tuner Consists Of.

The device consists of a condenser and two coils attached in a unit. The condenser is of a special type, being a low-loss variable of seven plates. It is of the straight-line capacity type, having semicircular plates of aluminum, well spaced with heavy aluminum washers to prevent possible short circuits and to insure a permanent electrical connection. The plates are rounded on the edges to prevent the so-called edge discharge which is so detrimental to all circuits employing a variable condenser. Two heavy insulated plates support the aluminum plates and prevent warping and leakage.

There are two coils—one a stationary and the other a rotary. The stationary coil is set in the unit at an angle of forty-five degrees from the condenser. It is of the spider web type and has inside diameter of sufficient size to permit the insertion of the rotary coil. It is wound with No. 24 DCC wire, and has ninety-six turns with a short wave tap at forty-two turns.

The elipsoithes form of winding used in this coil has a tendency to keep the distributed capacity at a minimum, which insures against broad tuning and weak signals. There is no insulating support, the coil being kept together by a thin coating of a moisture-proof, impregnating compound.

Both Tickler and Primary.

The rotary coil is built with the same idea in view. It is of elliptical form winding, and is held in position by two bakelite disks. It is wound with forty-eight turns of the same heavy wire used on the stationary coil, and can be used as a tickler in the three-circuit regenerative circuits, or as both tickler and primary in other circuits.

There is nothing particularly new in the tuner, taking the parts as separate units. It is the mechanical construction of the whole that makes it stand out as a remarkably efficient device, and upon which its patents are obtained. The simplicity of controls is a decided factor in radio sets, and "The Long 45" certainly has reduced the operation of a circuit to the fewest possible controls.

In the accompanying illustrations is shown a schematic diagram of a single circuit regenerative hook-up which the makers of the tuner recommend. In this hook-up an additional condenser is used. Also, there is a thirty-five or fifty-turn honeycomb coil. A photograph of the completed receiver built from this hook-up, using "The Long 45" tuner, also is shown.

Good Range and Selectivity.

With this "Long 45" receiver as illustrated, some remarkable reception was obtained. Stations more than a thousand miles away have been heard on it and it proved exceptionally selective for a single circuit set, inas-

(Continued on Page 9.)

1

2

3

Fig. 1—Duncan sisters at KYW midnight revue Friday evening. Fig. 2—Mrs. Georgene Faulkner, "The Story Lady," at WMAQ. Fig. 3—Jules Herbecaux, leader of Guyon's orchestra, which plays at WTAS (Elgin) Sunday and Monday evenings. Fig. 4—Rosemary Hughes at WDAP every Tuesday evening.

Radio Programs

L. Wolfe Gilbert, composer of "Nobody Else but You" and many other popular song hits, personally appeared as the headliner of the vaudeville bill the last week. Gilbert has been identified with the concerts of the local stations prominently, and many of his radio artist friends turned out in his honor to see him.

Tuesday night was set aside at the Rialto as KYW night and if you journeyed down to the theater on that occasion you had an opportunity to personally view Sen Kaney, the popular announcer; Herbie Mintz, the demon pianist; Walter Wilson of "Dream Daddy" fame, and Milton Weil, the popular partner of Isham Jones. This evening will be set aside for Willie, Tommie, Annie and Sammy, otherwise known as Charley Erbstein's WTAS station at the Villa Olivia, Elgin, Ill. Charley will forsake his legal practice this evening and make his debut as an actor. He will bring with him Lou Fordan, Billy Stoneham, Rocco Vocco Duo. The Lewis and Calvert entertainers and Harry O'Brien. Sounds mighty interesting for radio fans, doesn't it?

Next week the KYW studio staff will be at McVickers all week in person.

Below are given the complete schedules of all the Chicago and suburban broadcasting stations and those of the out-of-town stations which are most commonly tuned by local radiophans.

These schedules are a regular daily feature in The Chicago Evening Post.

On Thursday of each week a complete list and schedule of every broadcasting station in the United States is published in The Chicago Evening Post's sixteen-page Radio Magazine section.

CHICAGO STATIONS

(Central Time Is Shown.)

KYW—Located in Commonwealth Edison building, 536 meters; Wilson J. Wetherbee, director.
Day—9:30 a. m., news and markets; 10 a. m., market reports; 10:30 a. m., financial news and comment; 10:58 a. m., naval observatory time signals; 11 a. m., market reports; 11:05 a. m., weather report; 11:30 a. m., news and comment of the financial and commercial market; 11:35 a. m., table talk by Mrs. Anna J. Peterson.
Evening—6:30 p. m., financial and final market and sport summary furnished by the Union Trust company, Chicago Journal of Commerce and United States department of agriculture; 6:50 p. m., children's bedtime story; 8 to 8:28 p. m., twenty minutes of good reading by Rev. C. J. Pernin, S. J., head of department of English, Loyola university, Chicago; 8:30 to 9 p. m., H. C. McClory, tenor; Louis Puppillo, violinist; Eleonora Koskiewicz, pianist; Sallie Menkes, accompanist; Gladys Phillips, accompanist and Sandy Meek, tenor. "Bood-Bye" (Tosti) and "Little Town in the Ould Country Down Sanders," by H. C. McClory; "Intermezzo" from "Cavalleria Rusticana" (Mascagni) and "Souvenir" (Drdla), by Louis Puppillo; "Your Garden in My Heart" (Verdi) and "London Bridge" (Robinson), by Sandy Meek; "Etude" (Arensky) and "Love Waltz" (Moszkowski), by Eleonora Koskiewicz; "The Trumpeter" (Dix) and "When the Dew Is Falling" (Schneider), by H. C. McClory; "Souvenir d'Venice" (D'Agostine) and "Serenade" (Drigo), by Louis Puppillo; "Somehow I Know" (Shaffer) and "Let Me Call You Sweetheart" (Friedman), by Sandy Meeks; "Two Larks" (Leschetizky) and "Valse in A" (Rachmaninoff), by Eleonora Koskiewicz.

WAAF—Located at Union stock yards; 286 meters.
Day—Live stock reports at 8:40, 10:30, 10:45 a. m., 12:30, 12:45, 4:30 p. m.
Evening—No schedule.

WMAQ—Located on Hotel LaSalle; 447.5 meters. Miss Judith C. Waller, station director.
Day—Illinois Federation of Women's Clubs.
Evening—Weekly talk to Boy Scouts—Financial talk by Roy Munger. Talk by Rockwell E. Stephens, auto editor of The Daily News. First of a series of lessons in golf by B. A. Andrews. 7:30 p. m., Axel Christensen; 8:30 p. m., WMAQ orchestra; 9:15 p. m., St. Paul trio.

WJAZ—Located on Edgewater Beach hotel; 447.5 meters; E. Warren Howe, program director.
Day—This station has no regular day schedule.
Evening—10 p. m. to 2 a. m., music.

WDAP—Chicago Board of Trade, located at Drake hotel; 390 meters.
Day—9:30 a. m., 10 a. m., 10:30 a. m., 11 a. m., 11:30 a. m., 12 noon, 12:30 p. m., 1 p. m., 1:30 p. m., quotations and market reports direct from the Chicago Board of Trade.
Evening—10 p. m., Martha Bjorn, soprano; John Stamford, tenor; Esther Jane Henderson, piano; Frank Grief, tenor; Sidonia Friedricks, soprano; Jack Chapman's orchestra.

WSAH—Located at 4801 Woodlawn avenue; 248 meters.

FOREIGN STATIONS

CKAC—Montreal, Canada; 430 meters:
Day—3 p. m., news, weather and stock reports; musical tea.
Evening—Silent.

CYL—Mexico City, D. F. "El Universal"; 500 meters: Reul Azcarraga, director; G. Obregon, Jr., announcer (Spanish); Sendel Hodges, announcer (English).
Daily, 12:54 p. m., news and weather; 8:24 p. m., war bulletins from the war and navy departments; Tuesday and Friday, 8:24 to 8:54 p. m., music. Sunday, 7:24 p. m., war bulletins.

PWX—Havana, Cuba; 400 meters: Jose Isquierdo, chief operator; Urbano del Castila, program director; Remberto O'Farril, announcer; regular broadcasting nights, Wednesday and Saturday, 7:30 to 10 p. m., central standard time.

TSF—Paris, France; French Post and Telegraph department, 106 Rue de Grenelle. Director, M. G. Valensi; assistant, M. Chanton; 400 meters; 500 watts.
Daily except Tuesday at 2:21 p. m., Tuesday at 1:51 p. m., music, classical theater and a course in English literature; Tuesdays, a course in the Morse code. Every tendays, scientific lectures.

SUBURBAN STATIONS

(Central Time Is Shown.)

WCBD—Zion, Ill., 345 meters; J. H. Depew, station manager.

WCAY—Milwaukee, Wis.; 261 meters: No silent nights.
Day—1 p. m. to 4:30 p. m., special concert; novelty and test programs as announced.

Continued on Page 14.

Amateur Tuner Is Greatest Offender

By IVERSON C. WELLS.
(Radio Editor of The Chicago Post.)

RERADIATION is a worse evil in broadcast reception than interference from the indifferent amateurs and powerful local broadcast stations.

In the latter case receiving sets may be so constructed and tuning so developed interference can be eliminated. In the former case there is no receiver made or can be made nor any operator capable of being developed to get away from the evil.

There is only one way out—only one remedy or cure. It is to teach the offending novice HOW to operate his set so not only will the rest of us have a chance to pass a pleasant evening but also he himself will have an enjoyable time—something neither he nor us now are doing.

Later I will propose a plan that would bring about this happy solution if put into effect. In the meantime let us analyze the situation.

Cause of Reradiation.

Reradiation is caused by an unskillful operator of a regenerative receiver—usually of the single circuit or ultra audion type. However, any regenerative set will perform likewise if not handled properly.

In the unskillful operator's hands his receiver becomes a minature transmitting set and sends forth its whistle and wheezes for many blocks around.

As long as he is at work no receiver within the range of his minature transmitter is going to produce any sort of satisfactory service to its owner, however selective and efficient the set may be, or however skillful a tuner the operator may be.

The work of the novice single-circuit tuner is particularly noticeable on "silent" nights in Chicago. He has been "kept in Chicago all week" by this and that big local broadcasting station from which he "can't get away." He has cursed and berated this or that station to his friends and neighbors, and he has written letters of protests to his favorite radio editor, and be has sought to lead a movement to squelch the "offending" broadcasting station and have its operators quartered and halved and burned in the fiery furnace of revenge.

Now, comes along Monday, or "silent" night. It is HIS night. At last he is to reach out and bring in Honolulu or Timbuctoo and run in a string

Continued on Page 4.

Novice Tuner Is Greatest Offender

Continued from Page 3.

of DX stations that will make the records published in The Post each week look like child's play.

Then He Reradiates.

Promptly at 7 p. m., as the last local broadcasting station signs off for the evening, he sits down to his set and turns on the juice. Then his laborous work begins.

From 7 p. m. until along about 11:30 p. m. he whirls dials right and left. his tube tuned up to the high oscillation point.

He usually strikes WTAS (Elgin) or WCBD (Zion) right off the bat. So do his neighboring reradiating friends.

The concert of cat howls and whistles begin! It sounds as if bedlam was reincarnated.

Perhaps, you, yourself, may be just tuning in WTAS. You have succeeded after several minutes of hard work, squeezing in during a temporary lull in the reradiative chorus, as the novices stop to "see what is the matter with the set."

Just as you sit back to hear Charlie Erbstein "do his stuff" over the microphone WTAS fades out and the whistle-wheeze chorus sets up again. They have completely blanketed everything with a chorus of whistles and howls.

Up and down the scale the whirl. Whee-ee! whee-ow! whee-oo-ee-ee! wow!

Knowing it is useless to try to keep WTAS on as long as the "chorus" is at work, you turn with a sigh and tune into KDKA (Pittsburg), and immediately you discover, just as you clear up the signal and bring in the music, that at least fifty of your "friends" have followed you.

To WLW (Cincinnati) you go. The same thing is repeated here, only by so doing you have lost probably 20 per cent of your followers. But still the reradiating fiends are sufficently numerous and even more persistent, in their own desperation, and you, equally as desperate by this time as they are, bid them, as you hope, a last fond (?) farewell and turn to KSD (St. Louis). To your satisfaction you have lost them.

However, your satisfaction only is short-lived. The chorus that has been with you had been hanging around the neighborhood of 300 meters, but having failed to "bring anything in" they change to a higher wave length and pick you up again just as you begin to enjoy KSD's early evening program. What's the use?

They Quit in Exhaustion.

By 11:30 they have dropped off one by one—worn out in their ceaseless, vainless effort, and retire to their sleepless couch, to toss and tumble in their sheer exhaustion and dream of the goblin broadcasting station on the north side or some other side which has ruined their radio pleasure.

And so they finally drop off into a dreamless slumber—innocent, but yet ignorant, for, unknowingly each and every one of them have spoiled the pleasure of several hundred radiophans in their neighborhood.

It is after 11 p. m. Mondays I do most of my long-distance work. I find this is true of a great many phans in Oak Park, where I live. To make any attempt earlier is too laborious and certainly unsatisfactory.

Looking at the matter in purely a selfish way, it would be better for me not to have any silent nights in Chicago at all. I say this because on the other six nights in the week I do not have my reradiating friends operating their miniature transmitting sets. With almost any sort of receiver I can tune out local broadcasting stations and bring in the faraway fellows.

The crystal set owners, probably, also would like to see silent nights abolished—looking at the matter in the same unselfish way. They must "stand by" Monday evenings and wait until the local stations receive their regular schedules, as fifteen to fifty miles is about their average range.

And I haphazard a guess that even these reradiating chaps would welcome abolishing silent nights, for they certainly "don't get anything," and their only reception is during the rest of the week, when the powerful local stations, because of their proximity, literally force themselves into their receivers, in spite of their inability to tune in a signal.

Solution to Problem Suggested.

Of course, none of us really want "silent" nights abolished. There is a solution to the problem that would bring joy to all—except the crystal set operator. It is this:

Teach the offending novice HOW TO TUNE.

There are two ways to do this.

One is by textbook or magazine instruction. The other is by personal instruction.

The first method would be the most economical and certainly cover a greater number in a given time, but the trouble is this class of offenders do not READ what is prepared for them, or they would not be offenders long.

The Post technical department receives probably an average of 200 letters a day from its readers asking questions. Most of these are unnecessary.

As, for example:

"I have just concluded reading your construction details of the Umpty-Dump circuit and am quite interested. Will you please send me a diagram, as I wish to build the same."

And yet on that same page there were panel layouts, a schematic diagram, a pictorial diagram and the most minute details for construction! They don't read. If they do, it is done without thinking. It is all the same in the long run.

Personal instruction, altho more tedious and taking more time, is the best solution.

Last winter I was living in a north side district. We had some of the same type of offenders in our neighborhood as we have today out in Oak Park, altho I must confess they were in much smaller numbers.

Unfolds the Plan.

I visited each apartment in a radius of several blocks where I saw an aerial and could trace the lead-in to its source. Where I found the owner at home, by using considerable tact I explained to him how he not only was cheating himself but also the rest of us for several blocks around. Usually he was eager to be shown. Sometimes a young fellow would resent "outside interference," become indignant and almost order me from the house. Tact, however, mixed with a few grains of gentle persistence, usually won the day.

For those I did not find at home I left a card inviting them into my own home on a certain evening, and most of them sooner or later responded. It was my duty, then, to instruct them in the art of tuning INTELLIGENTLY. This only was a matter of a few minutes' work. They went home happy and became offenders no more.

There was only one obstinate fellow in the neighborhood, and I hope he will pardon me for thus referring to him. He lived just across the street. From my front window, second floor, I could look into his second floor front window and see him working over his set.

This young man had a single-circuit receiver of a good type, well constructed and equipped with two stages of audio-frequency amplification and a loud speaker.

With a pair of opera glasses I watched him on this particular Monday evening for more than two hours—on and off. I could SEE him whirl his dials—at times cautiously, then again viciously, as his temper got the best of him. Also in my own set I could HEAR him.

It so happened just a few days before I had bought a lot of junk from a fellow. Among the parts was an old army transmitting phone of the button type.

I hope Mr. Beale doesn't see this, because I infracted a rule, even if it was for a good cause.

Voice Startles Him.

Hooking this microphone into my receiver and starting the tube (a five-watter) to oscillating, I called him by name. You should have seen that lad jump!

He told me later that my voice came in thru his loud speaker with a roar. He said he was startled with the uncanniness of it all.

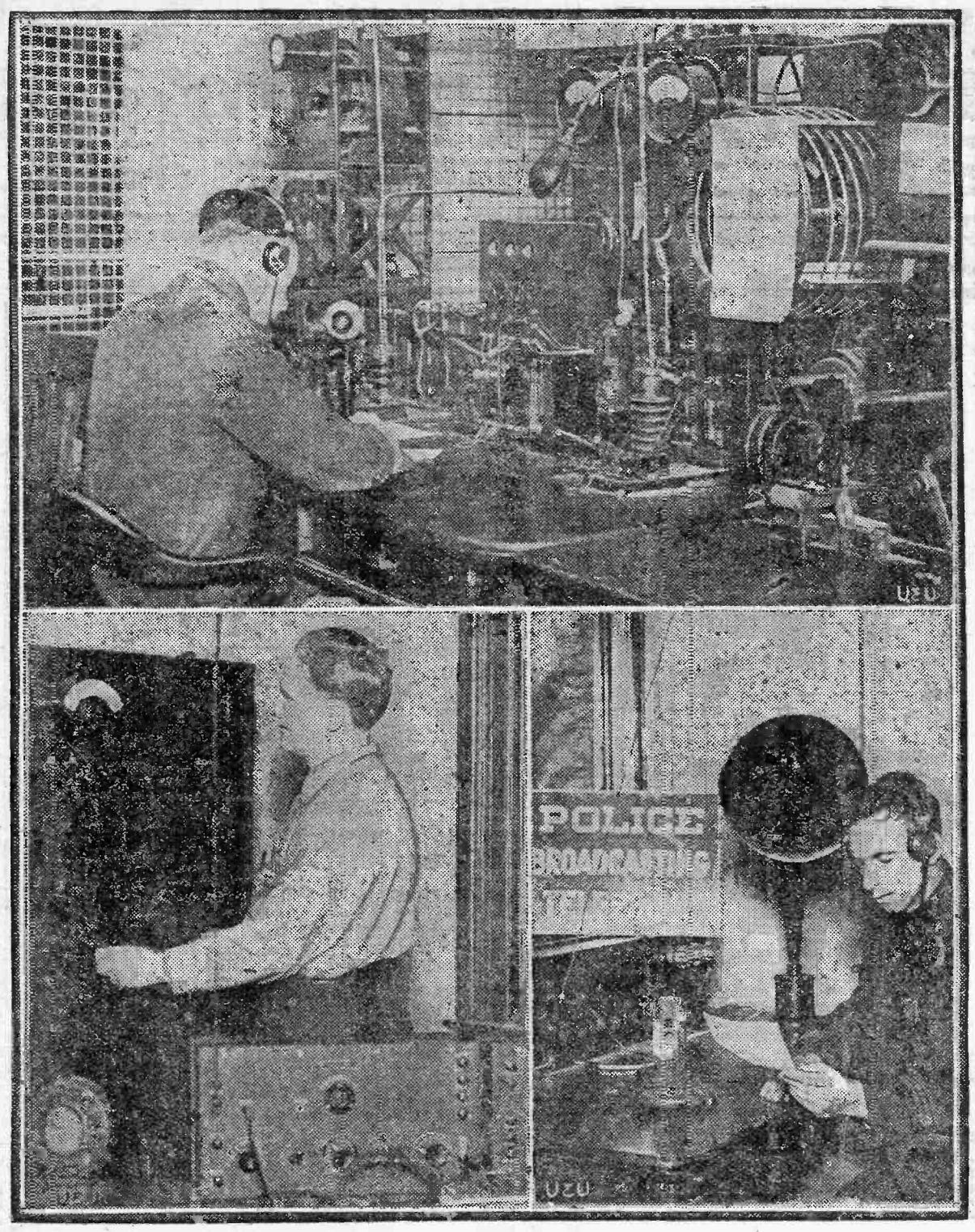
Then I told him he had been trying for two hours to tune in some station without success, and if he only would come across to my apartment for five minutes I would teach him how to tune in and he would go home happy. He did come. He went home happy. He brought in his first outside station that night after nearly three months of useless effort.

The point is this: You who know how to tune can do the same good work, altho I would advise you not to try the microphone unless you have a license.

It is even possible to meet at some public hall, erect an aerial, install a portable set and instruct several hundred at a time. If this is too much, then do as I did and take it in smaller doses.

The only way to cure the reradiation offender is to TEACH HIM TO TUNE.

New York City Police Opens Powerful Broadcasting Station for Public Safety



Two views of the new powerful broadcasting station, WLAW, are shown above. In one, Operator Charles E. Francis is shown receiving radio messages from the police boats Manhattan and Macon. In the other Operator Francis is seen before the microphone of the transmitter broadcasting an interdepartment message. The third picture is a view of the old radio telegraph station, which has served the police department since 1916 but which is to be dismantled.

WLAW is the new radio broadcasting station at New York city's police headquarters. This powerful station is equal to any of the largest and most elaborate broadcasting stations in the country. It makes a long step ahead in police work, for the broadcasting of descriptions of criminals and missing persons, literally will put millions of Americans on the lookout for the "wanted." In cases where large fires or other fatal disasters occur, the names of all casualties will be broadcast so that the police no longer will be flooded by telephone calls from anxious friends and relatives of those involved.

When not in public safety use, the apparatus will be used to broadcast concerts by the police department band and for lectures and other programs.

The city of Chicago also owns a broadcasting station. However, the keys have been turned on the studio even since the change in administrations. It was not used by the police when in service.

Doing the Job Well Has Its Rewards

Gary, Ind., Jan. 25, 1924.

Gentlemen:

The Post is to be congratulated on its enterprise in putting out an excellent Radio Supplement.

I like the manner in which questions are answered. I can see that they are given careful consideration and the answers are complete and understandable. Most papers make you wait several weeks for a reply, and even then you get only a few, brief, unenlightening lines. This applies to magazines also, some of which make a charge for their so-called "service."

Your supplement is the best and livest in the field. All fans in and near Chicago await with eagerness its weekly coming.

Very truly,

(Signed) WM. F. OTTO.

Soot-Covered Aerials Cause Weak Signals

Aerials, particularly outside ones, should be wiped off with a cloth soaked with denatured alcohol occasionally. Coal smoke contains minute particles of carbon. Carbon is an excellent conductor for radio currents. If a wire becomes coated with a film of soot which is mixed with the moisture of the atmosphere it forms an easy path for leakage. This is the reason why signal strength and distance reception drops gradually or suddenly in your receiver. When cleaning off the wire also give the insulators the same treatment as they are the connecting link to the ground.

Poland Link of Radio to U. S. Longest

A new record for long-distance commercial radio communication was set with the opening of a circuit between Rocky Point, Long Island, and Warsaw, Poland. The space over which the signals must travel is more than one-sixth the distance around the earth.

This circuit, which is a part of the Radio Corporation of America system, was opened formally when officials of the Polish government and the Radio corporation exchanged greetings by radio. It marked the first time in history when the United States and Poland were brought into direct communication, without the messages being relayed over land wires thru other countries.

The cost of the sending station at Warsaw and receiving station on Long Island was approximately $2,000,000, and the work of building them began in August, 1921.

The transmitting aerial at the Polish station is similar in design to those employed at Radio central, the Radio corporation station at Rocky Point, L. I. There are ten steel towers erected on a large tract of land on the outskirts of Warsaw, and these support aerial wires a mile in length. The receiving apparatus consists of a double receiving circuit used in connection with the recently developed wave antenna, which is nine miles long.

Forty engineers and operators are employed at the Warsaw terminal.

The establishment of the new circuit gives Poland political advantages not enjoyed by countries which must relay their messages by land wires under the control of neighboring countries.

Heard 5,800 Miles on Crystal Set in 1910

A comparison is often made between the present-day marine radio working with that of a few years ago before the vacuum tubes came into use, says the Wireless Age. The radiophan of today imagines that long-distance receiving was unheard of and that broadcasting is not more than three years old.

C. D. Guthrie, now radio supervisor of the New York district office of the shipping board, used to listen to music being broadcast from a naval ship during the Jamestown exposition in 1907. The writer heard an opera broadcast in 1910. Ships running to South America used to maintain direct communication with New York up to two and three thousand miles around 1909. San Francisco, with a five-kilowatt transmitter and crystal detector, exchanged weather reports and names with Japan, a distance of 5,800 miles, in 1910.

Charles A. Hahne, now traffic manager of a radio company, was instrumental in saving the life of William Jennings Bryan and other passengers on a ship over two thousand miles away from New York, where he was a coast station operator, in 1911.

Three Texas Cities Equip Ambulances with Radio

Three Texas cities are equipping municipal ambulances with a radio equipment. Houston, Dallas and Fort Worth hope within a short time to have municipal broadcasting stations at police headquarters and ambulances while responding to one emergency call may pick up other calls from headquarters and go direct to the scene of the accidents. It is believed that the new method will prove a great time-saving device.

France Lets Down Bars

In France, a new law has been recently passed whereby no license will be needed for wireless receiving sets. French subjects will be able to use sets by filling up a form to be procurable at any postoffice. It is anticipated that, in consequence, there will be an enormous increase in the number of listeners.

Here Is the First Radio Church of the World with Congregation of 100,000

THE station illustrated and described this week is one of those that are most frequently heard by Chicagoradiophans—WOAW, the Woodmen of the World station located at Omaha, Neb. Not only is this station a powerful one, but it is a unique one, as it operates a church of its own.—The Editor.

PREACHING to a congregation of 100,000 every Sunday is the feat accomplished by Rev. R. R. Brown, pastor of the Radio Church of the World. It is said to be the largest congregation a minister of the gospel ever talked to. Also this church is the first of its kind.

Rev. Brown preaches from station WOAW, which is the radio broadcasting station of the Woodmen of the World, located at Omaha, Neb. The congregation, while invisible to the pastor, is a real one, for each member has a signed certificate of membership which has been issued him after investigation into his character.

There are many broadcasting stations broadcasting sermons and religious services, but none that can lay claim to conducting a church organized and maintained especially for that station and its listeners-in.

Faced Two Problems.

W. A. Frazier, sovereign of the Woodmen of the World, and at the head also of station WOAW, is responsible for this unusual church. When he organized it he faced some problems that required delicacy, diplomacy and considerable practicability in the handling.

First of all he had to organize a church that would not compete with existing churches, but support and supplement them. Second, in broadcasting religion to the world, he had to make it acceptable to the world.

This is the way Mr. Fraser solved the problem: He invited all the ministers of Omaha of every denomination and creed to attend a conference. The Protestant, Catholic and Jewish churches were represented. Ministers from the churches within a radius of 125 miles also were invited. Without a single exception, every minister accepted the invitation and gave full support to the new church. That solved problem No. 1.

Then Mr. Fraser tackled the second problem and started out to make the Radio Church of the World acceptable to the world. He did this by broadcasting an interdenominational service every Sunday morning, in addition to the services conducted Sunday evenings.

Sane Psychology Involved.

There was a second reason for the Sunday morning services. It was a psychological reason. Mr. Fraser held that religion makes its strongest appeal in the morning. He attributes this to the fact that one's senses have been refreshed after a night's rest and one is vitally awake to the world around and about him. He also held that people are more susceptible to deeper and more fundamental subjects of thought.

Mr. Fraser says that the experience of the Radio Church of the World since has proven his position is correct. Notwithstanding that the evening services are conducted by the leading pastors their listeners invariably react most favorably to programs with short sermons and varied musical programs, while in the morning services longer and more sustained sermons receive favorable comment.

WOAW, however, is not just broadcasting church services alone. It is on the air daily for four hours, from 6 p. m. to 8 p. m. and from 9 p. m. to 11 p. m., central standard time, and works on a 526-meter wave length. Wednesday is silent night. The Sunday services are held at 9 to 11 o'clock, both morning and evening.

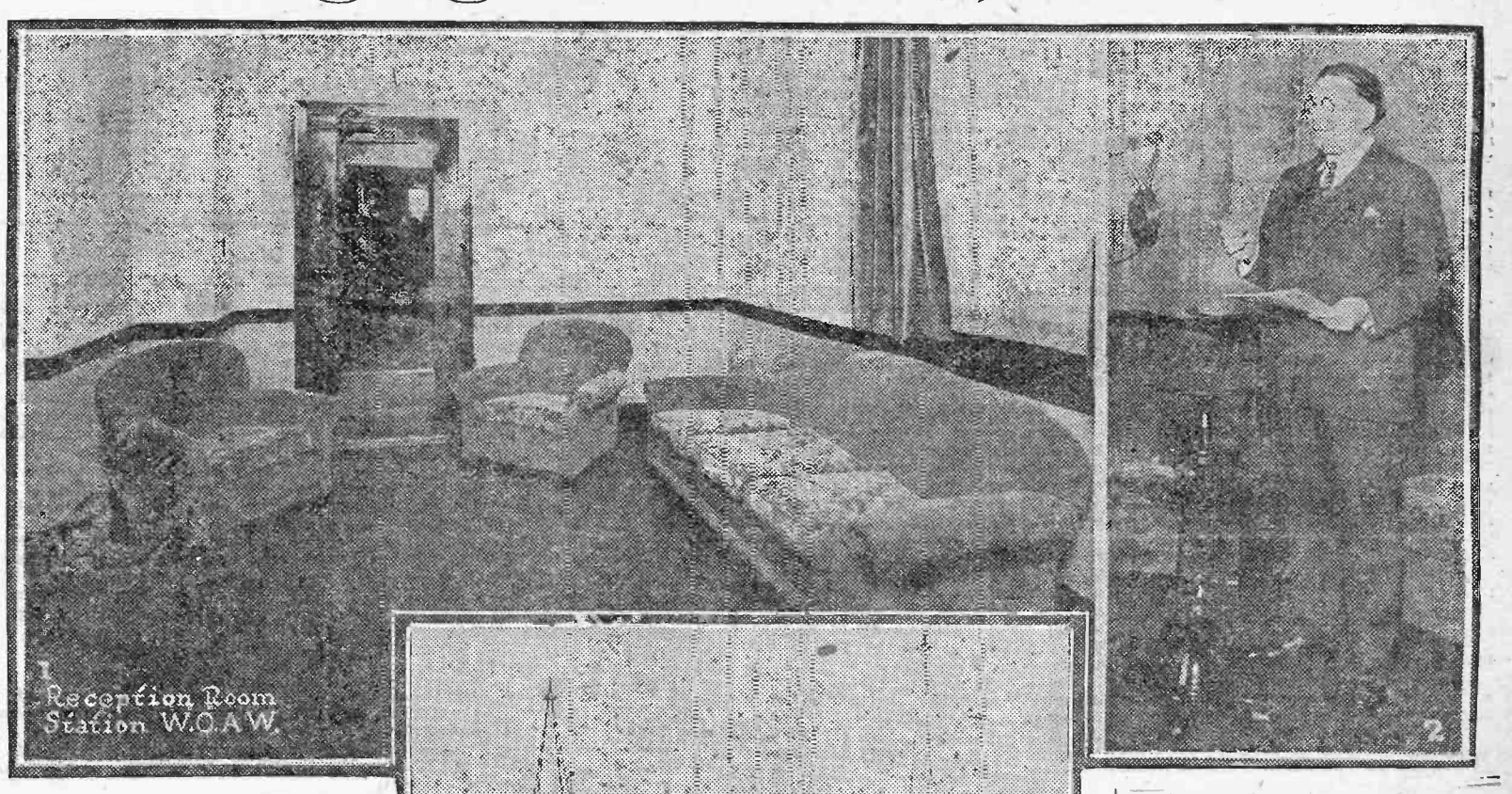


Fig. 1—General reception room at WOAW station, Omaha, Neb. Fig. 2—Sovereign W. A. Fraser, before the microphone delivering an address. Fig. 3—The Woodmen of the World building, showing the antenna towers on the top of the roof and the station, which also is on the top. Fig. 4—Studio showing musical act being broadcast.

West Side to Get Powerful New Station

Chicago is to have another class B radio broadcasting station. It will take the air sometime during February.

The new station is being constructed by the Sears-Roebuck Agricultural foundation and is said to be designed as one of the most powerful ones in the United States. It will use 448 meters.

The station is planned especially to interest farmers, altho its varied program will prove equally of interest to city listeners-in.

"The balanced program for the station will be furnished and supervised by the foundation," explained Samuel R. Guard, director of the foundation. "It will be the only exclusively agricultural broadcasting station in the United States. We will have programs that will challenge the farmers' attention and hold it.

Day and Night Programs.

"This means that we will broadcast facts about the nation's basic industry of real value to the farmer, so far as the educational phase of the program is concerned. We will broadcast both at night and in the daytime, and will give an interpretation of market trends and a current events feature, explaining what is going on all over the agricultural world.

"The biggest men in the agricultural field will be used for many of the educational programs. Everything that is broadcast will be authentic and the result of research and study by the best farm-minded experts in the nation.

"There also will be stories for entertainment of the country kiddies. We will furnish the best orchestral and vocal music to be obtained, and theatrical stars will bring the stage to the farmer's parlor every night."

Overshadows Other Stations.

According to L. F. Dryden, who has charge of construction, the station will be the largest built by the Western Electric company.

By having the station located in the open district and free from absorption by its own and adjoining buildings, Mr. Dresden estimates that it will be possible to put more energy in the air than any other Chicago station. There will be one 130-foot aerial post. The other post will be the fourteenth story tower of the Sears-Roebuck "tower building."

The station will have a rated output of 500 watts, employing two motors. The studio will be on the eleventh floor of the tower, and will be the acme of perfection in equipment and construction, it is asserted. The operating-room will be on the fourteenth floor of the tower.

In addition to the main studio, it is intended to have a downtown branch in the loop district, with special wires thru the city to points of vantage for the entertainment features of the program, which will include the best musical and theatrical talent.

The schedules are booked far in advance, often three months ahead, and the programs are sufficiently varied to prevent monotony. Orchestras, piano selections, vocal solos, choruses, lectures and public addresses make up the menu, which compares favorably with those of any of the other large stations thruout the country.

On Omaha's Highest Building.

The station is located on top of the Woodmen of the World building in Omaha, in especially built quarters.

It is the highest point in the city. Two towers, 125 feet in height, support the antenna system, which is of four wires and of the "T" type.

While WOAW was established as publicity feature for the fraternal society that owns and operates it, very little of the programs ever are used to broadcast lodge information or news directly or indirectly, other than the announcement of the call letters with the explanation that the station is that of the Woodmen of the World.

There probably is not station that comes into Chicago so strong and is heard by so many Chicago radiophans as is WOAW, except, perhaps, KDKA of Pittsburg and KFKX of Hastings, Neb. Even crystal set owners are frequent listeners-in and in almost all of the crystal loggings of long-distance reception which are published in The Post WOAW is listed.

Hear Original Saxophone Played Over Radiophone

When Oscar Saxe, a Belgian, invented his musical instrument which is now called a saxophone, he little thought that ninety years afterward music from it would be played in Cincinnati from the WLW broadcasting station and possibly heard, thru radio, in the town of its creation.

Some years ago Dr. Wagner purchased this instrument from the Norwegian government and had it in his Omaha home for some time. When Tom Brown, creator of the saxophone band, visited the city, the original Saxe instrument, valued at $50,000 was given to him by the doctor. This saxophone is used in every performance given by Tom Brown in the Julian Eltinge-Tom Brown "Black and White Revue of 1924."

When the Tom Brown aggregation played in Cincinnati at the Grand opera-house, they were visitors to the WLW studio, and thru the courtesy of Henry Fillmore, leader of the local Syrian Temple Shrine band, gave a midnight concert. This was the first time that Tom Brown and the original Brown Brothers saxophone sextet ever played for a radio audience. One of the most prized telegrams came from Dr. Wagner, who presented the original saxophone to the leader of the band. He heard Tom Brown play a solo on the instrument.

Broadcasting Stations Take In Everything

Every conceivable form of education and entertainment can be enjoyed from listening-in on a radio receiving set. A review of programs planned by some of the larger broadcasting stations confirms this.

In a recent week these are some of the subjects covered by one broadcasting station out of Chicago:

Concert, special religious services, travel lectures, a talk by local banker, grand opera, a radio play, quartet, duet and solo music, business talks, children's stories, readings, joint recitals; farm, market and stock reports daily; sports events, fashion talks, time signals and weather forecasts daily, humor, current events, book review, tea music at 4:30, dance music.

That is not all. Every now and then a station announces the broadcasting of an entire play by its actors. Everything but the action goes over, and even that is explained sufficiently to make the production a success.

Now efforts are being made further to develop radio, even to broadcasting movies. And a few years more may see the broadcasting of action itself, so that listeners may not only hear, but see an entire production while sitting at their radio sets at home.

Canary Birds Broadcast Songs from Cleveland

CLEVELAND, Jan. 31.—Birds on exhibition at the International Canary show here held a radio concert during their visit. They broadcast their voices from station WTAM, the all-storage-battery station here.

Those who listened in heard the best canary voices in the land. Vancouver Premier, judged the world's champion singer, led the program. Another artist was Lohengrin, 1922 champion which has been made a gift to Mrs. Coolidge.

While some of the birds took readily to the microphone, others had to be coaxed into singing by the soft tones of a violin.

If you want to enjoy radio, learn it. There are text books that explain the fundamentals of radio, which can be had as low as 25 cents.

Denmark Early Listener

Enthusiastic radio amateurs in Denmark always are endeavoring to catch broadcasting from the United States, even tho that country lies in a somewhat more unfavorable position to receive American radio messages than other European countries.

You will find the classified advertisement section interesting. See Page 15.

Secrets of Radio Tuning Simply Told

The chief secret in tuning a radio receiving set lies in getting the set in complete resonance with the incoming signals. When this is done voice and music come in with clarity and full volume.

Radio broadcasting and radio reception may be likened to two tuning forks. Strike one of the forks with a small hammer and a series of vibrations are set up. These are sound waves.

If another tuning fork, which is capable of exactly the same vibration, be placed within the range of the vibrations of the other fork, immediately it will set up a series of similar vibrations. Another fork, which responds to higher or lower vibrations only, placed in the same range of the first, a transmitting fork, will not respond.

If a tuning fork be used which has a sliding device on its prongs which will permit the lengthening or shortening of its wave-length, or vibrations, it is plain to see that it may be so adjusted as to be responsive to the sound-wave vibrations of the first, or transmitting fork.

Also Applies to Radio.

The same principle controls radio broadcasting and reception.

The transmitting or broadcasting station sends forth sound waves of a certain length, measured by meters. It has the power of varying these wavelengths, but in accordance with the ruling of the department of commerce, uses a certain prescribed wavelength, which it consistently observes. For illustration let us say this is 360 meters.

Now, for a receiving set to be responsive to these 360 meter waves it must be capable of being tuned to them.

The usual radio receiver, because of its peculiar construction, can be adjusted to respond to several wavelengths.

This is true of the single-circuit sets as well as the two and three-circuit sets.

The single-circuit set, however, because of its limitations, is not quite so effective in making fine adjustments as the other two. However, it is simpler of operation because of this very lack of finer adjustment, if not so sensitive or selective.

The two-circuit receiver has two circuits to be adjusted instead of one. This permits finer adjustment, but increases the difficulty of adjustment or operation, because both circuits must be placed in complete resonance or "tune" with the broadcasting station whose signal you seek to obtain.

There are three circuits to be brought into resonance—each with the other, and all three with the broadcasting station—where a three-circuit receiver is employed. This further complicates the tuning, as it means a greatly increased nicety of adjustment.

Resonance Controls Reception.

In the case of either of the three receivers, however, the same general or fundamental principle—that of resonance—is involved and this condition is obtained by adjustment, just as it is with the adjustable tuning fork whose sliding device, when moved up or down, changes the period or number of its vibrations so they will be in resonance with the vibrations of the transmitting fork.

On all receiving sets, however simple or complicated, there is some sort of controlling adjustment.

The simple crystal or the one-circuit vacuum tube receiver, employs practically the same principles of control—namely, an inductance coil that can be varied from one wave length to another, and sometimes a variable condenser which can be used to bring about even a finer adjustment of this inductance.

By raising or lowering the wavelength of the inductance, which may be a simple coil tapped or with a slider that moves over its windings, the receiver may be placed in resonance with the incoming signal. This control alone, however, is not sufficient for real close tuning. That is why even the simple crystal sets and one-tube single circuit sets use a variable condenser in series with the inductance coil. This enables the operator to bring about a still closer adjustment.

If the inductance takes the form of a variocoupler or two coils that may be moved to and from each other in different variations, such as two honeycomb coils or two spider-web coils, even finer adjustment is possible.

Now if we add still another circuit, with its controls, it stands to reason that a still finer adjustment may be obtained. However, both circuits must be delicately adjusted to that point when they will be in complete resonance with each other nad also with the broadcasting station whose signal you are seeking to bring in.

The addition of a third circuit makes still finer adjustment, but adds more complications to the operation.

It may be seen, therefore, that the knack of tuning depends upon the ability of the operator to get his set in complete resonance with the broadcasting station and that the more selective the set—that is, the more capable of fine adjustment—the more careful must one be in his tuning.

Reflex Hook-up for Two-Element Tube

DURING the last summer the reflex mode of reception has gained a wide usage among radiophans who want a circuit that will work on dry cell tubes—a circuit for a portable set.

Even now there is a demand for a single-tube or two-tube reflex receiver for use by the beginner who wants to make the tubes perform double or triple duty as a radio-frequency amplifier, an audio-frequency amplifier, and sometimes also as a detector.

Most of the simple reflex circuits, however, have made use of the crystal rather than the vacuum tube as a detector. This, of course, simplifies things enormously: there is one less tube used, there is also less drain on the "A" and "B" batteries and the circuit is also less complicated. And yet there is not any appreciable loss in signal strength because the radio-frequency signal has been amplified to such an extent that the sensitivity of the crystal does not make very much difference.

Adjustment Is Drawback.

There is one serious drawback to the use of a crystal as a detector in one of these single-tube reflex sets nevertheless. This is in the matter of adjustment. The operator has to be forever fooling with the "cats-whisker" and eventually he becomes tired of it and gives up in disgust. This is not so when more than one stage of radio-frequency amplification is used, because the radio-frequency signal then becomes so strong that the crystal adjustment makes relatively little difference.

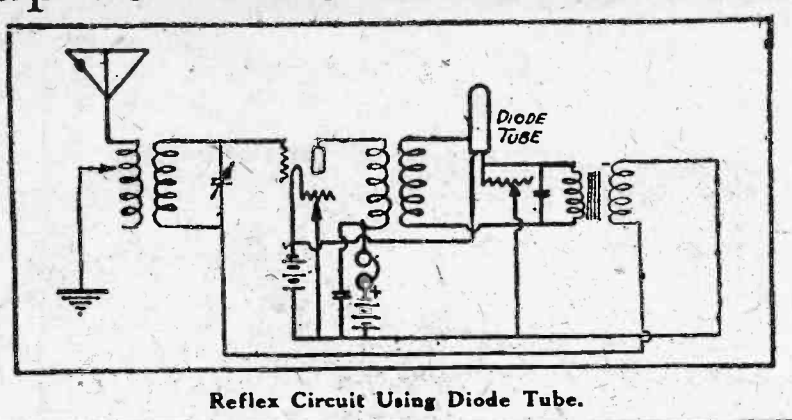
Another drawback with the crystal detector in a simple single-tube crystal reflex receiver is the fact that such a simple set seldom makes use of a potentiometer for controlling regeneration. It is all done with the crystal adjustment.

In other words, they may have the set working nicely, receiving signals from WHN, and wish to change to another wave length say, listen to WJZ on a higher wave length. As soon as they tune to WJZ they find him surrounded by a peculiar whistle and must change the adjustment of the crystal before they have the signals coming in again. A change back to the original wave length again necessitates a change in crystal adjustment to take out the "squeak."

Two-Element Tube.

A Fleming valve, or Diode tube as it is called by one manufacturer, is one of the original vacuum tubes having two elements, a filament and a plate. The tube when used as a detector alone, without any radio-frequency amplification, is a steady, reliable detector.

The tube used in this way has two distinct advantages in the reflex set. It produces as good a signal as the crystal; it needs no adjustment for sensitivity, and it requires no further adjustment for wave length changes. Set the filament rheostat to the most sensitive point and the set is ready at all times.



Reflex Circuit Using Diode Tube.

The circuit diagram for this set is shown in the sketch. The parts necessary to build the set are: A 1, variocoupler; B 1, variable condenser .0005 mfd.; C 1, radio-frequency transformer; D 1, audio-frequency transformer (for first stage); E 1, WD12 vacuum tube; F 1, Diode tube; G 1, fixed condenser .001 mfd.; H 1, 1½-volt dry cell; L 1, small "A" battery, 45 volts; J 2, rheostats, 6 ohms; K 1, regular vacuum tube socket; L 1, Diode tube socket; M 1, pair phones; N, panel; O, cabinet; P, connecting wire; Q, binding posts; R, solder.

How to Mount Parts.

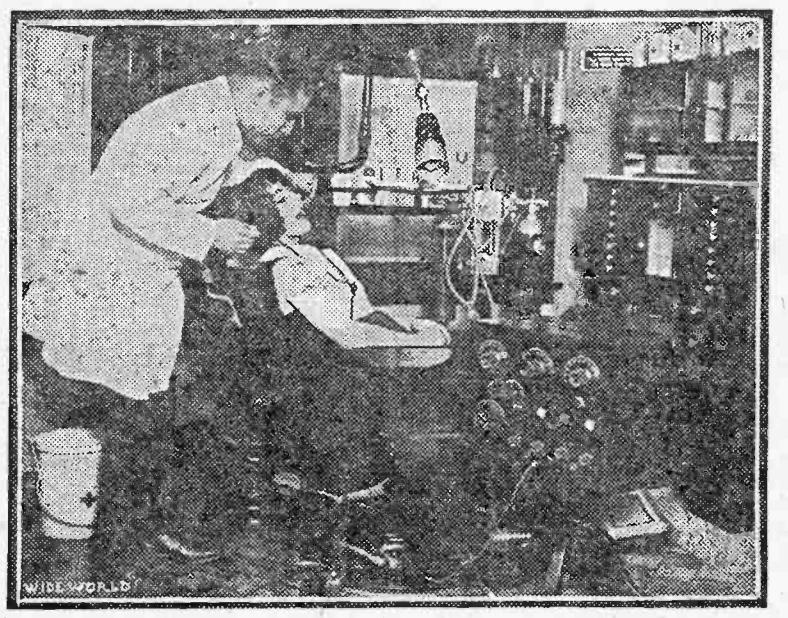
In building the set the best procedure would be to mount the variocoupler on the left end of the panel (looking from the front) with the variable condenser beside it. The two rheostats should be mounted next, beside the condenser, with the WD-12 and the Diode tube directly in back of them, respectively. Then mount the two transformers on the base in such a manner that the connections will be as short as possible.

In wiring up the set follow the diagram exactly, connecting the two fixed condensers, one across the primary of the audio-frequency transformer and the other across the phones and the "B" battery. Keep all the wires as short as you are able to and keep the grid connections isolated from the other parts of the wiring as much as possible.

If you already have a one, two of three-tube reflex set with a crystal detector you may use one of these tubes, obtaining an extra rheostat, a dry cell of 1½ volts and connect it directly to your present crystal detector stand as indicated in Fig. 2. This will enable you to compare the two methods of detection for yourself.

Waiting for the Eggs.

In a recent radio contest from WLW, the broadcasting station of the Crosley Radio corporation, a number of hams were given away. Several letters have been received asking when the eggs will be offered in a contest.



Dr. Howard G. Thompson, Chicago dentist, has introduced the idea of soothing the necessary pain that goes with having one's teeth attended to by installing an elaborate radio receiving outfit in his office and allowing his patients to listen in while working on them. The fair patient that Dr. Thompson is working on is Miss Elsie Bowman.

Family Hotel Has Radio in Each Suite

Newark, N. J., has been claiming the distinction of having the first radio-equipped apartment-house. A radio receiving set is operated in the pent house on the roof, and connected to the address system, which has outlets in every apartment.

The building thus fitted is the Ritz apartment, 299 Clinton avenue, and in any of the seventy-two suites the radio programs can be enjoyed by simply slipping in a plug to connect a headset or loud speaker.

F. B. Kopff, the superintendent of the building, says the popularity of this innovation in apartment-house service is evidenced by the fact that but comparatively little elevator service is required in the evening. The greater number of the Ritz tenants prefer to stay home and listen-in.

Prepares for Emergency.

The operator in the radio-room on the Ritz roof must needs combine diplomacy with ability when he selects and picks up from the air a program that will suit the preferences of all the people in the seventy-two apartments. But thus far he has been so successful in his selection that even a loud speaker could not make the complaints audible, for there have been none. However, should such a contingency ever occur, it will be taken care of by installing an additional radio receiving set, permitting simultaneous reception of two programs.

The equipment now used consists of a radio receiving set and a high-power amplifier. There are four vacuum tubes in the receiver, affording two stages of radio-frequency, detector and a single stage of audio-frequency amplification. The complete set can be operated on dry batteries.

Because of the set's sensitiveness and selectivity every city in the Union which has a 500-watt broadcasting station has been heard by the families living in the Ritz apartments.

By means of a specially designed input coil, the radio receiver is connected to a Western Electric amplifier, in which power tubes provides three stages of audio-frequency amplification, the last stage being push and pull.

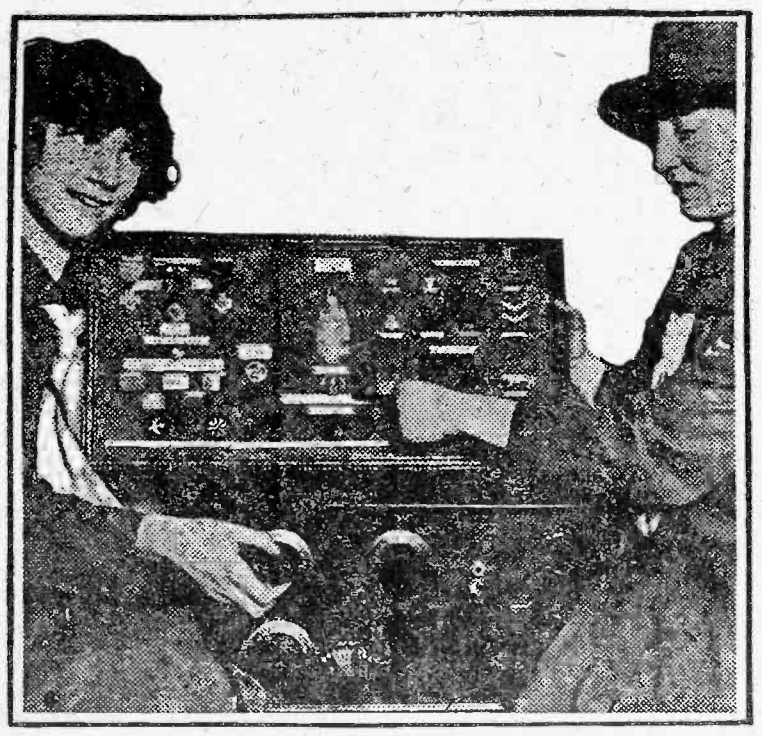
Each Tenant Has Headset.

Radio signals from the receiver are amplified and thence wired to all apartments, each of which is equipped with a headset of high impedance type and with a special receptacle, so arranged that no matter whether a few or all seventy-two headsets be used, the quality and volume will be in no-wise impaired.

The possibility that apartment-houses which provide radio service may become as tumultuous as the Tower of Babel thus is easily averted. By using headsets there can be no bedlam, and each lessee is given clear reception of broadcast numbers.

Superintendent Kopff believes in the practical application of the old adage: "All work and no play makes Jack a dull boy." He finds that the workers in the big boiler-room of the Ritz perform their tasks with much more zest after intermissions or "recesses for radio." Accordingly, at intervals the workers in the cellar are given the opportunity to listen to what the chap on the roof picks up from the ether. And usually the effect is enlivening.

Girl Scouts Hold Record Radio Club Meeting



Two Girl Scouts "attending" a radio meeting and hearing a lecture on merit badges.

PITTSBURG, Pa., Jan. 31.—Honors for the greatest regular attendance at weekly club meetings, of all organizations in the world, safely may be awarded to a new group of Girl Scouts.

They meet—5,000 of them—by radio.

It is a new idea, originated by Laura P. Holland, scout director here, who began giving out her instructions for such a "troop" thru broadcasting station KDKA at East Pittsburg, near here.

Today the largest single troop of Girl Scouts is to be found, not in the largest city, but scattered thruout the country, wherever the ethereal waves of KDKA strike. It consists especially of girls tucked away in the isolated regions of the country, where there are never enough within hiking distance to form a troop.

Now these girls assemble every Monday evening at their radio sets and begin their meetings by listening-in on the customary signals, the allegiance to the flag and the other routine of troop meetings. Instead of personal instructions from a local scout leader, these girls listen in on the instructions broadcast from KDKA.

Constructional Details of Miner's Superdyne, with Notes on Coils and Tuning

PERHAPS no hook-up has been published in The Post Radio Magazine that has created as much interest among the more advanced radiophans and home builders as has Miner's Superdyne. The first announcement of this receiver made in the central west was published in these columns Nov. 15. In the Dec. 27 issue was printed the first details of the circuit with notes on coils and construction. Today The Post, thru the courtesy of the C. D. Tuska company, is giving additional construction details and some notes on tuning.—The Editor.

By BOYD PHELPS.
(Research Engineer, C. D. Tuska Co.)

SINCE the appearance of the first article on the Superdyne receiver and subsequent articles in many newspapers, many people have written us requesting further details as to the building of this set for personal use.

The answering of these inquiries by personal letters indeed has become a burden so this article has been written to fill this need, being based partly on a random selection of one day's mail containing 216 inquiries which were tabulated, and on our knowledge of the probable stumbling blocks the constructor will encounter.

The panel of the Superdyne is of formica and is 6x21x3-16 inches Looking at the front of the panel (see illustrations) the center of the first variable condenser is 2⅝ inches from the left hand edge of the panel. The center of the variocoupler is 6½ inches from this edge as is also the wave change switch shown below and coupling dial of the variocoupler. The right hand variable condenser is 10½ inches from the left edge of the panel.

How Condensers Are Mounted.

Both condensers are mounted with shafts 3 inches above the bottom edge of the panel. The center of the wave change switch is one inch up from the bottom and the shaft of the coupler rotor is 4 inches up from the bottom. All dimensions to and between shafts mean from center to center, or the place where the drill point would start. The rheostats are mounted 3 and 6⅝ inches from the right hand edge of the panel, respectively. Their centers are 2¼ inches up from the bottom edge of the panel. A jack ⅞ inch in and 1½ inches up takes the phone plug.

Referring to the view of the interior of the receiver, the antenna and ground binding posts are brought to an insulation strip 1x1¾ inches with two binding posts mounted on top of it. It is secured to the back of the condenser by an angle bracket. The variocoupler will be discussed more in detail later. The plate reactance is mounted to the rear of the condenser approximately in the center of the set.

A cast aluminum framework supports the four tube sockets and amplifying transformers. The row of three sockets are mounted with centers 2 inches behind the panel and 3½ inches is the spacing between their centers. A formica terminal strip 1x5 inches is mounted above the transformers by means of cast aluminum gooseneck brackets. The binding posts from left to right are negative and positive "A" battery, negative "B" battery, detector positive tapoff for 22½ volts, and amplifier "B" battery positive. The radio-frequency amplifying tube socket is the one at the back and the detector tube socket is just ahead of it and the remaining sockets on the right side are in the audio-frequency amplifier circuit.

Data on Construction of Coils.

Secondary, 42 turns No. 22 D. S. C. wire, wound on 4-inch diameter tube, tapped at 20th and 42d turn. Length of winding, 1⅛ inches.

Antenna coil, 4 turns No. 22 D. S. C. wire wound over secondary, turns spaced ⅛ inch.

Tickler, 3⅝-inch ball rotor, 18 turns No. 22 D. S. C. wire on each side, total 36 turns. Center of shaft ⅜ inch above top turn of secondary winding.

Plate reactance, 46 turns No. 22 D. S. C. wire wound on 4-inch diameter tube, tapped at 25th and 46th turn. Length of winding 1¼ inches.

Grid and plate condensers, each 23 plates, Tuska type 271, maximum capacity .00048 microfarads.

Approximate wavelength ranges, 176-257 meters and 310-660 meters.

Suggested dimensions for amateur band secondary 17 turns, plate 18 turns, tickler same as above.

A great amount of experimental work has been done in our laboratory and many experimental models have been tried at the homes of various members of the Tuska company over a period from early March to December. Thousands of small variations were given trials and good working sets were kept as standards until better ones would replace these and they in turn would be superseded.

One of the big problems was eliminating stray magnetic and electrostatic coupling which plays so important a part in regeneration. The theory has been covered in the articles previously referred to. Briefly, it consists of a radio-frequency amplifying tube having both input and output circuits tuned to resonance and a means for controlling and preventing oscillation that would normally result from this arrangement, consisting of a tickler coil feeding back some energy to the input circuit which energy tends to buck or build down oscillation in a manner the reverse from tickler regeneration.

Reverse Feed Back Regeneration.

This action is commonly called negative regeneration or reversed feedback because it is the opposite of ordinary tickler regeneration. But the advantages of a resonant plate circuit are still present and its great amplification is due to this factor largely.

In operation the input and output circuits of the first tube are resonated to the incoming wave and just enough energy fed back into the input circuit by the tickler to hold the tube from breaking into oscillation. When on the critical edge of oscillation an ultra sensitive condition exists that may produce more volume than the amplifiers can handle, so for ordinary reception with an outside aerial it is not advisable to push the circuit to the limit.

Many have asked questions about the coupler. It so happens that the winding on the rotor acts as one plate of a condenser with respect to the stator winding and this company spent considerable time developing the correct winding data and physical arrangement of the coils so that this capacity effect would not be so great as to render the control of oscillation impossible.

It is hard, therefore, to hit the right combination on the first trial. With too few turns on the rotor or too small a rotor coil it will not be possible to hold the circuit from oscillating when the tuning controls are in absolute resonance.

Oscillation Must Be Avoided.

To make the Superdyne a success it must be so constructed that oscillation can be prevented by the tickler coil and the dials turned in any position without oscillation occurring. Now, if the rotor coil has more turns added or is made a large diameter it has the same effect as increasing plates in a condenser or putting the plates closer together, and the capacity between the rotary and stationary windings increases to the point where it is impossible to control oscillation because of the feedback of energy thru this capacity in the coupler according to the principles of regeneration. Somewhere between these two extremes the best size of coils will be found.

As to the tubes recommended—the best combination is to use a Radiotron UV-200 (Cunningham C-300) tube for a detector and Radiotrons UV-201A (Cunningham C-301A) for the radio-frequency amplifier and audio-frequency amplifiers. The WD-12 (C-12) tubes as well as the Radiotron UV-199 (C-299) tubes may be used and have given good results but the power obtained from them is not ordinarily satisfactory if it is desired to operate a loud speaker. In other words, they are a low power filament tube and give low power signals in return, which is perhaps not an unfair situation. For reception with headphones only, these tubes may well be used. If dry cell tubes are to be used it is much better to use the correct socket in building the set than to use an adapter with standard sockets.

Notes on Use of Grid Leak.

Some tubes have a tendency to block or choke up when resonance is reached and do not come out of it readily even after resonance is passed. This condition may be removed by tuching the moistened finger tip to the grid terminal on the socket of the detector tube. If it becomes annoying it may be remedied by using a better grid condenser or using a grid leak.

One very important thing is to have no leak connected across the grid insulating condenser. A grid leak, if needed, should be connected from the grid terminal of the detector socket to the positive filament terminal of the socket. The value of this leak generally is around two or three megohms and it is best, especially if a "hard" or amplifying tube is used for detection, to regularly wire a grid leak mounting in the set and substitute various values of leak to get best results. This is ordinarily not needed if a "soft" tube like the UV-200 is used.

Two Audio Stages Unnecessary.

Two audio stages are by no means necessary. If headphones are to be used there is absolutely no need for more than one audio stage. There is an advantage in one stage over no stages in making readable faint signals and in isolating the phones and phone cord from the part of the circuit that would otherwise contain radio-frequency currents, which reduces the effects on tuning caused by the operator moving his hands about the set.

A circuit diagram is shown of the Superdyne complete with two stages of audio, in accordance with many requests. Jacks may be provided to allow the phones to be plugged in the first audio stage if desired and the standard hook-up for this should be used. Push-and-pull audio may be used, but the gain in quality is hardly worth the burning of the extra tubes. In general, if two stages of audio are used with fairly low ratio transformers the results should be very satisfactory.

Separate filament rheostats for each audio stage need not be used and in fact the radio stage and the audio stages may well be controlled by one rheostat. A separate detector rheostat is desirable, however, especially with the "soft" detector tube, as the UV-200. There is no advantage in using separate "A" and "B" batteries. The grid condenser should be well insulated and of about .00025 microfarads with no leak connected across it, otherwise from the detector on thru audio stages the Superdyne is exactly like any other receiver.

Radio-frequency Causes Trouble.

Speaking more in detail of the radio-frequency stage, a great deal depends on its construction whether it really beats a regenerative detector and two stage audio or not. Considerable difficulty seems to center around the tickler coil or reversed feedback coil.

In addition to what has already been said about the theory of it, the best way to tell whether honeycomb coils, spiderwebs, or freak coils will work is to try them. The main thing is to be able to hold the radio-frequency tube from oscillating when both tuned circuits are brought to absolute resonance. With the tickler winding on the usual form of rotor both halves are connected in series so the windings are in the same direction in the halves.

With the rotor coupler in one direction the tube oscillates very strongly and continuously and in the other direction it will hold the tube from oscillation or if only partly coupled in the reversed feedback direction oscillation will only occur for a few degrees when the tuned circuits are resonated. If the dial reads upside down it is generally preferable to reverse it rather than reverse the leads to the rotor or wind it in the opposie direction. So it does not really matter which direction the rotor or stator coils are wound as long as the dial can be shifted after the set is tried out.

Try Reversing Coils.

As the coils are more or less within reacting distances of each other it is well to try reversing the coil in the plate circuit as there is sometimes a difference in signals and ability to hold the circuit from oscillation.

If it is desired to experiment with a loop, very good results should be obtained by connecting the loop to the aerial and ground binding posts thru a small fixed condenser. Better results can be obtained, however, by grounding the negative side of the filament and connecting a small aerial strung across the room to the stationary plates of the first variable condenser.

In clearing up a few more questions, the tubes can be arranged in any manner desired in keeping with the policy of making the leads carrying radio-frequency currents short and direct. A vernier condenser is not necessary and is generally a nuisance unless the vernier can be easily disconnected, adds no additional losses, has high ratio of gearing, and is not noisy.

How to Wire Filament Leads.

It has not been possible to reflex the Superdyne.

The wiring of the filament and other parts at more or less ground potential should run near the front of the panel and the rotary plates of the variable condensers should be as near to ground potential as possible to reduce stray capacity from the hands of the operator. All wires from the grid and plate circuit should be far back from the panel and separated from themselves and everything else as far as possible.

A later change in the Superdyne is shown in the illustrations. If condensers of about 25 plates are used and the coils have 30 turns each, a wavelength band of from 220 to 580 meters can be covered without any taps on the coils or the use of a wave change switch. This greatly simplifies the construction and efficiency. The top of the stator winding or end of the coil nearest to the rotor shaft may then be connected to the rotary plates of the variable condenser and to the negative "A" battery lead, thus causing more stable operation and better regenerative control.

Fixed Condensers and Aerials.

Another change that is of value if small aerials are to be used is also shown in the illustrations and consists of several fixed "micadon" condensers connected as shown in the diagram. With a very short indoor aerial, terminal A1 should be used, with a long indoor aerial use A2, with a medium sized outdoor aerial use A3 and with a very long aerial use A4, always putting a good ground connection on G. The use of the wrong post merely unbalances the dial settings whereas they will ordinarily run almost together for any wavelength.

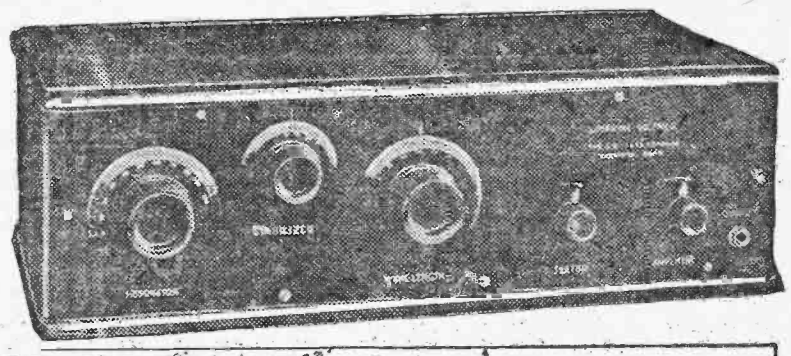
To the beginner knowing little about radio or even to one who has had several sets, the operation of the Superdyne is liable to be a bit puzzling at first. It is not easy to explain in words. With the aerial connected to what is supposed to be the right post and everything connected right, set the resonator dial to the left and the wavelength dial to the right at say 20 on their scales. Advance the stabilizer from the zero or "full reversed" position until a click is heard in the phones.

How to Tune-in Signals.

When the click point is reached it denotes oscillation. Work on the edge of this point coming up with the resonator and wavelength dials until the squeal of a broadcasting station is heard. Get this tuned-in to the loudest possible volume and then reduce the stabilizer one or two degrees at a time and follow with the resonator dial, keeping the squeal at a low tone. Keep on gradually reducing the stabilizer coupling and following with the resonator until the squeal is lost and the speech or music is left.

It is well then to see if the wavelength dial needs slight readjusting, which may make a final adjustment of the other two controls necessary to refine the music.

Reception should never be attempted with the squeal present and the remedy is to reduce the stabilizer and slightly retune the control on the left. This at best can only serve as a guide to follow, as experience is the best teacher.



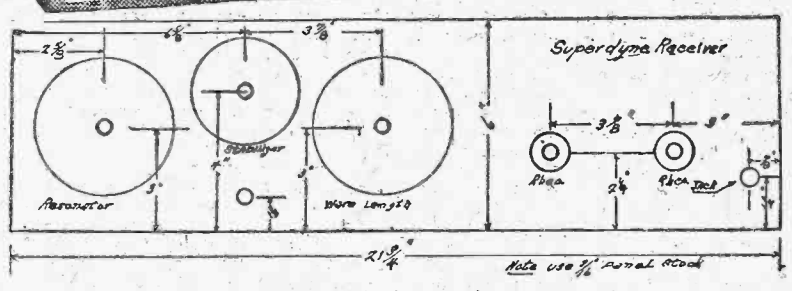


Fig. 1—Front view of panel showing control dials. The first dial at the left is the resonator. The stabilizer is the smaller dial just to the right and above. Below this is the wave change switch. To the right, the larger dial, is the wave length control. The two small knobs are on the rheostats, the detector on the left and the amplifier on the right. Just to the right of these is the phone jack. Fig. 2—The interior of the receiver. Fig. 3—Panel layout. Fig. 4—Superdyne with two stages of audio. Fig. 5—The latest change in the circuit. This simplifies the construction and operation. Note the use of fixed condensers for the different sized aerials.

Shipping Board Seeks Operators for Sea Service

According to recent advices from Washington, D. C., it is understood that approximately 100 first-class radio operators will be needed to fill vacancies on vessels of the United States shipping board during the next few months.

On the 1st of last July the government increased the pay of all its commercial operators approximately 15 per cent. The monthly rates of pay now in effect range from $85 per

At a recent meeting of the British Association for the Advancement of Science John Scott-Taggart suggested a new way to minimize interference. It consists in multiplying at the receiving station the frequency of the incoming signals by a thousand or more before attempting to read them.

For example, two waves of 15,000 and 15,100 meters, respectively, are too close together for distinct reception, but if these frequencies are each multiplied by 1,000 (dividing the wavelengths, of course, in the same ratio), the resulting frequencies of 20,000 and 19,868 kilocycles are sufficiently far apart for distinct reception.

Finds Trouble in Windings of His Variometer

A friend of mine called me in to look over his radio set a few evenings ago, complaining that different adjustments of the tickler coil in his single-circuit regenerative set did not affect the volume of the set in any noticeable degree. I looked over the set and tried reversing the leads to the tickler coil, but this did no good.

I rewound the primary of the coupler, as it was an old one, and the windings on it did not take in the new wave lengths, but still the tickler coil refused to do its duty. I took the rotor out of the coupler entirely and looked it over carefully and found that it had been rewound once before. The rotor was one having twenty-two turns on one side of the shaft and twenty-two on the other. I noticed that one-half of these windings were in one direction and one-half in the other. I rewound the coils, putting the turns on all in the same direction, also in the same direction as the windings on the stator, and placed both in position and the tickler worked perfectly.

I am passing this helpful suggestion on to aid other readers of The Post, and wish to add that mistakes of the nature of the above are much more likely to happen in winding the couplers or variometers that have two halves to both rotor and stator such as the molded type. If your set that you have has a rewound coupler in it and is not giving satisfaction, make sure that the windings and the halves of these windings are in the same direction.

I find The Post Radio Magazine section very helpful and instructive.—CARL R. SMITH, 6242 Rhodes Avenue, Chicago.

Be Sure to Use Wire Specified by Designer

In making inductance coils always use exactly the size and kind of wire specified by the designer. Failure to do so may be the cause of a puzzling failure in a circuit which you have hooked up correctly in all other details.

If you use a wire thicker than called for the winding will be longer and the coupling will not be so close. If you use DCC instead of SCC or DSC instead of SSC, this means fewer turns and also affects the coupling.

It is best to follow the designer's specifications, as he has tested the size and kind of wire and specifies that which is best adapted to the circuit he has described.

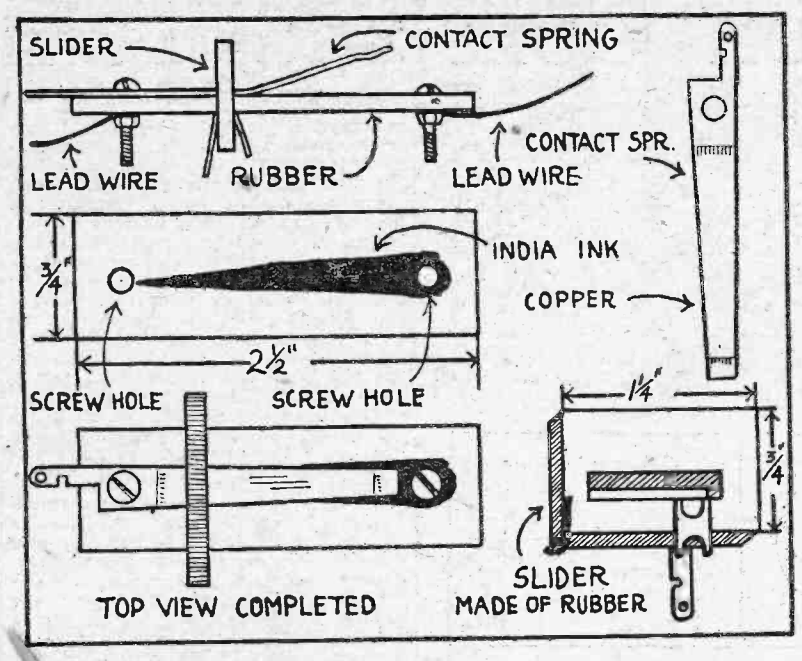
Adds Life to Dry Cell

I submit the following "radio kink": Very often, in using dry cell "A" batteries, the zinc case will be eaten thru in one or two small spots. This will allow evaporation to take place and kill the cell. A good idea is to give the zinc case a coating of warm parafin when first purchased. This will enable the cell to "linger on awhile longer."

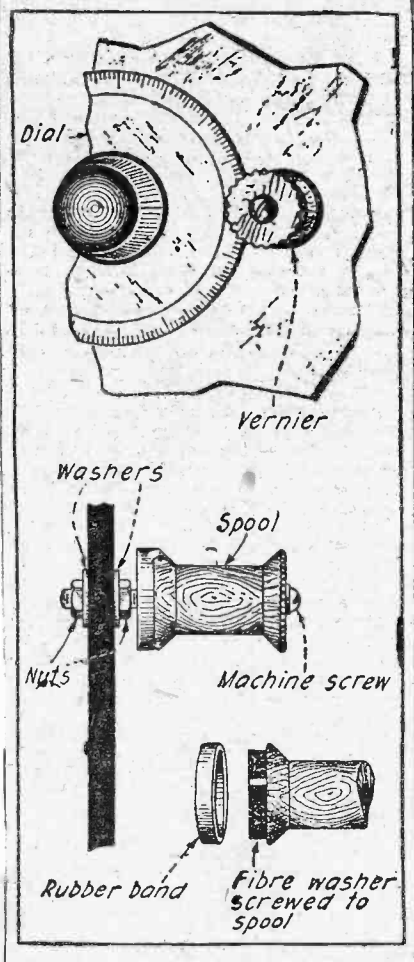
A. J. GMEINER,
3224 Walnut Street, Chicago.

You will find the classified advertisement section interesting. See Page 15.

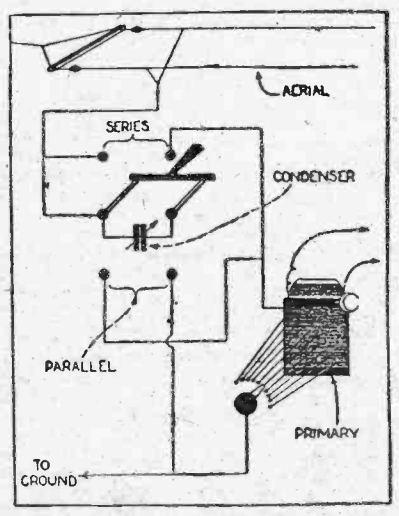
THE HOME WORKSHOP



Here is a good variable grid leak that can be made at home out of material easily picked up out of the junk box. It is far better than most of the ready-mades and costs nothing more than a few minutes of effort. The accompanying sketch clearly explains construction. The slider referred to in the drawing should be of rubber composition or bakelite instead of just "rubber" as indicated. The base also is of scrap bakelite.—GEORGE H. TAYLOR, 2855 South Harding street, Chicago.



A simple yet efficient vernier for use on any instrument may be made as illustrated above. A fiber washer is attached to an ordinary spool and a rubber band slipped over the edge of the washer. A machine screw supplies the mounting. The vernier should not be drawn up so tight that the edge of the spool cannot be slipped away from the edge of the dial when ccarse tuning it desired.—L. B. ROBBINS, in Practical Electrics.



A double-pole double-throw switch makes a very effective series-parallel connection on any receiving tuner. The hook-up is given above. It is advisable to use a small switch which can be mounted on the front of a panel.—S. H. CORNELL, in Practical Electrics.

Aids Ear Phones

Rubber ear cushions that fit over phone caps on radio receivers are becoming nearly a necessity. With them much more comfort is obtained and all exterior noises eliminated, thereby allowing the listener to tune in stations that would be indistinguishable otherwise.

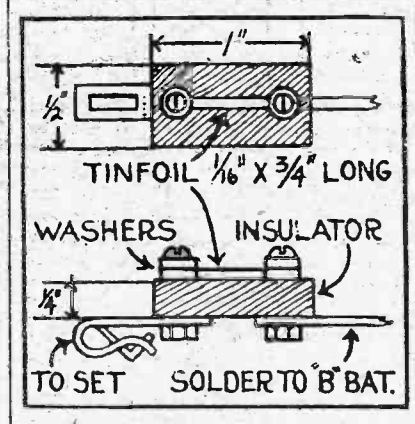
Ground Your Transformers

The metal shell of audio-frequency transformers always should be grounded. This eliminates a great deal of interference, and thereby increases efficiency.

Saves "B" Battery

Here is a suggestion that will save the "B" battery bank when experimenting with new hook-ups.

Clamp a piece of tinfoil across a small strip of bakelite or other insulating material as shown in accompanying sketch. Connect it in series in the "B" negative lead from the bottom to the set. The "B" circuit is an open circuit and the tinfoil will pass any amount of plate voltage. But, as the tinfoil will melt when shorted across one dry cell it is a positive guard against a burned-out "B" battery.—JOHN PRUSA, 4207 West Cullerton Street, Chicago.



How to Revive an Old Dry Cell When Worn Out

When the zinc of a dry cell is eaten out, the cell usually is thrown away and a new one procured. This is not necessary. A well-made dry cell of standard make can be made to give twice as much service as it already has given before new ones are required.

When a dry cell goes dead, and the zinc is still good, additional life may be given by punching a few holes in the zinc and placing the battery in a concentrated solution of ammonium chloride. But when the zinc is eaten up, no life can be added by this method. It becomes necessary to make a straight Leclanche cell.

This is accomplished by removing all traces of zinc from the outer wrapper of the dry cell. When the zinc is removed, a cardboard layer will usually be found beneath it. Carefully remove it, until the black inner layer of carbon and manganese dioxide is exposed. If it is a cheap make, the paper will be lacking and a cloth wrapper will be found in its place. Do not remove this. The better grades of dry cells will fill the carbon center rod to within one-fourth of an inch of the top. Cover the entire carbon and manganese mixture with a piece of cloth and wrap a strong string around it very tightly.

Then take a piece of zinc, which can be obtained in sheets of almost any thickness, and bore a hole near the top after it has been cut into strips just long enough to encircle the carbon cylinder. Into this hole a bolt is passed and a wire is bent around it, then a nut is attached and the bolt and nut tightened. This is the negative pole of the battery.

Pour into an open quart jar a concentrated solution of ammonium chloride, and into this solution place the carbon element. Then the negative element, the zinc ring, is introduced, and the cell is finished.

This cell will give, on the average, 1.1 volts. When one volt is to be drawn for a protracted period, as in radio tubes, then a number of these cells should be placed in parallel by connecting zinc to zinc and carbon to carbon.

As to Soldering

When soldering, paste and plain solder or rosin core solder should be used. Acid should always be avoided, as it causes corrosion, which sometimes interferes with reception.

Homemade Engraving

I am a radiophan and also a good reader of your radio magazine. I'm submitting a very simple dial indicator for home-made sets. The tools consist of some white ink, a pen and holder and a sharp knife.

Take the sharp knife and make a small triangle with the point down, at the entry above each dial. Then take the blade of the knife and scrape off the smooth part of the panel. Take a little white ink on the pen and fill in until the little triangle is covered white after this dries, repeat. White shellack will make it more permanent.

If you hear a station at a certain degree, then you can tune in some other station, and if you want to, you can tune the dial back to the first place and hear the original station, as the indicator will give the proper location.

WILLIAM S. FRIEDMAN,
7024 Yale Avenue, Chicago.

You will find the classified advertisement section interesting. See Page 15.

Compass Tells Polarity of Radio Head Sets

A French amateur, J. Libre of Roubaix, vice president of the French Northern Radio club, reports a method of determining the polarity of a phone, now used by all the members of the club.

The method is as follows: The phone is placed on a table with cap and diaphragm removed, and a compass is brought sufficiently close to it to produce a deviation in the needle. When the needle has taken its new position in response to the attraction of the magnet in the phone, a current is passed thru the windings of the phone. A new movement will be noted in the needle of the compass.

If the needle swings still further in the same direction in which it originally was deflected, it is an indication that the current passing thru the coils of the phone serves to increase the magnetic field. This is the proper connection.

If, one the other hand, passing the current thru the phone causes the needle to swing back in the opposite direction, the current is flowing thru the coils in the wrong way, neutralizing the effect of the permanent magnets. This is wrong, and tends to weaken the phone.

Long 45" Tuner Proves Big Aid to Any Set

Continued from Page 3.

much as distant stations could be tuned out while local stations were broadcasting.

It operated on a ground alone with fair range and volume. It also worked better than the average single circuit on an inside aerial and on a loop. However, like all circuits, it works best on an outside aerial.

To construct "The Long 45" circuit shown in the illustrations it will be necessary for you to have the following parts:

One "Long 45" tunner.
One .00025 grid condenser, fixed.
One high-grade variable grid leak.
One vacuum tube socket.
One 201-A vacuum tube.
One rheostat.
One cut capacity switch.
One 23-plate vernier variable condenser.
One pair of head phones.
One 45-volt "B" battery.
One 7X10 panel and cabinet.
One DL 35 or DL 50 honeycomb coil and mounting.
Necessary antenna equipment.

In wiring the set the low frequency wires need not be kept very short, but the high frequency wires should be made as short as possible, and it would be better to sacrifice the general appearance of the set than to have a long grid lead. The interior view of the receiver used in these experiments gives an idea of the location of the various parts on the panel. With "The Long 45" tuner the wiring will be found quite simple, as there scarcely are half a dozen connecting wires. The grid leak should be placed on the outside of the panel, where it can be reached conveniently.

After the set is hooked up and you find that it does not regenerate, transpose the two tickler leads.

How to Tune the Set.

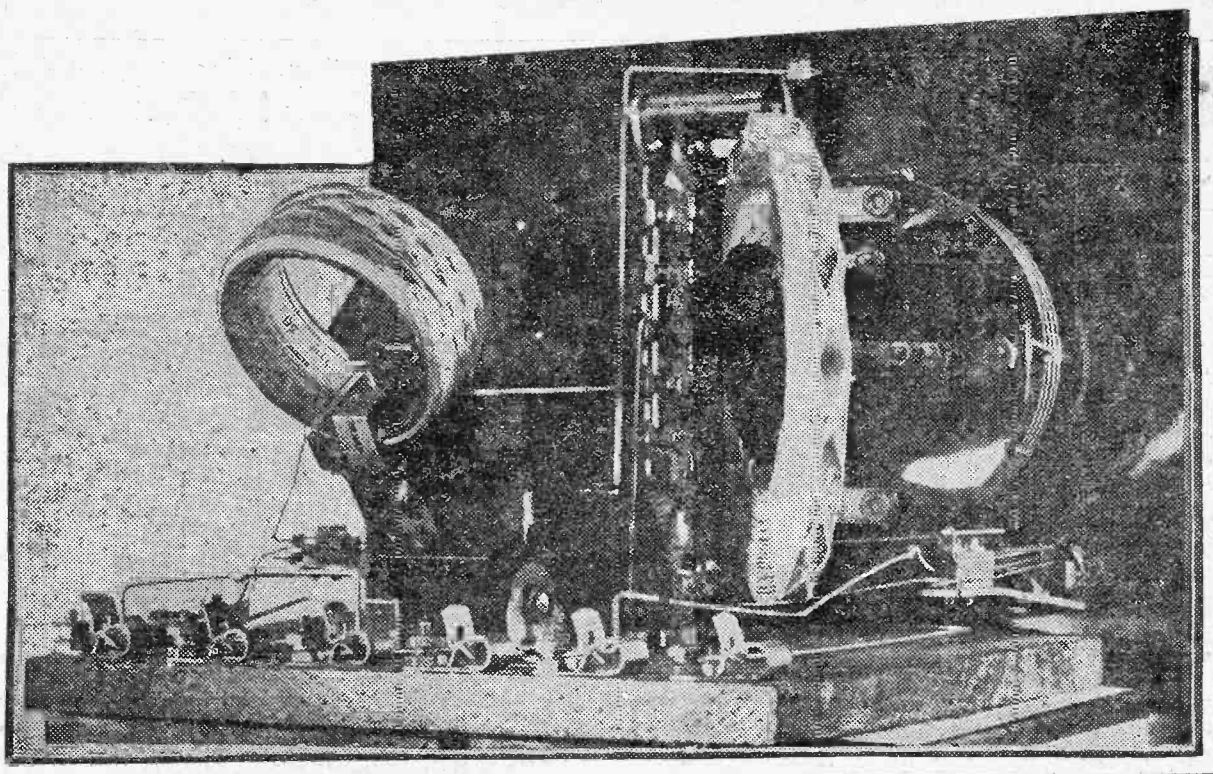
In tuning you will find that the grid leak is very critical. In fact, volume will be controlled largely with it and you also will discover that quite often you can tune out an interfering station completely and at all times partly so by a slight adjustment of the leak.

To operate the set the seven-plate condenser on the tuner is used to tune the circuit to the various wavelengths. Regeneration is controlled by the rotary or tickler coil, together with the twenty-three plate condenser and the variable grid leak. There is no need to give any consideration to the filament control, other than to see that the tube is lighted properly, as the circuit is not critical at this point.

This receiver operates a loud speaker, without amplification, on local stations and those outside stations within the range of a crystal set. However, if loud speaker is to be used on distant stations, a two-stage audio-amplifier will be necessary.

If any of the other standard regenerative circuits are used with the tuner, bear in mind that the rotary coil is used either as a tickler or as both a tickler and primary.

In an early issue The Post will illustrate another circuit using "The Long 45" tuner.



French Take Kindly to American-Made Radio

Radio fans in the Lille district of France are manifesting interest in American-made equipment, Consul Squire reported recently, pointing out that as permits for receiving sets may now be obtained from the government, there is no reason why the use of radio should not increase steadily. Broadcasting from Paris, London, Cardiff and Glasgow can be heard in Lille regularly, he adds, the Paris concerts coming in on 1,000 to 1,500 meters and the British stations on 200 meters.

Highest Receiver in New York.

The tallest mountain in New York state is Mount Marcy, 5,344 feet above the sea. A receiving set was carried to the top recently by Hall E. Shepherd and Sherwood Marvin. An antenna wire was stretched between two bowlders and concerts from WGY, WEAF and WMAF were picked up.

Counterpoise Works Fine as a Ground

By WALKER C. IRWIN.

Counterpoise ground, composed of wires insulated from the earth and radiating from the receiving station at a height of about ten feet from the earth, makes a most excellent ground because of its comparatively low resistance. It should be directly under the aerial, if possible, for best results, but not necessarily.

It is not practicable to make an ideal counterpoise in a city like Chicago where available open spaces are few and far between. There is a way, however, that an inside counterpoise may be employed and give exceptional clarity in reception and at the same time afford selectivity of a high order. It also will aid in eliminating the so-called static and other extraneous noises.

One of the members of The Post radio staff, nearly two years ago, at that time was unable to erect an outside aerial. He strung about 100 feet of No. 14 wire around the ceiling of his room, spider-web fashion, using insulators at the four corners, being careful to keep away from the electric light in the center of the room.

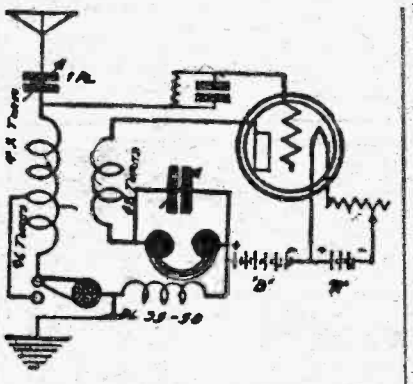
Two Blocks from WDAP.

His station was located within two blocks of WDAP at that time, but with this inside aerial and a highly sensitive three-current regenerative set he was enabled to tune in and out all the Chicago stations and do some very fine distance work.

Later this experimenter was privileged to erect a single-strand aerial 150 feet long, east and west, on the roof of the four-story building. The lead-in was about 40 feet, and from the west.

A steam radiator ground was used at first with fair success, altho there was considerable interference from "static" at times. A Flewelling receiver, with two stages of audio, was being used, it being the original Flewelling circuit. Practically every worthwhile station, from coast to coast, was brought in. A cold water pipe ground improved the range and reception considerably.

It must be admitted that WDAP bothered considerably at times and on some evenings it was difficult to tune this station out. It is probable this was due, largely, to inexperience in tuning, especially of the Flewelling.



Upper picture is photo of "Long 45" hook-up receiver used in experiments. At bottom is schematic diagram of the circuit.

Tunes Out WDAP Easily.

However, one night after trying loop aerials and hastily improvised wave traps of uncertain efficiency, the ground was connected to the counterpoise. WDAP was tuned out easily, and while the range was cut down several hundred miles, all the eastern stations, including Toronto and Montreal, came in, as well as those west as far as Texas. The volume only slightly was less, but the clarity of reception was remarkable.

When the three-circuit regenerative receiver was installed WDAP could be tuned out without the counterpoise, altho it was used frequently, especially during the summer months.

If it is impracticable to erect a counterpoise in the room, one may raise the roof aerial some fifteen or twenty feet above the roof—more if possible—and place the counterpoise underneath, say five to six feet above the roof. The type of counterpoise may be varied. The cage type makes an excellent one, so does the fan shape. Of course, the counterpoise has no connection, either with the earth or the aerial.

Burn at Cherry Red.

Do not attempt to light up WD-11 or WD-12 tubes brighter than a cherry red. It is dangerous.

Spaghetti Tubing.

Spaghetti, or insulation, is not necessary in wiring your receiver, but if you do use it, employ only the best grade—rubber preferably.

Doctor Makes Patient Build a Radio as Cure

The use of radio receiving sets in hospitals has become fairly common, but it remained for a Massachusetts physician to prescribe a set for one of the patients he was treating in her own home.

For some time he had been the family physician of two middle-aged women living on a rather lonely farm. One of the sisters had been under his care constantly for an obscure condition which seemed to be growing chronic. A consultation of physicians revealed no organic trouble, and the conclusion was reached that the patient's ailment was more mental than physical.

It happened that the physician was a radiophan, and the thought of a radio set for the patient suggested itself. He prescribed one.

Prescribes Home-Built Set.

The price of a complete set, however, seemed prohibitive, so he advised the sisters to build one. They wouldn't have been more surprised if he had asked them to build an aeroplane. But the physician loaned them his own set until he could go to town and buy the parts for one for them. He chose a four-tube reflex because of its simplicity of construction and ease of operation. He found that one manufacturer recently had issued a booklet with diagrams showing the apparatus connected into sets of various kinds so simply that it was only a question of placing the parts on a board and connecting them, piece by piece, as shown in the dummy.

As they say in novels, the idea "intrigued" the sisters, and, with a little help from the physician, they built the set, got excellent results right off the bat, and they rapidly are becoming ardent radiophans. Meanwhile the sick sister, forgetting herself and her troubles in her absorption in the set, ceased to be sick and is now well on the way to a perfectly normal condition.

Electrons Are Solar Systems.

Prof. Niels Bohr of the University of Copenhagen has discovered by studying electro-magnetic waves sent out from hot atoms in the forms of rays of light, that the atoms of matter really are tiny solar systems, each with suns and planets of its own.

Judge Holds Radio Set Is Not Nuisance

Judge Fleischmann of Ridgefield Park, N. J., decided recently that the radio loud speaker is not a nuisance.

Years ago the courts ruled that the phonograph wasn't either, so it follows logically, then, that radio has now a clear course before it, at least in Judge Fleischmann's jurisdiction.

The particular radio set in this instance is the property of Audley Walsh of 17 Overpeck avenue, Ridgefield Park. Walsh's radio outfit was equipped with a loud speaker and it was his wont to entertain the neighborhood. As many as a hundred persons were accustomed to stand and sit in the vacant lot across from the Walsh home and listen to the music and speeches. An even larger crowd listened to the Marine band concerts and the returns from the Polo grounds the night that Dempsey put Firpo to sleep.

Everybody seemed pleased except Louis Vander Pyl, 22 Overpeck avenue, who said that the radio set and loud speaker was a nuisance. Vander Pyl retaliated with a phonograph which he set out on his front porch and played at nights. One night it blared for eight hours, emitting the sextet from "Lucia" 178 times, until the neighborhood entertained thoughts of murder.

But even an entire night of "Lucia" did not discourage Walsh, who kept on entertaining the crowd with his loud speaking radio set until Vander Pyl appealed, without success, to the board of health, and later to Judge Fleischmann, whom he asked to silence the Walsh radio as a nuisance.

Donald Waesche, a lawyer, was retained by Walsh. Mr. Vander Pyl, altho not a barrister, appeared as counsel for himself. Mr. Waesche's victory was complete. The court ruled that no nuisance was discernible and that the case was closed.

Church Bell Tolls Time Signals Every Noon Hour

Many stages of amplification and three different wave lengths are used to get Arlington time signals to the farmers in the vicinity of Medusa, Albany county, New York.

C. J. Waldron, a Medusa resident, lives next door to the church. He has added a few feet to the length of the bell rope and every noon, after tuning in WGY, the General Electric company station at Schnectady, N. Y., he sits in his rocking chair with phones on head and bell rope in hand, waiting for the long Arlington note which marks 12 o'clock. At the long note he pulls the bell rope, and the bell, which is a big one, broadcasts the time signal miles around.

The signal passes thru three different wave lengths—from Arligton on 2,500 meters, thru WGY on 380 meters and the bell tone which has not been measured.

Long hours of convalescence in a strange land were made happy for Mrs. Louis Posth, 452 St. James place, by concerts and talks in her native tongue, caught by a five-tube neutrodyne receiving set.

Mrs. Posth, who hardly understands a word of English, gave birth to a daughter at the Northern hospital and free dispensary. Her husband, a radio engineer at 504 South State street, realizing the loneliness of her position where no one spoke her native language, built an elaborate receiving set for her hospital-room.

The mother listened to talks and music from PWX (Havana, Cuba) rendered in her own Spanish and concerts from New York, Honolulu and Pacific coast stations.

The result was most successful Mrs. Posth's period of recovery was short and happy.

"The effect of the radio has been so wonderful that I am contemplating providing receiving sets for my other patients," declared Dr. Doyle, in charge of the case."

How Your Aerial and Ground Aid Good Reception

A good aerial and a good ground are essential for efficient radio broadcasting reception.

Radio waves are electrically energized. It is a well-known fact that all electrical currents seek the shortest and easiest route to the ground. It is essential, therefore, that you so construct your radio receiving station so it will offer the least resistance to the incoming currents on their way to the earth.

The aerial is a collector of these currents. Your lead-in wire, your receiving set with its coils of wire and the ground wire are the conducting materials which direct those currents to the earth.

The fact your receiver converts these inaudible waves of radio-electrical currents into audible currents so you may hear them as they pass thru your receiver to the earth does not alter the fact that every effort must be made to permit them to continue on their inevitable way uninterrupted.

A poorly insulated aerial will cause leakages to the earth before the currents reach your set. This will either render your reception weak or destroy it altogether.

A lead-in wire that touches the cornice of the building or any wood or metal portion of the house as it travels to the receiver also is deadly to good radio reception.

Insulated wires help but little at this end of the circuit. Radio-frequency currents will travel thru brick or stone walls and a small covering of insulation on a wire is not going to stop them from passing from the lead-in wire that offers itself or other substance that offers itself as a fair conductor to the earth.

Lead-in wires should clear all metal roofs or cornices or other good conductors by at least one foot. Even a wider clearance would be better. It should clear all electric light or telephone wires by three or more feet at the least and not be parallel but cross at right angles. Several inches should separate the lead-in from the sides of the house, being held away by projecting insulators.

Where the lead-in enters the house—either thru walls or window, a glazed porcelain lead-in tube should be used.

Lead-in wires should be kept as short as possible. The quicker you get to your receiver from the tap of the aerial the better it will be.

The ground wire should go as direct to the earth as possible and be thoroly protected by insulation. However, it would be better to add a few feet to the ground wire and get a perfect contact with the earth than make a real short ground wire and have an imperfect contact.

In Chicago, where conditions make it impracticable to have direct connections with the earth, the best ground is the running cold water pipe in the bathroom or kitchen. The water pipe should be sandpapered until bright and clean and a ground clamp applied. This should be soldered to the pipe as well as tightly clamped. The ground wire also should be soldered to the clamp.

Precautions taken in your antenna and ground circuits, such as are advised here, will make your receiving set more efficient than if they were neglected.

Notes on Home Chargers

Tungar battery chargers using a bulb charge with a slow rate of amperage, thereby lengthening the life of your battery. They are also noiseless. Vibration chargers require replacement of contact points and create a great deal of noise, but charge faster. Liquid rectifiers are subject to evaporation and are not as reliable in their action as the tungar or the vibrators.

Buy Good Crystals

When selecting a crystal for your crystal set be sure to get a good one. With a sensitive crystal distances up to 700 miles occasionally are heard.

Storage "B" Batteries Best

Storage "B" batteries are a great economy and also produce more reliable results than dry cells. Altho they are slightly more expensive in first cost, they last indefinitely, being more economical in the long run.

Use 180 Degree Coupler

Whenever a variocoupler is used, one of 180 degrees variation is most defective. The principle is exactly the same as the ninety degrees, but the tuning is half as critical.

Be sure to read the Classified Advertisements on page 15.

HOME RADIO OPERATION

This department is conducted with the idea of assisting owners of radio receiving sets to operate them more efficiently. Believing that most of the complaints made by broadcast listeners against interfering stations are due mainly to lack of knowledge in tuning receivers properly, The Post will present here from time to time constructive articles on the operation of sets.

Knocking the Howls Out of Receivers

THE following article is reprinted from the current issue of Popular Science Monthly and will help the novice locate, understand and remedy half the evils in a receiving set, making it more selective, produce stronger signals and operate over a wider range.—The Editor.

By JACK BINNS,
(Radio Editor Popular Science Monthly.)

CLICKETY-CLACK, Rat-tat-tat-tat, bing, bang, E-e-e-e-yow-e-e, crack! This is not a sample of the new type of jazz orchestra, but merely a weak imitation of what a radio receiver can do when it rears up on its hind legs and "tells the world."

There are two types of troubles that can be experienced with a receiver that is not working properly. The first is the presence of a whole orchestra of noise demons. The second is the total absence of sounds or noises of any kind.

With the possible exception of the demon static, there is no reason why a properly made receiver should not function properly without noise or trouble, giving clear, distortionless signals from stations within its receiving range.

Where Most of Trouble Originates.

What, then, are the exact causes of the varieties of trouble that bring grief to almost every radio fan at some stage of the game? First, let's see if we can't put our fingers on the most common of the trouble-makers, determine their locations, and expose the secrets of their noise-making. Afterward, we'll discuss the means of guarding against them in designing and constructing our receivers.

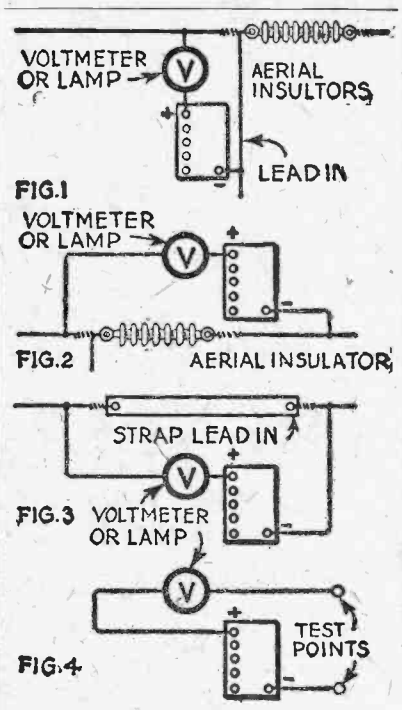


Fig. 1—How to test for open circuit between aerial and lead-in. Fig. 2—Test for short circuit between aerial and aerial support wires. Fig. 3—Test for open circuit in strap lead-in. Fig. 4—Voltmeter and battery test circuit, with testing points.

All trouble usually can be traced to defective parts, poor construction or unskillful operation.

If you get crackling noises, the first thing to do is to determine whether they are caused by static or by the set. This can be done easily by listening in with aerial and ground disconnected. If that eliminates or cuts down the crackling noises, the trouble is due to static. If the noise persists with aerial and ground disconnected, you may absolve the static imp from all blame.

Run-Down Batteries.

Many of the irregular crackling noises in a receiver are due to run-down batteries, poor wiring connections, and defective rheostats and condensers.

A steady, regular, staccato beat note, somewhat like the steady patter of a machine gun, often can be traced to an improper value of the grid leak. The remedy is to try grid leaks of different values till the right one is obtained.

A steady humming noise usually is caused by near-by power lines or lighting circuits near the aerial or lead-in wire. The remedy is to erect your aerial as far as possible from such lines and as nearly as possible at right angles to them.

A loose connection or open circuit in the grid circuit of the detector stage often will cause a sharp drumming noise that can be eliminated by checking up the grid circuit connections.

Whistling or howling noises may be due to too much regeneration, too many turns in the tickler-coil winding, poorly designed transformers, location of transformers too close to each other, improper routing of wires so that grid and plate wires run closely parallel to each other, body capacity effects when the hand is brought near the controls, neglect to use a fixed condenser across the primary winding of the first stage transformer, and overloading of tubes.

Grounding Rotary Plates.

The remedy for most of these troubles is obvious. Capacity effects practically can be eliminated by making sure that the rotary plates of tuning condensers are connected with the grounded or battery sides of the circuits in which they are used. Another source of capacity effects is the method used by some makers of variocouplers or variometers to lead out the connections from the rotor windings.

A lead from the rotor winding never should be soldered or otherwise fastened to the shaft of the rotor. Flexible wires should be connected with the ends of the windings and the free ends connected with the outside binding posts or connections. Where a hollow tube is used as the shaft, these flexible wires can be run from the inside of the rotor, thru the hole in the tube, and out thru the end of the tube to the binding posts or outside connections.

Transmitting Neighbors.

A whistling noise changing in pitch without any adjustment of the receiver is caused by a neighbor tuning in his single-circuit regenerative set, with the circuit in an oscillating condition. The only remedy is to find out who operates the troublesome set and convince him that he should use a double-circuit set or tune in his present set with the tube filament turned down as low as possible.

Don't let noises discourage you. The fan who gets noises at least gets something, even tho it is unwelcome. He is better off than the fan who expectantly turns on the juice, plugs in the phones, and hears—nothing.

One of the most common causes of "no noise at all" is a poor aerial or ground. Be sure before you make any changes in your set that the trouble is not due to this cause. You can do so by making the tests illustrated in Figures 1, 2 and 3, using the test circuit shown in Figure 4.

A voltmeter with graduations reading up to 30 or 35 volts will be found suitable for all purposes in testing. In connecting the voltmeter in the circuit, make sure the positive pole of the meter is connected with the positive pole of the battery by touching the free end of the meter with the negative terminal of the battery. If you get a reading, the meter is connected properly. If you do not, reverse the connections to the meter so that you get a reading when the free end of the meter is connected with the negative of the battery.

Testing for Ground Connection.

To insure a good ground connection, you can make a temporary connection to another ground and then insert your test circuit between your regular ground and the temporary ground. If you get a reading, the ground connection is all right. Another way is to test around the ground clamp and see that the ground wire is making a good contact thru the clamp with the ground.

Many phans, especially beginners, often forget to connect aerial and ground when testing.

A common source of trouble is poor contact of tube prongs with socket springs. Before connecting the sockets with the set, the springs should be bent up as shown in Figure 5. A wise precaution is to bend up these springs every so often and clean off the ends of the tube prongs with a fine file, so that they will make a good contact with the springs.

Another source of trouble in tube sockets is loose binding-post connections with contact springs. Screws and binding posts always should be tightened before the socket is connected with the circuit.

So much for those who are experiencing difficulty with receivers already constructed.

Forestall Trouble Later On.

In radio an ounce of prevention is worth more than a pound of cure. Testing the parts before connecting them may take time, but it will save you more time, temper, and embarrassment later on. A few simple tests often will prevent any possibility of trouble after the set is built and ready to operate.

First of all, test your batteries. This can be done easily in the manner illustrated in Figure 4, by touching the two test points together. If a 22½-volt "B" battery gives a reading of less than 15 volts, throw it away and get a new one.

Coils can be tested by connecting one end of the coil with one test point of the test circuit, as shown in Figure 4, and the other end of the coil with the other test point of the circuit. The volt-meter should show a steady reading. Where the coils of transformers are being tested, a lower reading will be obtained because of the resistance of the coil. The important thing, however, is a steady reading.

All coils of variocouplers, variometers, and transformers should be tested in the manner described above and as shown in Figure 6. Each coil of every transformer should be tested separately. The primary-coil terminals usually are marked P and B, and the secondary-coil terminals are marked G and F.

Two Other Tests to Make.

Another test, to determine whether there is any connection between the two coils, is to touch one test point to one terminal of the primary coil and the other test point to one terminal of the primary coil and the other test point to one terminal of the secondary coil. To make sure that the windings are not connected with the core of the transformer, one test point should be touched to the core or case of the transformer and the other test point touched first on one terminal of the primary, then on a terminal of the secondary. No readings should be obtained during this test.

The binding posts and screws of rheostats and other parts should be tightened up carefully before being used in the circuit. Neglect of this precaution often is the cause of troubles impossible to locate later on.

Condensers should be tested as shown in Figure 8, one test point being connected with one terminal of the condenser and the other test point with the other condenser terminal. While the test circuit is connected, the rotary plates should be revolved. During this operation, the needle should not falter. If it does, it indicates that at some point the rotary plates are touching stationary plates or that dust is short-circuiting the plates. If the short circuit is caused by dust, the spaces between the plates should be cleaned by blowing thru them; if by touching plates, the rotary plates should be straightened carefully.

Rubbing contacts, either in variocoupler, variometers, or variable condensers, should not be relied upon. The best method is to connect the leads, terminals, or parts with soldered flexible connections.

Stops should be provided to prevent rotors of variocouplers and variometers and rotary plates of condensers from being turned thru more than one revolution. If this is not done, the leads will be twisted or broken, or the insulation worn off, causing short circuits.

Fixed condensers, especially the grid condenser, should be tested to make sure that there are no short-circuited condensers. When the condensers are connected between the test points, the volt meter should show no reading.

After you have connected the set, test the various circuits for opens before connecting the batteries. In the plate circuit, for instance, touch one test point to the plate terminal of the socket, and the other test point to the positive B battery connection, to make sure that there is a complete circuit between those points. The same should be done with other parts of the circuit.

Before you jump to the conclusion that something is wrong with your set, try various values of B and C battery voltage, since the correct values are important if distortion is to be eliminated.

If you don't get results after making tests and checking up your wiring, you will find it an actual saving in time and temper to take the whole works apart and make the tests on the apparatus as I have described them.

Don't try to make all the tests, wire up the receiver, and get good results all in one evening. It simply can't be done.

Trouble-Shooter's Chart

HERE are the most common troubles the home operator meets up with in his receiving set, with the probable cause in each case:

CRACKLING NOISES: Caused by static, run-down batteries, poor wiring connections or defective rheostats or condensers.

WHISTLING, HOWLING NOISES: Caused by too much regeneration, too many turns in tickler coil winding, poorly designed transformers, transformers too close together, parallel wiring, body capacity, overloading of tubes.

SHARP DRUMMING NOISES: Caused by loose connection or open circuit in the grid circuit of the detector tube.

MACHINE GUN BEAT: Caused by incorrect value of the grid leak and grid condenser.

HUMMING SOUND: Caused by near-by high-power lines, lightning circuits near the aerial or lead-in wire, near-by motors and generators, telephone wires too close to aerial.

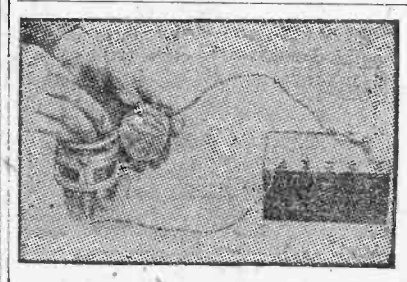


Fig. 8—This illustration shows the method of testing the condenser for short circuits, using voltmeter and battery.

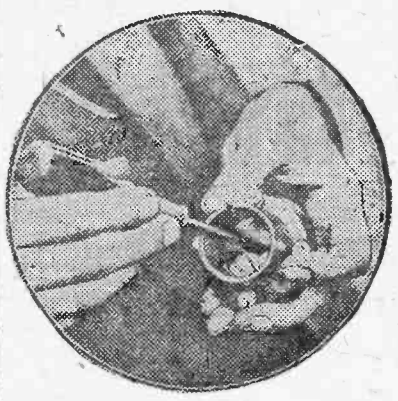


Fig. 5—To assure good contact springs of the tube socket and tube prongs, bend up the springs as shown above.

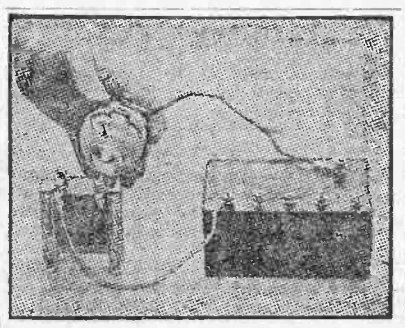


Fig. 6—How to test the transformer for open circuits, by using the voltmeter and battery.

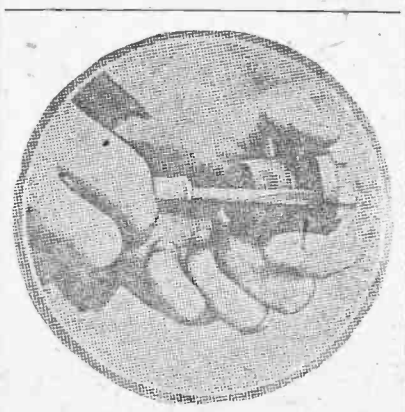


Fig. 7—Before connecting the rheostat with the circuit, tighten all connections as shown.

Why Near-by Stations Are Hard to Lose

When a powerful transmitting station sends out radio energy from its aerial, near-by sets are more or less affected by what is termed "the splash." It is this splash that prevents nonsensitive sets or the novice tuner from "pulling away" from local interference and picking up distance stations.

Radio waves have been likened to water waves. A small pebble tossed into a pond causes a successive series of waves to radiate from the spot where the pebble strikes the water.

If a light cork is placed somewhere within the circle of these waves it will be affected by them. The nearer it is to the source of the energy—the point where the pebble strikes the water—the more violently will it be agitated.

However, it is possible to so weight the cork as to make it less sensitive to the "splashing" effect. In other words, it will be more stable in its response to the incoming waves, however close it may be to the source of energy.

All of this also is true of radio broadcasting and radio reception.

The energy thrown out from a broadcasting station is the pebble that was tossed into the water. The cork is the receiving set. If the "pebble" is a large one it will make a heavier "splash" and create a more violent disturbance. If the "cork," or receiver, has sufficient resistance in the way of inductances and capacities and, by proper controls, can be made to absorb the "splash," the receiver is not going to be so violently affected by the near-by station.

It is essential, therefore, to have a receiving set constructed to absorb the "splash" of a near-by station and be so designed as to be capable of responding to the waves made by some other station. It also is necessary to know how to operate such a set so its sensitiveness may be utilized.

Universal Panel Is Converted into a Cockaday Four-Circuit Tuner This Week

IN THIS week's series of articles Mr. Freund converts his universal panel into a Cockaday four-circuit tuner. The beginner experimenter who has been following this interesting series will do well to try the Cockaday circuit this week. He will have a surprise in store for him.—The Editor.

By BENJAMIN FREUND.
(Chief Engineer, Radio Division, Crossland Pfaff Engineering Laboratories.)

IN THIS week's article I aim to explain the mysteries of the Cockaday four-circuit tuner and its adaptation to the Universal panel.

There seems to be quite a misunderstanding of the type of circuit from which it primarily was derived.

The Cockaday four-circuit tuner is a development of the original De Forest Ultra Audion circuit. It is well known among radio enthusiasts that all the freak wonder circuits developed to promote the sales and interest of the radio industry are but developments of the Ultra Audion circuit. This circuit is one of the best distance getters we know of, but its selectivity is nothing to cause great comment.

We owe credit to Lawrence Cockaday for improving this ideal receiving circuit, and in place of disguising it he has taken the bad features and changed them so his efforts have brought about a receiver which has all the good points that are to be expected from the ideal receiver.

One of the main reasons for the satisfying reception of Ultra Audion circuits is because of a common inductance being used to tune both the grid and plate circuits.

If the grid and plate inductances are one, it is evident that in tuning the grid circuit to the incoming signal the plate circuit will always be in resonance and thus will give maximum regeneration thruout the full range of which the inductance is capable of tuning to.

Where Ultra Audion Fails.

But we find that sometimes we get clearest results when we can retard our regeneration slightly below the highest point of regeneration. This cannot be accomplished with the ordinary type of Ultra Audion circuit because retarding the regeneration also detunes your grid circuit, which might result in the loss of the station, due to both grid and plate circuits being tuned out of resonance with the incoming signal.

It is in the overcoming of this obstacle that we owe respects to the ingenuity of Mr. Cockaday. He has introduced an auxiliary circuit. This circuit consists of an inductance or coil which is connected to a variable condenser, which retards regeneration without detuning the grid circuit by introducing resistance into the oscillating circuit by absorption of excess regeneration. By that I mean the receiver is tuned to the incoming signal to the point of resonance, and then if it is found advisable to retard or lower regeneration slightly below the point of oscillation it is done so by being absorbed by the auxiliary or absorption circuit.

The condenser and section of the coil at the right end of the drawing illustrating the tuner is the absorption circuit.

Similar to Superduc.

The remainder of the circuit is similar to the Superduc circuit which has been described and illustrated in The Post for the last few weeks, the difference lying in the coupling of the primary and secondary circuits.

In the four-circuit tuner the coupling of the primary and secondary is very loose except for the single turn of wire which is very closely coupled to the secondary and absorption circuits. The remainder of the primary winding is placed at right angles to the secondary circuit, so that extremely loose coupling is obtained. By this fixed loose coupling sharp selective tuning is had at all times.

By the control of regeneration and selectivity featured there is nothing more desirable to a good radio receiver.

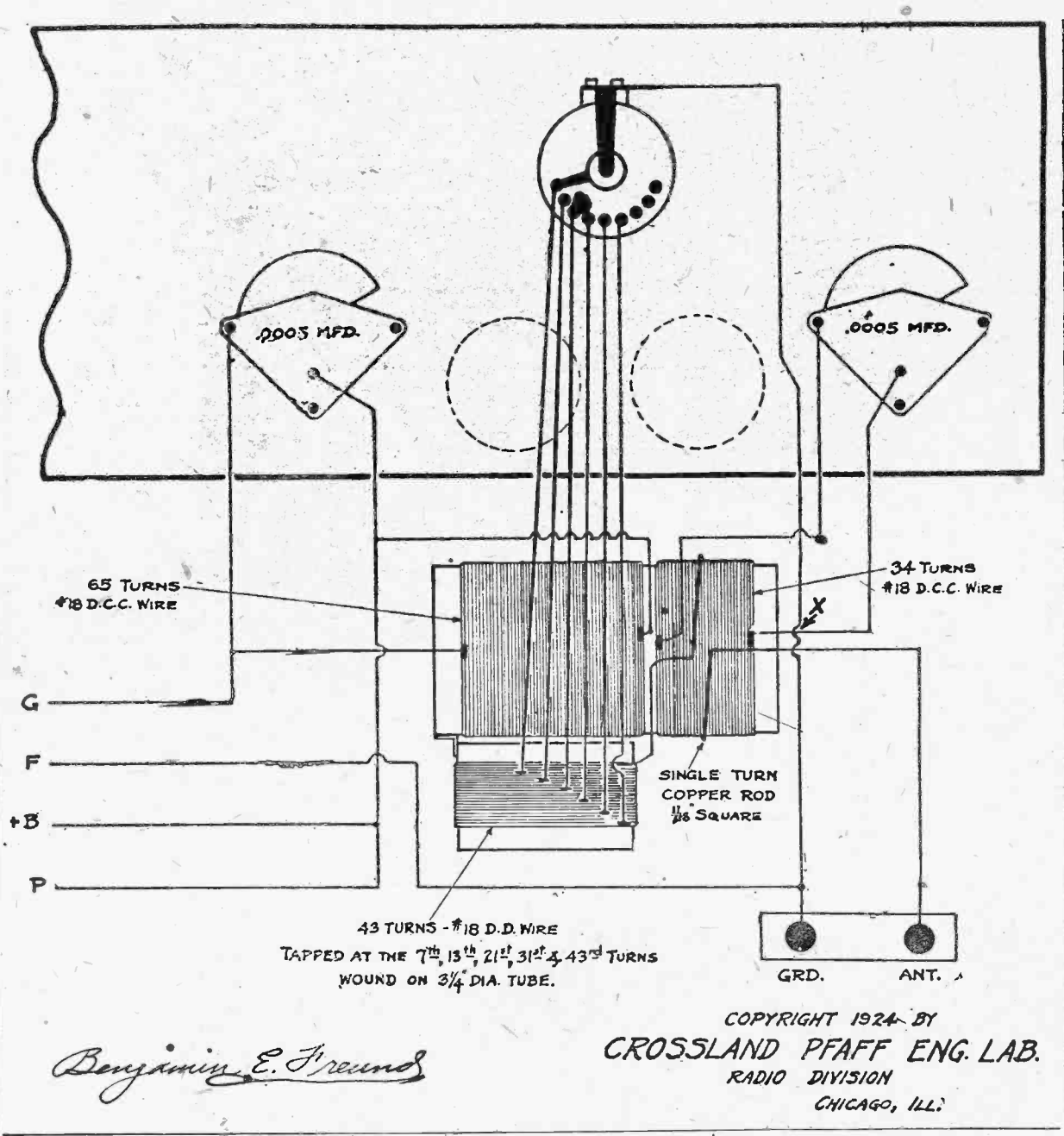
In the illustration the small section of winding at the right end of the Cockaday coil is the absorption circuit. This consists of 34 turns of No. 18 double cotton covered wire. Directly over this winding is wound a single turn of 1-16-inch square brass or copper rod. If the square rod is not obtainable any heavy wire with large cross section or low resistance will do (No. 14 solid round aerial wire). This turn of wire is connected in series with the antenna loading coil. The taps on the loading coil are connected to the induction switch. The induction switch lever is connected to the ground terminal, while the other end of the single turn is connected to the aerial.

The antenna loading coil consists of 43 turns of No. 18 double cotton covered wire wound in a two-layer bank and tapped about every sixth turn. This coil must absolutely be at right angles to the secondary circuit.

The secondary circuit is wound to the left of the absorption circuit and consists of 65 turns of No. 18 double cotton-covered wire, the secondary and absorption circuit being wound on the same tube. The diameter of the tubes necessary for either of the coils is about 3⅛ or 3¼ inches.

The tube that contains the second

Continued on Page 14.



Benjamin E. Freund

Questions You Ask and Answers We Give

1243—CHICAGO: Kindly give me hook-up for the following: First stage radio-transformer, second stage audio-transformer, third stage 3-1 audio-transformer, 1 Kellogg 23-plate variable condenser, one 501 Kellogg variocoupler, one 501 Kellogg coil, one Howard 200 ohms potentiometer, 1 Howard rheostat, three Acmestats, four sockets, one detector, 200, three amplifiers, 301-A, two double jacks, one single jack, one Walnart 0-6 variable leak.

A hook-up for a three-circuit set with one stage of radio-frequency, as per your request, is shown.

CODE INTERFERENCE.

1244—CHICAGO: Your column is a great source of enjoyment as well as a great convenience. I have a Kennedy short-wave receiver, but I have not received everything I think it is capable of. I often have trouble tuning out local stuff. Have sixty feet of antenna, with thirty-five foot lead; everything seems to be o. k. Kindly advise me. Had to go to bed last night at 12:30, as some code fiend kept butting in at intervals, 9-PSO calling 9-PUX, all over my dials. They should lock that kind up.

A wave trap would be the solution to your problem. Use one as described in the Dec. 20 issue of the Radio Magazine.

CRYSTAL PARTS.

1245—CHICAGO: If you will be so kind, would like to have you furnish me with the name of the makes of variometer, variometer and crystal detector used by Lewis B. Hagerman in his hook-up of the long-distance crystal set as illustrated in your edition of Wednesday, Nov. 28.

The parts used in the Hagerman crystal set are as follows: One Dayton variometer, one RW crystal detector, one Rathbun variable condenser.

CRYSTAL DATA.

1246—CHICAGO: I am very much interested in the long-distance crystal set described by you in the Radio Magazine of The Post of Nov. 28. I am only a novice—I am strong for "the crystal," and have one now (varicoupler and variometer) with which I can get everything in Chicago, and with the aid of two coils, one across the ground, the other across the aerial, I am not bothered with any interference at all; can tune in any particular local station and hold it.

As I desire to make one as described by you, I am asking a little information—what make of condenser and variometer did you use? The photo of rear view in the magazine is not very clear—(perhaps it is because I do not understand it). Is this variometer connected up with pigtails or not? Is it what is called a split variometer? Will you kindly give me the desired information? I agree with you regarding aerial and ground—I have found by experience that the better they are the better results. I have two aerials—one a stretch of about 100 feet double, or a continuous length of 200 feet thru insulators about [illegible] inches apart; the other a single wire about seventy feet. With an arrangement of switches I can use either one, or both of the aerials. I am using a double ground—to cold water and waste pipe—but am going to take your tip and run another.

The parts used in the Hagerman crystal set are as follows: One Dayton variometer, one RW crystal detector, one Rathbun variable condenser. The variometer used was not split. A diagram of the set is shown.

WAVE TRAP.

1248—CHICAGO: I have a Radiola RC, three WD-12 tubes. May I use a wave trap on it? If so, please send me a list of parts needed, where to get them and the price of each piece.

A wave trap may be used on the Radiola RC. A list of parts needed was given in the Dec. 20 Radio Magazine.

CRYSTAL DIAGRAM.

1247—CHICAGO: I became very much interested in your diagram showing a long-distance crystal set. I thought I would buy the very best parts for this crystal set and bought a Kellogg variometer. It has five different binding posts, where yours only shows two. That puzzles me. My condenser is a Kellogg 43-plate with a 5-plate vernier. After trying to hook up same according to your hook-up we find that it does not work, so I am asking you if you would please send me a hook-up for the parts I have bought. I refer to The Post Radio Magazine of Wednesday, Nov. 28. I am using an R. W. crystal.

A hook-up, as per your request, is shown.

1249—CHICAGO: On Friday evening, Dec. 4, at about 5:45, I heard a station broadcasting a program and I am pretty sure the call letters were WABZ. As this station is not in any call book and I did not understand the city, I would like to know where it is, its usual wave length and the owner.

We find no call letters such as WABZ in our directory. Could it be WCBD of Zion City?

GREBE HOOK-UP.

1251—CHICAGO: I am very desirous of getting the hook-up of the Grebe CR-12 set with two variometers, detector, two stages of audio and one stage of radio-frequency. If you have this hook-up and are free to distribute it, I certainly would be glad to receive same. I would also like to know what ratio the audio-transformers are and any other information available to assist a green phan in making such a set.

We are showing diagram of Grebe CR-12 receiving set.

1253—CHICAGO: Am a constant reader of your weekly radio supplement and have profited by it. "Long may it come." In your issue of Dec. 6 I found your article on "How to Add One Stage of Radio to Reinartz Set." As I have a Reinartz set with two stages of A-F, I am greatly interested in adding a step of tuned R-F. Is my drawing, which I am inclosing herewith, correct? If not, will you kindly make the necessary corrections and return same? What is meant by "hard tubes"? Will you furnish me their numbers?

A diagram of the Reinartz set with radio-frequency has been mailed. All tubes are hard tubes except UV-200 and C-300. A hard tube is one in which the vacuum is very high.

ONE-STAGE AMPLIFIER.

1270—CHICAGO: I have inclosed a self-addressed envelope in which I want you to send a sketch and list of parts for one stage of amplification of an Armstrong three-circuit regenerative set. Also please state which peanut tube is best suited for this circuit.

A one-stage amplifying diagram is shown. Use a WD-12 tube.

1271—GLEN ELLYN: While the writer was a graduate electrical engineer and for years has been mixed up in electrical work, like many other men so trained he has paid no attention to radio and until a few days ago was absolutely innocent in regard to it. He was looking at your article in Nov. 15 issue of the magazine and was struck with the reflex circuit shown and built one, and must confess that he did not use any high-grade material. The results were unexpected, as it brings in everything from the Atlantic coast to Kansas and Nebraska, west, and Texas, south. The selectivity is good and the operation so simple that the writer's 8-year-old boy has good success finding DX. The local stations all come in good and strong on the loud speaker. Am using 66-turn stator in variocoupler and a WD-11 tube and 112 volts B battery. What I would like to do is to leave this set undisturbed and instead of building the two-tube set shown in your issue of the next week, to simply add one standard stage of audio-frequency amplification. Please tell me if there is any reason why I cannot do this, and if I can, give me circuit to use. I have another WD-11 tube and suppose would use separate A battery. Show where to connect to the present B battery. I had in mind using no potentiometer, but simply transformer, tube and rheostat and C battery if necessary. Have I got the limit of distance with this set in getting Troy, Dallas, Kansas City and Omaha in the different direction, or can I expect to pick up stations more distant?

A diagram of a one-stage amplifier, as per your request, is shown. Considering the parts you are using, the results are very good.

REGENERATION AND R-F.

1272—CHICAGO: I am one of those misguided ones who was about to throw his Armstrong set in the ash can. I have one-stage tuned radio and two stages audio, using Dayton variometers and coupler, All-American transformers and all parts are first class. I am unable to tune out Chicago stations and have trouble in bringing in outside stations when Chicago is silent. I would feel very grateful to you if you could furnish me a hook-up whereby I could get results.

A diagram of one stage of R-F and two stages of A-F., using parts mentioned, is shown.

PECULIAR RECEPTION.

1275—CHICAGO: PWX, Havana, Cuba, came in only without ground and when I would put my ground on it would bring in Texas and could not get Cuba, and I would like to know why. The announcer's voice was clear and distinct.

Referring to the incident in your letter about tuning PWX of Havana, Cuba, with the aerial on your set and when you put the ground on to receive Texas, this is due to the fact that connecting the ground changes the natural wave length of your set and therefore cut out PWX and brought in Texas.

TRANSMITTING HOOK-UPS.

1273—CHICAGO: Inclosed find two code transmitter hook-ups. Please tell me if they are correct. If not, please give hook-up. About what range in miles would a 45-volt B battery transmit?

Both diagrams as shown are O. K. Forty-five volts of B battery would enable you to transmit about twenty-five miles, altho they would not last long under the strain.

HOOK-UPS AND VARIOMETER DATA.

1277—CHICAGO: Can you give me directions for winding a variometer? Also Mr. Hagerman's long-distance hook-up?

It is impracticable and almost impossible for the ordinary layman to wind his own variometer. To do this the proper machinery is necessary. One can be bought very cheaply. The Hagerman long-distance hook-up is shown.

FOREIGN CRYSTAL HOOK-UP.

1276—CHICAGO: Would you be so kind as to explain in detail the nature and worth of the inclosed crystal set diagram taken from the French electrical publication, L'Electricien, for Nov. 15? I am very anxious to have a set, but am unable to afford valve sets that are worth while.

We greatly doubt the veracity of the claims made for the crystal detector set, a diagram of which you mailed us. We are showing a diagram of a much more practical crystal set that can be built of parts obtainable on the market today.

FREE SERVICE

QUESTIONS asked on any subject pertaining to radio will be answered in this department in either the daily edition or the Radio Magazine published each Thursday. No charges are made for this service.

Due to the immense volume of letters being received by the Question and Answer department, the following restrictions must be made:

All letters must be plainly written in ink and perferably typewritten, and only on one side of the paper.

Drawings, hook-ups, etc., must be on a separate sheet from question and clearly drawn, showing values of parts.

Do not ask for panel layouts, construction details, etc., for a set unless they have appeared in the columns of this magazine. Self-addressed and stamped envelope must be inclosed. Address all your letters to Radio Questions and Answers Department, The Chicago Evening Post, 12-14 South Market Street, Chicago.

R.-F. ON REINARTZ.

1263—CHICAGO: Referring to the article in The Chicago Evening Post Radio Magazine of Thursday, Dec. 6, page 7, in regard to adding one stage of radio-frequency to the Reinartz circuit, would appreciate it if you would furnish me with full details and diagram showing hook-up.

A diagram showing radio-frequency on the Reinartz circuit is shown.

HAGERMAN CRYSTAL.

1264—CHICAGO: Kindly send me or republish your radio crystal set hook-up with which the people are having such wonderful success. I have a De Forest crystal set with a Duolateral tuning coil, with which I have been getting local reception fairly good, but I think that with a few additional parts which your hook-up must have that I could at least get Elgin and Zion.

The circuit of the long-distance crystal set, as per your request, is shown.

THREE-CIRCUIT HOOK-UP.

1265—CHICAGO: Will you kindly send me a diagram of your pet three-circuit, the feedback regenerative set, and oblige? I have not seen a radio magazine that could compare with yours. Keep it up.

The circuit you request has been mailed.

HAGERMAN CRYSTAL.

1266—CHICAGO: Please send me information regarding long-distance crystal set, or better still, Radio Magazine o. Nov. 28, as I lost or misplaced mine.

The diagram of the Hagerman crystal set is shown.

A-F AMPLIFIER.

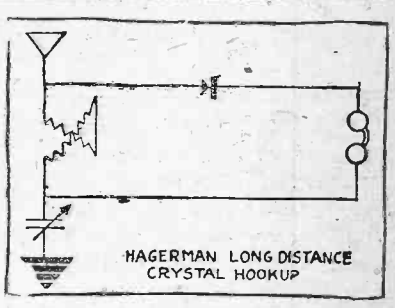
1257—JOLIET: If you can please send me the diagram for a one-step amplifier for this circuit. Also the ratio and some good makes of transformers. If you know any way to improve this set, send it along. I have a UV-200 detector and amplifier tube. I have had California, and get Chicago so you can hear it in the next room. I get many helps from your section.

A hook-up for a one-step amplifier for your circuit is shown.

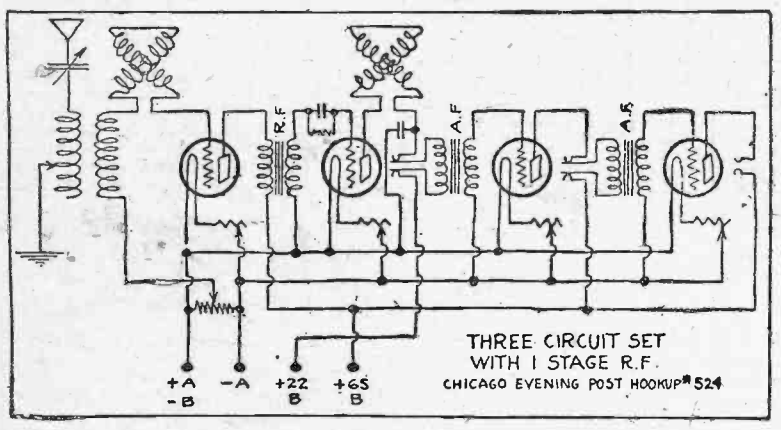
WRONG TUNER.

1108—CHICAGO: Just a line to let you know I have tried your new Superdue set. I did not have the parts on hand that you called for, so I thought I would try it anyhow with the parts I had. First, I have with their sets. I happen to have a few wrinkles of my own and therefore would kindly ask you to help me press them out. I have a three-tube Armstrong regenerative receiver, using two variometers, one variocoupler, 3WD-11 tubes, a variable grid leak, a 10-1 all-American transformer and a 3-1 American transformer for the second stage. My aerial is a two-wire, 65 feet for each length. My main trouble lies in the fact that I cannot tune out WJAZ on nights when the opera is being broadcast. I live about seven or eight blocks southwest of the above mentioned station. Also I cannot get any distance with this outfit. My radius is only about fifty miles, such as Zion or Elgin, Ill. Will you kindly advise how I can improve this set if possible?

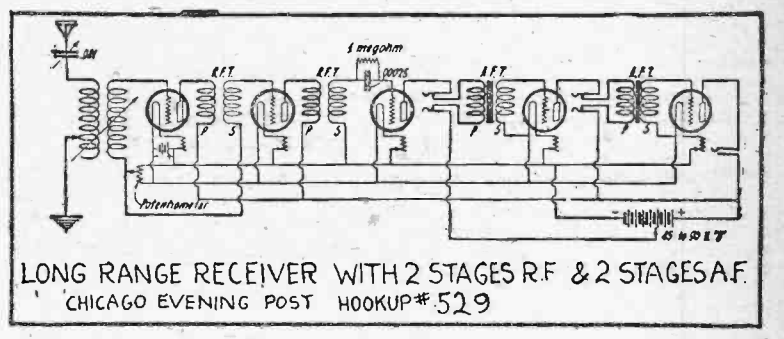
To tune out WJAZ we would advise using a wave trap as described in the Dec. 20 issue of the Radio Magazine. To get more distance a longer aerial is required, the proper size being one wire, 100 feet long in a straight line, 6 to 8 feet above all obstacles. You might also try using a 45-volt battery on the plate of your detector tube.



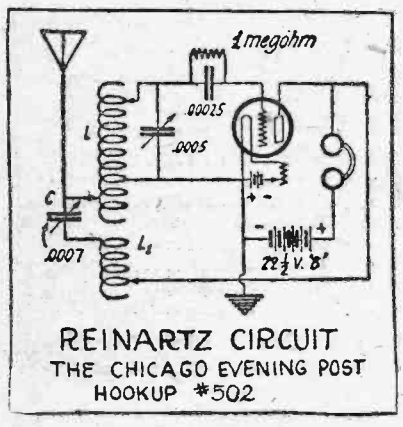
Q. & A.—1257, 1270, 1271: A simple one-stage amplifier appears above. Use a 5-1 ratio transformer.



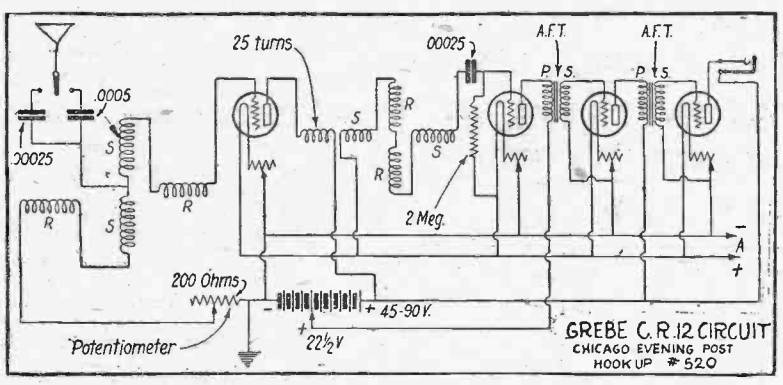
Q. & A.—1243: A four-tube radio-frequency set using regeneration is shown above.



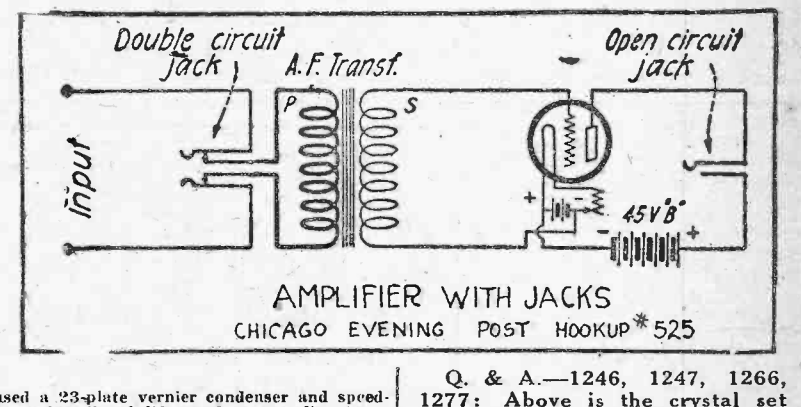
Q. & A.—1241: A standard transformer coupled radio-frequency circuit appears above.



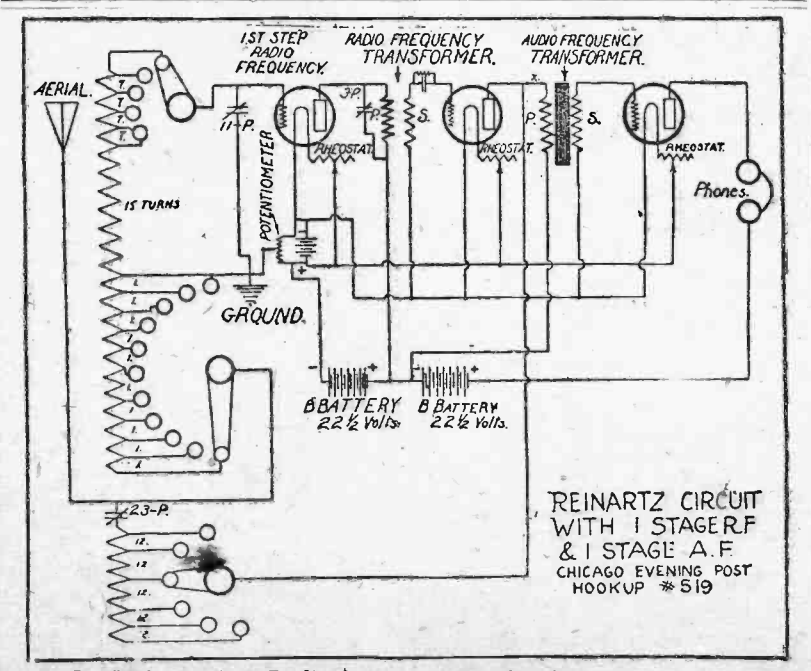
Q. & A.—1256, 1268: The Reinartz circuit above is very fine [illegible].



Q. & A.—1251: A diagram of the Grebe C. R. 12 set is shown above.



Q. & A.—1246, 1247, 1266, 1277: Above is the crystal set that the local crystalphans are so enthusiastic about.



Q. & A—1253: Radio-frequency on the Reinartz set is accomplished successfully with the above circuit.

Blame Radio for Storms

The claim that radio broadcasting is producing bad weather, especially thunder and lightning, seems to have been taken seriously by a large part of the ignorant farming population in Europe, with resulting opposition to the growth of the radio industry.

You will find the classified advertisement section interesting. See Page 15.

Amateur Covers World with Radio

To the radio amateur the letters DX call up a vision of immeasurable distance that would have made our ox-cart pioneers and forefathers blink in amazement, but easily is obliterated with the pressure of fingers on a brass key.

This business of "packing up the old kit bag" for the sake of the wanderlust that is in all of us now has, thru radio, a modern version that does not require the lifting of a foot over one's doorstep. That is the major fascination in the wonderful game of amateur radio, the thrill that comes with each new conquest over space and time, ability to reach the ends of the world.

You read on every hand how the possession of a receiving set from the simple single circuit tuner to the latest superheterodyne brings "the world into the home," but seldom have you read how easily a radio transmitter can take you out into the world.

From the time that such men as Daniel Boone lifted rifles over their shoulders and hit the trail into the wilderness, there has lurked in all of us the strong desire to go beyond our immediate ken. It is the same ambition that led early explorers to this country and made possible the pioneer days that eventually developed in the building of the west.

Equal to Seven League Boots.

For a little more than the same amount of effort that it would take you to equip your home with a radio receiving set, you can install a telegraph code transmitter which is equivalent to a pair of seven league boots, a railroad pass, or a passport to distant countries. Sixteen thousand young men have done that in this country. It all started with the neighborhood line telegraph, but it has ended in the year 1923 by making amateurs of the world neighbors.

It is remarkable when one realizes the odds that have been encountered and the technical obstacles that have been overcome by a comparatively small group of experimenters in this modern winning over of space. It is comparable only to the heart-breaking efforts of those who have in years gone by in giving us the little office globe that we can twirl with a movement of the hand and put our finger on every country and city of any consequence on the earth. Just as surely as undiscovered territory was won over by the pioneers, so is the art of amateur radio making international citizen radio a reality.

World Open to Amateurs.

In the interval of a few years since members of the Radio club of Hartford, Conn., were considering as a great triumph code transmissions over a distance of thirty miles, these same amateurs have communicated direct with amateurs on the west coast and their transmitters are heard frequently in Europe.

Interest in amateur radio is keen in New Zealand, Australia and some parts of the South American and African continents, giving promise of the day when amateur radio will have put its foot on every natural barrier.

With American amateurs on the eve of participating in new trans-oceanic tests, two way communication across the Atlantic ocean has been accomplished and it would be ridiculous for anyone to predict DX values for the future.

The prophets of the past have too often fallen short of the mark. The world is growing smaller and smaller out of all proportion to their vision. One can only say that amateurs in those countries where radio is already taking a strong hold are on the verge of an era when communication among citizens of those countries will be as common as communication among amateurs in the several states of our own country.

Blots Out Boundaries.

There is no such thing as east and west, and north and south are as one while DX men bound their signals around the globe. Canadian amateurs are sending messages across the continent. The Australians have rubbed elbows with California. The island of New Zealand is one of the latest entrants into the world amateur fellowship without legal bonds and tugging for greater contact, a louder CW twang and a whole lot more punch to the DX. The American Radio Relay league is bringing together amateur transmission all over the world.

Talking Thru Her Hat.

A recent millinery exhibition in Cincinnati had a radio receiving set fastened to a hat. Next they will be equipping them with transmitters and talking thru them.

Here Amateur Reigns Supreme

Amateur Records in Last Year

By BEVERLY DUDLEY.
(9BR and Member A. R. R. L.)

While much has been said about broadcast reception and improvements for 1923, comparatively little has been published on amateur activities. Amateur radio was not without its accomplishments during the last year, however, and many records were made that would have seemed almost impossible a few years ago. A few of the most outstanding amateur achievements for 1923 are reviewed here so the public may know what the "hams" are doing.

Probably the best piece of work being done by amateurs at the present time is the supplying of a means of communication to WNP, the radio station aboard the Bowdoin. Dr. MacMillan has two complete receivers and a complete 100-watt I. C. W. transmitter aboard the Bowdoin in his trip to the arctic, and with this equipment manages to keep in touch with the world almost as easily as if he were in the United States. Entertainment and news is obtained from the various broadcasting stations (notably 9XN or better known as WJAZ), but for communication, Donald I. Mix, WNP's operator depends entirely on American and Canadian amateurs, who, thru an efficient system of relaying messages, handle traffic for the men in the arctic. Mix, by the way, is a "ham" himself.

Talks to French Amateur.

Beside working WNP, American amateurs have gone in for some distance records in the transatlantic tests recently conducted by the American Radio Relay league. On Nov. 26, communication was established between station IMO, the radio station of Fred Schnell, traffic manager of the A. R. R. L. at Hartford, Conn., and F8AB, owned and operated by Leon de Loy, Nice, France. The same night F8AB (the prefix F denotes a French amateur radio station) communicated with 1XAM, the station of John L. Reinartz, South Manchester, Conn., and for two hours these three men conversed. Since then F8AB has been in communication with American amateurs almost nightly. All three stations operated on a wave length of 100 meters, and as ordinary apparatus was used, the effectiveness of the short waves was well demonstrated.

The final report of these tests will be published at a later date, but it is reported that more than 150 American amateurs heard thirty-five European amateur transmitters.

F8AB recently figured in a relay sent from Nice, France, to Etah, Greenland. This relay established a world's record. It was the first four-country relay and it is the longest amateur relay on record. On the night of Nov. 27, F8AB sent 1XAM a message for WNP. Reinartz of 1XAM and 1QP, phoned the message to S. Kruse, 1HX, who relayed it to 6XAD, Avalon, Cal. From 6XAD it went to Canadian 9BP, Prince Rupert, B. C., finally reaching WNP. Amateurs of France, United States, Canada and Greenland were involved in the relay, which covered a total distance of 9,565 miles.

In a cartoon, Clyde E. Darr, 8ZZ, predicts that in 1930 American amateurs will be communicating with most of the world, and from the above it would seem that his prediction is not so distant after all.

China Hears U. S. Hams.

The Atlantic is not the only ocean over which signals have been reported, however. For quite some time signals have been reported off the coast of China and in New Zealand. Radio station 4AA of New Zealand reports logging about 100 American amateurs, many of which are received with great intensity. Japan is also in the race, and Mr. Hiroshi Anod of Tokyo has reported hearing fourteen amateurs.

An unknown American radio operator, situated at Tokyo, Japan, recently sent a message to his mother in Cambridge, Ill., thru station 7HG of Tacoma, Wash., marking the first short wave two-way communication across the Pacific.

All the time is not spent in breaking records, however, or in communicating with foreign amateurs. Norman R. Hood, 7ZO, has organized a number of amateurs into an emergency communication unit for the Santa Fe railroad. These amateurs will establish reliable communication for trains in case of storm, floods, or other emergency where wire lines become inoperative. In establishing this means of communication, amateurs will be greatly benefiting the railroads.

The communication of United States amateurs with foreign amateurs may not mean any more to most people than the establishing of a new record, probably to be broken next month. Communication across the Atlantic, the goal at which amateur operators had aimed for years, has been accomplished. The transatlantic tests this year have brought some new theories regarding short wave communication which will be described in QST for February by S. Kruse, technical editor of the magazine.

Police Radio Experts.

New York city police department announces its force is to be instructed in radio and will become the best-trained staff of police radio experts in the world.

F. W. Dunmore, scientist of the United States bureau of standards, is shown here measuring the wave frequency of a radio broadcasting station. These tests are made so that each station may transmit on its allocated frequency and thus reduce interference.

Amateurs Want an International Code Language

HARTFORD, Conn., Jan. 31.—With the growing interest in private communication among the nations of the world on short waves by amateur radio telegraph operators, officers of the American Radio Relay league are convinced that the time now has come when amateurs should be giving serious thought to the adoption of an international language.

The lack of intimate contact between citizens of this country and those of foreign nations has so far discouraged the efforts of organizations to secure recognition of a common means of expression. It is possible that radio will bring about naturlaly and easily what persuasion and propaganda have been unable to accomplish.

The short wave tests of the last few months, resulting in the establishment of two-way communication between amateurs in the United States and operators in France, Holland and England, have done more than anything else to remove the elements of time and space as obstacles to intercourse between citizens of these countries.

With the idea in view of gaining general adoption of an international language at a time when private communication by radio among citizens of various nations is becoming commonplace, Kenneth B. Warner, secretary of the A. R. R. L., has written officers of foreign radio clubs asking for their approval of the use by amateurs of either Esperanto or Ido, sometimes called Ilo.

Of the two he believes that Ido decidedly is the better for amateurs, both from a grammatical point of view and because of its vastly more extensive vocabulary. He states that the league is prepared to adopt the latter for amateurs provided it has the approval of radio men in all of the other countries. Until then American slang must prove incomprehensible to foreign listeners.

Eighth District Works British for Two Hours

PITTSBURG, Jan. 31.—In the last two months radio amateurs in one United States district after another have succeeded in establishing communication with operators in England, France and Holland. Now the 8th district rolls into line with the announcement here that B. P. Williams, operator of station 8ZAE in this city, sat down at his station the other night and worked British 2OD for an hour.

According to latest advices from the American Radio Relay league headquarters at Hartford, Conn., this makes the fifth United States district in which amateurs have communicated with European operators. The others are the 1st, 2d, 3d and 9th districts. Soon after the contact Williams received the following message:

"Congratulations on connecting the 8th United States district and Great Britain. Please convey 73's (best regards) to them from the British Radio Transmitting society. You may be interested to know that I communicated with 9th district at Marion, Ind., yesterday."

The foregoing was signed by the British call, 2OD. The transmitter at Williams' station used three five-watt tubes with only eighty watts on the plates. The source of supply was a 500-volt motor generator. The signals across the ocean were exchanged on an approximate wave length of 150 meters.

In addition to working British 2OD, Mr. Williams also has received signals from British 2KL, 2SH, 2LD and 5NN, French 8AB and the Holland station PCII. He reported that the last-named station was easily the loudest of all the foreign sets worked. The signals were received on a single circuit short wave regenerative set with detector and audio amplifier. The contact was made between 12:05 and 12:55 a. m., eastern standard time.

With the consistent development of extremely short waves for trans-oceanic transmission with European countries equally favorable reports may be expected from the other radio districts.

AMATEURS

This Is Your Department

AT THE request of numerous amateurs The Post is establishing a special department for the key pounders. Its perpetuation depends upon the interest manifested by the amateurs.

We are particularly interested in your loggings, hook-ups and any and all information that will be helpful to the amateurs.. The columns of the department are open for your discussion of any and all subjects of general interest.

"Best He Has Seen"

RADIATOR POST—The Thursday Radio magazine section of the Chicago Evening Post is very good. I consider it the best radio section of any paper I have seen. — BEVERLY DUDLEY, 9BR, assistant city correspondent, American Radio Relay league.

Canadian Government Plans Radio Beacon

The Canadian government is about to install a powerful direction-finding wireless station at Pachena, on the west coast of Vancouver island, British Columbia, to protect ships of all nations entering the straits of Juan de Fuca en route to American and Canadian ports. Numerous shipwrecks have occurred in this district, and it is expected that the new radio beacon will enable vessels to determine their exact positions in foggy weather, avoiding many dangerous reefs thereabouts.

Gets $40,000 for Electron.

The Nobel prize of $40,000 has been awarded Dr. Milliken of the California Institute of Technology for his work in isolating the electron and determining the exact amount of electricity in it.

McMillan Sends Iceberg

Powel Crosley Jr., recently spoke from WDAP (Chicago), and asked Dr. McMillan, the explorer, whose ship is a few degrees from the North Pole, for a No. 1 iceberg to be placed in the yard of his Cincinnati home. A radiogram from Dr. McMillan saying he received the order and that the iceberg had been shipped, was received at the Chicago station. By the size of the piece of ice the iceman brought to Mr. Crosley's home, he thought the iceberg must have been carried near the fire-box of a locomotive.

Aids in Selectivity

One stage of radio-frequency placed before the tuning unit of any set will aid materially in making it a more selective one. However, only one stage will not increase its range to any appreciable extent. Two stages will, and also increase selectivity and the complications of tuning.

Sextet of Managers.

A voice from the telephone in the WLW radio station asked for the manager of the six-piece orchestra, which had just finished a number. All six musicians rushed to the phone to get the message.

CALLS HEARD

Amateurs are invited to send in list of calls heard. Please write on only one side of paper and follow style used in this department. Address Amateur Editor, Post Radio Dept., Chicago.

By 6AMS, 72 Henry street, San Francisco, Cal. 5ct, 6ea, 6km, 6om, 6pl, 6ags, 6aho, 6beg, 6beq, (6bgc), 6bgv, (6biq), 6bjq, (6bks), 6blv, (6bpz), (6brf), (6brk), 6bvx, 6obu, (6cfz), 6cfy, (7bj), 7eb, 7go, 7ew, 7hr, 7io, 7iy, 7ki, 7lu, 7mf, 7nn, 7pi, 7wm, 7ws, 7zt, 7zl, 7zm, 7ads, 7agv, 7bdw, 9amb, 9bjk, 9bum, 9ceu. Anyone hearing my 5-watt C. W. and fone, pse qsl crd an' qrk. All crds answered.

Maxim Takes Sea Trip for World Relay

NEW YORK, Jan. 31.—With one of the first private receiving antennas ever permitted a passenger on board a vesel bound for Europe and his cabin snugly equipped with a high-grade short wave radio set, Hiram Percy Maxim, president of the American Radio Relay league, left this city recently on the Belgenland of the Red Star line after assuring local radio men that he expected to hear United States amateurs in the Mediterranean.

In other cases where a passenger going to Europe has installed a private receiving set on board ship, it has been necessary to arrange for the use of the ship's antenna when it was not required for traffic. Anxious to use the radio set any time he pleased during the voyage, Mr. Maxim, who is a confirmed amateur radio man, obtained permission from the ship owners and the British Marconi company today to erect an aerial connecting with his own stateroom.

Keeps in Touch With League.

By prearrangement with the headquarters of the A. R. R. L. at Hartford, Conn., Mr. Maxim, intends to keep in constant touch with league affairs and will acknowledge receipt of such messages by means of the vessel's regular radio service. Above all else he will spend most of his time listening to American amateur stations.

The receiver conditions on the ship should be such that with very little trouble he could hear not only amateurs in the United States, but also those in England, France and Holland. Should he have difficulty in hearing messages from American amateurs when he approaches the other side, arrangements have been made by which such communications will be transmitted first to England and from there relayed back to him by amateurs in that country.

Plans World Relay Route.

Mr. Maxim is looking forward with a great deal of interest to cruising in the Mediterranean, radio receiver at hand, in order to prove his theory that the signals of American short wave amateur transmitting are penetrating beyond near European stations. He will keep in mind a possible route for an amateur relay around the world, and will determine if there are amateurs in Bombay and Calcutta.

The short wave receiving equipment which he is carrying was designed by F. H. Schnell, traffic manager of the A. R. R. L.

Dead "B" Batteries

One dead "B" battery connected in the plate circuit of a receiving set will make you think that there is a lot of static in the air and at the same time make you believe that the set has "gone wrong." Always test your "B" batteries with a small high-resistance voltmeter.

You will find the Classified Advertisement Section interesting. See page 15.

Today's Radio Broadcast Menu

Continued from Page 3.

Evening—7:30 p. m., regular concert program.

WHAD—Marquette university, Milwaukee, Wis.; 280 meters:

Wednesdays—At 7:30 p. m. only.

WIAB—Rockford, Ill.; 252 meters: Monday and Friday evenings; Monday evening, 9 p. m., MacDonald's Melody orchestra, in latest hits; Friday evening, 8 p. m., vocal and instrumental selections; Sunday, 12:30 p. m., religious services by the Rev. Toykmann and choir of the Mission Tabernacle church.

WJAN—Peoria, Ill.; 280 meters: Daily except Sunday.

Day—9 a. m., live stock market 9:15 a. m., weather; 11:30 a. m., Chicago, Peoria and St. Louis live stock and grain markets; 12:30 p. m., Chicago and Peoria grain and produce markets; United States agriograms. Evening—Tuesday and Thursday, special musical program to be announced by radio-phone.

WRM—Urbana, Ill., University of Illinois; 360 meters: 8:50 to 9:30 p. m., lectures news.

WTAS—Elgin, Ill., Charles E. Erbstein; meters: Wednesday evening schedule, 9 p. m., musical program.

OUT-OF-TOWN STATIONS

Eastern Programs.

(Central Time Is Shown.)

KDKA—East Pittsburgh; 326 meters:

Day—8:45 a. m., Union live stock market reports, furnished by the National Stockman and Farmer; 10:55 a. m., Arlington time signals; 11 a. m., weather forecast, United States bureau of market reports furnished by the National Stockman and Farmer; 1:10 a. m., concert by Daugherty's orchestra, from McCreery's dining-room, Pittsburg, Pa.; 5:15 p. m., dinner concert by the Fort Pitt hotel orchestra, Harry Hoehle, director.

Evening—6:30 p. m., weekly chat with the farmers, by Frank E. Mullen, radio editor, National Stockman and Farmer, presented from the Stockman studio; 6:45 p. m., the children's period; 7:00 p. m., National Stockman and Farmer market reports; 7:15 p. m., main feature; 7:30 p. m., concert by the KA Little Symphony orchestra, Victor [illegible], conductor, assisted by Mrs. Alton [illegible] Davis, contralto and reader; P. V. [illegible]itis, barytone Charles Muldowney, pianist and accompanist; program, selections by orchestra; overture, "Bohemian Girl," a, "Air de Ballet" Herbert; b, "Serenade d'Amour," Von Blon; "Valse," Mischa [illegible]tzki; suite, "A Day in May," Friml; [illegible]wn, "Spring Song," "Noontide," La [illegible]dale; "On the Steppes of Central Asia," [illegible]rodine; "A Finish Lullaby," Krook; musical scenes from "Mignon," Thomas; excerpts "You're in Love," Friml; contralto solos, "A Dream," Bartlett; "Yonder City," [illegible]humid; reading, "Taking an Elevator," and "How He Went to His Sister's Wedding" from "A Bad Boy's Diary." Barytone solos, "The Wanderer," Schubert; "To a Rose," MacFayden, and "Birth of Morn," Leoni; piano selections, "Mazurka," Chopin; Prelude in E flat minor, Techtorius; 9:55 p. m., Arlington time signals. Weather forecast; 10:30 p. m., late evening concert.

WBZ—Springfield, Mass.; 337 meters:

Day—10:55 a. m., Arlington time signals; weather reports, Boston and Springfield market reports 5 p. m., dinner concert by WBZ quintet.

Evening—6 p. m., "Preparation of Federal Income Tax Returns," by Thomas McGarry, tax consultant of Springfield; 6:30 p. m., bedtime story for the kiddies; farmers' period, letter from the New England homestead; 7:15 p. m., organ recital by Arthur H. Turner, municipal organist, transmitted from the Springfield auditorium; 10:55 p. m., Arlington time signals.

WCAE—Pittsburg, Pa.; 462 meters:

Day—11:30 a. m., news, weather reports, reading of program for the day; 2 p. m., piano recital by Fred Rosenfeld, exclusive WCAE artist; 2:30 p. m., latest news bulletins; 3:30 p. m., stock market reports, Sunshine Girl and Uncle "Kaybee"; 5:30 p. m., dinner concert transmitted from the William Penn hotel.

Evening—6:30 p. m., Uncle "Kaybee"; 7 p. m., silent period; 8:30 p. m., musical program.

WEAF—New York city; 492 meters:

Day—10 a. m., popular Thursday morning talks and market reports by American Agriculturist and United States department of agriculture; 3 to 4:30 p. m., Manhattan male quartet, and other musical program to be announced.

Evening—6 to 11 p. m., midweek services under the auspices of the New York Federation of Churches; United Cigar Stores daily sport talk by Thornton Fisher; health talk by the New York Tuberculosis association; R. Huntington Woodman, pianist-composer, with Mrs. R. Huntington Woodman, soprano; Dixie Howell, contralto. Talk by the Bank of America; Arthur Billings Hunt, barytone; Minnie Weil, pianist. Talk by the Olive Oil Association of America. Columbia Recorders from record-ing studio of Columbia Phonograph company, 8:45 to 9:55 p. m., program following dinner of the Young Men's Hebrew association, direct from the Hotel Commodore, to 11 p. m., program by Gimbel Brothers New York city. Vincent Lopez and his orchestra, direct from the grill of the Hotel Pennsylvania.

WHN—New York city, Lowe's State broadcasting station; 360 meters:

Day—1:15 to 1:20 p. m. Robert Holdman singing "You've Got Me and I've Got You"; 1:20 to 1:25 p. m., Jack Sheehan singing "Whose Izzy Is He"; 1:25 to 1:30 p. m., George Robinson singing "Josephine"; 1:30 to 1:40 p. m., Robert Heldman singing "Mississippi Ripples" and "Glad"; 1:40 to 1:50 p. m., Jack Sheehan singing "Say It with a Ukelele"; 1:50 to 2 p. m., Billy Joyce in piano solos; 2 to 2:15 p. m., Jack Morrise, tenor, popular songs; 2:45 to 3 p. m., George Bluden, barytone, singing "Twelve o'Clock at Night" and others; 3 to 4 p. m., Oreste and his Peek Inn orchestra from the Peek Inn restaurant; 4 to 4:10 p. m., Five Locust Sisters singing "California, Here I Come" and "That Brand New Gal"; 4 to 4:20 p. m., Fritzi Leyton singing "Out There in the Sunshine with You"; 4:20 to 4:30 p. m., Martha Unger, piano selections.

Evening—9:30 to 9 p. m., Lou Gold's Wigwam Club orchestra; 9 to 9:10 p. m., A. B. Curtis, tenor, singing "Foolish Child" and "Honey Dats All"; 9:10 to 9:20 p. m., Al Nevins and Clint Sommer singing their own songs, "Nobody But You," "Our Home" and others; 9:20 to 9:50 p. m., Nacca's Society Jazz orchestra; 9:50 to 9:55 p. m., William Berkes singing "Steppin' Out"; 9:55 to 10 p. m., Gertrude Van Deinse singing "Twilight Rose"; 10 to 10:10 p. m., Max Ditrig singing "I Wonder Whose Dancing With You Tonight" and "Somebody Wrong"; 10:10 to 10:20 p. m., Gertrude Van Deinse singing "Watchin' the Moon Rise"; 10:20 to 11 p. m., John C. Smith and his orchestra, playing dance music.

WGI—Medford Hillside, Mass.; 360 meters:

Day—11 a. m., selection on the Ampico in the Chickering, Amrad Round Table and selections on the Brunswick console; 11:40 a. m., New England weather forecast furnished by the United States weather bureau; 11:45 a. m., closing report on farmers' produce market report; 4:30 p. m., closing stock market reports furnished by Elmer H. Bright & Co., members of the New York and Boston exchange; live stock market reports; agriograms furnished by the United States department of agriculture; 5:15 p. m., Boston police reports, Boston police headquarters; 5:30 p. m., meeting of the Big Brother Amrad club; 7 p. m., evening program.

Evening—"Stories for Parents," by the Children's Aid association entitled "A Modern Mary Antin" and read by Alfred Whitman, executive secretary; musical comedy, "Kicko," presented by the American Mutual Athletic association, Boston.

WHAZ—Troy, N. Y.; 330 meters; This station broadcasts only on Monday evenings.

WGY—Schenectady, N. Y.; 380 meters: Silent night Wednesday.

Day—10:55 a. m., time signals; 11:30 a. m., stock market report; 11:40 a. m., cotton market report; 11:45 a. m., weather report; 1 p. m., music and address, "Billboards vs. Scenery," Mrs. Edward P. Pressey, president of the Schenectady Federation of Women's Organizations; 5 p. m., produce and stock market quotations; news bulletins; 5:30 p. m., dinner music, by Romano's orchestra, New Kenmore hotel, Albany, N. Y.

Evening—6:45 p. m., Radio drama, "Dulcy," by George S. Kaufman, presented by WGY players; a few moments with new books, L. L. Hopkins, assistant librarian, General Electric company; instrumental selection, "Fragrance," by Ascher, WGY orchestra; "Dulcy," a comedy in three acts, by George S. Kaufman and Marc Connelly, presented by WGY players. The cast: Dulcinea, Ruth Schilling; Gordon Smith, her husband, Edward H. Smith; William Parker, her brother, Edward E. St. Louis; C. Roger Forbes, Jerome Lovenheim; Mrs. Forbes, Helen Campbell; Angela Forbes, Lola Sommers; Schuyler Van Dyke, Frank Oliver; Tom Sterrett, advertising engineer, Barrington Havens; Vincent Leach, scenarist, John Loftus; Blair Patterson, Charles Baumes; Henry, Harold Sunde; return engagement of Ruth Schilling as guest artist of WGY players. Act 1—Dulcy's home (a living-room) in Westchester county within commuting distance from New York; 5 o'clock Friday afternoon. Instrumental selection, "Pizzicato Polka," from the "Sylvia Ballet" (Delibes), by orchestra. Act 2—Same as act 1—immediately after dinner the same evening. Instrumental selection, "Canzonetta" (Hollander), by orchestra. Act 3—The same—the following morning. Instrumental selection, "Penseroso" (Bette), by orchestra.

WGR—Buffalo; 319 meters:

Day—9:45 a. m., weather forecast for Buffalo and western New York; 11 a. m., weather, produce and live stock market reports; 11:30 a. m., organ, dining-room, Hotel Statler, George Albert Bouchard; 1:30 p. m., closing prices of Chicago Board of Trade; 2:30 p. m., closing prices of New York Stock exchange; 3 p. m., tea-time music, Palm room, Hotel Statler, Miss Martha Gomph, harpist; Miss Catherine Stang, violinist; 5:30 p. m., dinner music, Vincent Lopez, Hotel Statler Dance orchestra.

Evening—6:30 p. m., digest of the day's news; second broadcasting of all daily reports; industrial employment bulletin; the American boy story; 8:45 p. m., ballroom, Hotel Statler; banquet of the Canadian Lumbermen's association.

WJY—New York City; 405 meters: Tuesday, Thursday, Friday, 6:30 to 10:30 p. m.; Sunday, 1:30 to 4:30 p. m., and 7 to 9:30 p. m.

Evening—6:30 p. m., Freda Williams, soprano, accompanied by Creighton Allen; 7:15 p. m., Wilbur C. Whitehead, "Auction Bridge"; 7:30 p. m., concert by Paul Specht and his Alamac Hotel orchestra, from the WJY studio.

WJZ—New York city; 455 meters: No silent night.

Day—4 p. m., Avy La Skere, noted double-voice entertainer; 4:30 p. m., closing reports of the New York state department of farms and markets; farm and home reports; closing quotations of the New York Stock exchange; foreign exchange quotations; Evening Post news.

Evening—6 p. m., "Jack Rabbit Stories," by David Cory; 6:30 p. m., New York university radio extension course lecture; 7 p. m., the world's work; 7:15 p. m., evening organ recital played by Dr. Alexander Russell on the Wanamaker organ; 8 p. m., Anne Lewis Pierce of the New York Tribune institute; 8:15 p. m., joint recital by Erna Korn, contralto, and Hedy Spielter, pianist; 9:15 p. m., Jimmy Moore's popular program; 9:30 p. m., dance program by the Hotel Commodore orchestra, under the personal direction of Bernhard Levitow, direct from the Hotel Commodore.

WOO—Philadelphia; 509 meters: Silent Sunday, Tuesday, Thursday, Friday and Saturday evenings.

Day—10 a. m., grand organ; 10:30 a. m., United States weather forecast; 10:55 a. m., United States naval observatory time signals; 11 a. m., luncheon music by the Tea Room orchestra; 3:45 p. m., grand organ and trumpets; 4 p. m., sport results and police reports.

Evening—Silent.

WOR—Newark, N. J.; 405 meters:

Day—1:30 p. m., Paula Nodine in piano selections; program, "Etude in E Minor" (Chopin), "Prelude in G. Minor" (Rachmaninoff); 1:45 p. m., soprano solos by Mrs. Ralph W. Bird; 2 p. m., talk by Maude Wetmore, fosterer of the minimum wage and forty-eight-hour law; 2:15 p. m., "From Society Matron to Business Woman," by Mrs. R. L. Douglas; 2:30 p. m., continuation of piano selections by Paula Nodine, "Polonaise in C Minor" (Chopin), "Hungarian Dance in G Minor" (Brahms); 2:45 p. m., soprano solos by Mrs. Ralph W. Bird; 5:15 p. m., "music while you dine," Wellmont theater of Montclair, N. J., presents Walter Feidkant, Alan Moran and Carl Good in a piano recital; 5:30 p. m., "music while you dine" featured by Tom Cooper's Country Club orchestra.

WRC—Washington, D. C.; 469 meters: Silent Tuesday, Thursday and Saturday evenings.

Day—2:00 p. m., fashion developments of the moment, prepared by Women's Wear, 2:10 p. m., song recital by Ellen J. Roman, soprano; 2:25 p. m., current comments by the editor of the Review of Reviews; 2:35 p. m., piano recital by Ethel Grant; 2:50 p. m., Bradstreet's financial report; 3:00 p. m., the Magazine of Wall Street; 4:15 p. m., instruction in international code; 5:00 p. m., children's hour, by Peggy Albion.

Evening—Silent.

WRW—Tarrytown, N. Y., 273 meters:

Evening—8 p. m., Westchester county police reports.

WDAR—Philadelphia, Pa.; 395 meters:

Day—10:45 a. m., daily alamanac; 11:02 a. m., organ recital from the Stanley theater; features from the studio; Arcadia Concert orchestra, Fery Sarkozi, director; 1 to 2 p. m., Arcadia Concert orchestra—artist recital from the studio; 3:30 p. m., Woman's club hour.

Evening—6:30 p. m., Dream Daddy with the boys and girls.

Midwest Programs.

WCAL—Northfield, Minn., St. Olaf college, P. Skifter, director; Ellu Hjertass, program director; 360 meters.

Evening—9 p. m., program by St. Olaf college students. Ruby Jacobson, Story City, Iowa, pianist; Arna Njaa, Northwood, N. D., soprano; Palmer Myran, Alpena, S. D., violinist; Robert Walledon, Chicago, accompanist; "Meadow Brook" (MacDowell), "Uncle Remus" (MacDowell), by Miss Jacobson; "O Sleep Why Dost Thou Leave Me" (Handel), "The Lass with the Delicate Air" (Arne), by Miss Njaa; "Simple Aveu" (Thome), "To Spring" (Grieg), by Mr. Myran; "Deep River" (Fischer), "Slumber Song" (Gretchaninoff), "In Winter I Get Up at Night" (Nevin), "Of Speckled Eggs" (Nevin), by Miss Njaa; "Bagatelle in C" (Beethoven), "Bagatelle in E Flat" (Beethoven), by Miss Jacobson.

WCX—Detroit, Mich.; 517 meters:

Day—1 p. m., news bulletins; 1:15 p. m., stock quotations; 1:20 p. m., Rev. Gains Glenn Atkins, D. D., speaker; a twenty-minute explanation of the international Sunday school lesson; 1:50 p. m., government weather forecast; 3:15 p. m., music; 5 p. m., dinner concert, broadcast from Hotel Tuller.

Evening—6 p. m., musical program.

WJAX—Cleveland; 390 meters: Silent every night except Tuesday and Thursday.

Evening—8 p. m., "Hark, Hark, the Lark" (Schubert-Liszt) and "Witches' Dance" (MacDowell), piano solos, Mrs. Ada Morris Hastings; "Hebrew Melody" (Bantock), "By the Brook" (Fischer) and "Concert Gavotte" (Schlemuller), cello solos, Mrs. Gertrude Heacox Stover; "Recitative and Aria" (Debussy), Miss Prudence Fish; "Intermezzo" (Schutt), "The Swan" (Saint-Saens) and "Scherzo" (Van Goens), cello solos, Mrs. Gertrude Heacox Stover; "Charity" (Hagemann), "My Lovely Celia" (Old English) and "The Brown Bird Sings" (Haydn Wood), Miss Prudence Fish; "Waltz Caprice" (Strauss-Tausig), piano solo, Mrs. Ada Morris Hastings; 9 p. m., "Mama Loves Papa," "Home in Pasadena," "Chili Bom Bom" and "Raggedy Ann," fox trot; "I Love You, Dear," waltz; "Walk, Jenny, Walk," "Oh! Gee Oh! Gosh," "Aready," "I Love You" and Dancing Honeymoon," fox trot; "Love Is All," waltz; "Love Is Just a Flower," "Somebody Stole My Gal," "Linger Awhile," "Lovey Came Back," "Sahara Rose," "Buddha Smiles" and "Sleep," fox trot.

WLAG—Minneapolis, Minn.; 417 meters: No silent nights.

Day—9:30 to 9:45 a. m., announcements; 10:45 to 11:15 a. m., household hints; 11:35 a. m. to 12 m., surprise program; 2 to 2:30 p. m., woman's club hour "Electricity and Its Uses in the Home," H. A. Dahl; weekly dancing lesson, Tess Cooperman; 4 to 4:30 p. m., story reading, "Abe Lincoln's First Circus" (Babcock), by Mildred Simons; 5:30 to 6 p. m., children's stories by Eleanor Poehler.

Evening—6 to 6:15 p. m., weekly talk on dogs, Dr. J. S. Dick Jr.; 6:15 to 7 p. m., George Osborn's Minneapolis Athletic Club orchestra; 7:30 to 8:15 p. m., farm lectures, "What Will Congress Do to the Railroads," M. L. Countryman.

WLW—Cincinnati; 309 meters: Silent Friday and Saturday.

Day—10:30 a. m., weather forecast and business reports; 1:30 p. m., business reports; 3:00 p. m., market reports; 4:00 p. m., piano selections by Adelaide Apfel.

Evening—10 p. m., the Cincinnati Conservatory trio; H. Borjes, violinist; Arthur Bowen, cellist; Thomle Prewitt Williams, pianist; Mendelssohn trio: Allegro, Andante, Sherzo, Finale; 10:30 p. m., the Cincinnati Zither quartet, Ruth Hobe, Charles Hobe, A. Roerich and L. Wegert; selections, "The Woodlawn Inn," and two trios with violin obligato: "Only You," and "Divided Sorrows." 11:00 p. m., Zella Lemar's Ladies' Dance orchestra, playing: "Only a Baby," "Pepkin," "Dear Old Georgia Mama," "Bobbed Haired Bimbos," and other numbers released by the National Association of Broadcasters, 1265 Broadway, New York city.

WOC—Davenport, Iowa; 481 meters: Silent Tuesdays.

Day—10 a. m., opening market quotations; 10:55 a. m., time signals; 11 a. m., weather and river forecast; 11:05 a. m., market quotations; 12 noon, chimes concert; 2 p. m., closing stocks and markets; 3:30 p. m., educational program and concert; 5:45 p. m., chimes concert; 6:30 p. m., Sandman's visit.

WSAI—Cincinnati, United States Playing Card Company; 309 meters. Tuesday, Thursday, Saturday evenings.

Evening—8 p. m., musical program; 9 p. m., address, "Recent Tendencies in American History," Prof. Beverly Bond, history department, University of Cincinnati; 9:15 p. m., instrumental and vocal numbers.

WTAM—Cleveland; 390 meters: Broadcasts only Wednesday and Saturday evenings at 7 to 8 p. m.,

WWJ—Detroit, Mich.; 517 meters: Silent Saturday.

Day—12 noon, dance music by Jean Goldkett's orchestra, broadcast from the Graystone ballroom.

Evening—Silent.

WOI—Ames, Iowa, Iowa State college; 360 meters.

Southwest Programs.

KSD—St. Louis; 546 meters: Silent Friday.

Day—Opening, midsession and closing quotations on the St. Louis grain markets; live stock conditions; Liverpool and New York cotton market; New York stocks, bonds and money market; metal markets, weather reports, forecast and news bulletins are broadcast at 8:40, 9:40, 10:40, 11:40, 12:40, 1:40, 2:40 and 4 daily.

Evening—8 p. m., broadcasting concert of the St. Louis Symphony orchestra, Rudolph Ganz conductor; Ignaz Friedman, pianist, soloist, given at the Odeon.

WBAP—Fort Worth, Texas; 476 meters:

Day—10 a. m., to 4 p. m., markets and financial review.

Evening—7:30 to 8:30 p. m., concert by the old-time fiddlers of Burleson, Texas (E. L. O. announcing); 9:30 to 10:45 p. m., concert by the Masonic Home orchestra, presenting an opera (G. C. A. announcing).

WDAF—Kansas City, Mo.; 441 meters;

Day—3:30 to 4:30 p. m., musical matinee; D. Ambert Haley's Dance and Concert orchestra.

Evening—6 to 7 p. m., school of the air; piano tuning-in number on the duo-art; marketgram, weather forecast, time signal and road report; address, speaker from the William Jewell college, Liberty, Mo.; address, speaker on "Cancer Week"; the children's story and information period; music, Fritz Hanlein's Trianon Ensemble, Hotel Muehlebach; 11:45 p. m. to 1 a. m., nighthawk frolic; the "Merry Old Chief" and the Coon-Sanders Novelty Singing orchestra, Plantation grill, Hotel Muehlebach; pipe organ recital by Miss Norma Mannering of the Newman theater.

WFAA—Dallas, Texas: 147 meters: Silent Wednesday.

Day—10:30 a. m., United States weather bureau report and forecast and C. A. M. A. A. highway condition bulletin for the southwest followed by Dallas produce market quotations, early cotton market report and Wall street review; 12:30 p. m., address; 2:30 to 2:45 p. m., Dallas live stock market, late general markets, sport news; 3:30 to 4 p. m., agriograms, health bulletins, Texas market news; 5:30 to 6 p. m., bedtime story and fairy tale, told by Miss Mary C. Toonoy.

Evening—8:30, music.

WGV—New Orleans; 359 meters.

WHAS—Louisville; 400 meters: Silent Mondays.

Day—4 to 5 p. m., selections by the Walnut theater orchestra; Walter Davison, conductor; selections by the Strand theater orchestra, Harry S. Currie, conductor.

Evening—9 to 10:30 p. m., music.

WHB—Kansas City, Mo; 411 meters: Silent Monday, Wednesday and Friday.

Day—8:25 to 8:30 a. m., estimated live stock receipts; 9:25 to 9:40 a. m., live stock, grain quotations; 10:25 to 10:40 a. m., live stock, grain quotations, weather and shippers' forecast, road conditions and foreign exchange; 11:25 to 11:40 a. m., live stock, grain quotations; 12:25 to 12:35 p. m., live stock, grain quotations; 12:35 to 1 p. m., popular musical program: "You're From Kentucky," "Sure as You're Born," "San," "No, No, Nora," "Aready," "Last Night on the Back Porch," selection from "Tangerine, (Sanders), Sweeney Radio orchestra; "The Daisy Chain," (Wheeler), Sweeney Radio orchestra; "Gitanilla Suite," "Les Romani," Sous les Etoiles," "Petite Marche," "Valse Bohem" (Tacome), by Sweeney Radio orchestra. Saxophone trio—"The West a Nest and You," Floyd Estep, Roy Sanford, Thomas McCluskey. Three Hebrew melodies: "Hebrew Song," (Rimsky-Korsakow), "Orient Chant" (Moussorgsky), "Hebrew Dance," (Karganoff), by Sweeney Radio orchestra; "Roses of Picardy," (Wood), by Sweeney Radio orchestra; 3 to 3:05 p. m., information from the United States weather bureau; 3:05 to 3:20 p. m., grain ma[illegible] review; 7 to 7:30 p. m., educational [illegible] am; saxophone duet, selected, Floyd Estep, Roy Sanford. Address on "Better Homes and Buildings," auspices of Better Homes Exhibit; piano solo, "Submerged Cathedral" (Debussy), by George Parrish; talk from the department of agriculture; piano duet, selected; George Parrish, Floyd Estep; 8 to 9 p. m., selected and classical and popular music and instrumental solos by the Sweeney Radio orchestra.

WMC—Memphis; 500 meters: Silent Wednesday.

Day—Stocks and news every half hour from 9 a. m., to 10 p. m.

Evening—8:30 p. m., the Chisca Hotel Philharmonic orchestra appearing in their weekly recital.

WSB—Atlanta, Ga., Atlanta Journal; 429 meters:

Day—5 p. m., news, market and message by C. V. Hohenstein, secretary of the automobile association; 5:30 p. m., kiddie program and Burgess bedtime story by Miss Bennie Bardhardt.

Evening—8 to 9 p. m., concert from the Wesley Memorial church; 10:45 p. m., transcontinental radiowl entertainment by members of the Mexico City Y. M. C. A. basket-ball team

WOAI—San Antonio, Texas; 385 meters: Silent nights, Mondays, Wednesdays and Thursdays.

Day—5 p. m., twilight concert by Vick Myers Melody orchestra; news, markets and talk on birds by Atlanta's "Bird Lady," Mrs. Ed Smering; 5:30 p. m., kiddie program and Burgess bedtime story by Miss Bonnie Barnhardt.

Evening—8 to 9 p. m., musical entertainment, sponsored by Mrs. Elizabeth Reeves Andrews, soprano; 10:45 p. m., transcontinental Radiowl entertainment, presenting the Foot-Warners Dance orchestra.

WHAB—Galveston, Texas; 360 meters:

Pacific Coast Concerts.

KGO—Oakland, Cal., General Electric company; 312 meters:

KDZE—Seattle, Wash; 455 meters: Silent nights, Tuesdays, Thursdays and Sundays.

KFDR—San Francisco; 509 meters:

Evening—Music.

Day—1 p. m., weather forecast.

KGW—Portland, Ore., Portland Oregonian; 492 meters.

Day—1 p. m., weather forecast; 5:30 p. m., woman's story program; installment of "The Midlander," by Booth Tarkington.

Evening—9:30 p. m., weather forecast and market reports; 10 p. m., one-act plays by Red Lantern Players; 12 p. m., dance music by George Olsen's Metropolitan orchestra of the Hotel Portland; violin solos by Marie Chapman MacDonald.

KHJ—Los Angeles; 405 meters;

Evening—10:45, 11:30 p. m. to 1 a. m.

KPO—San Francisco; 425 meters; 500 watts: Crair F. Morrison, station director; Ada Morgan O'Brien, program director. Friday night silent.

Day—2 p. m., time signals from the naval observatory; 3 to 4 p. m., Rudy Sieger's Fairmount Hotel orchestra, by remote control.

Evening—8 to 9 p. m., dinner concert by George Lipschultz and music masters from the Loews' Warfield theater, Marie Wallam, soloist; 10 to 11 p. m., Herold Montague Schulteis at the console of the Robert Morton organ; 11 to 12 m., a delightful program will be presented by some talented artists, Eleanor Clarke Boyle, soprano, accompanied by Eugene Knotts; Ray Johns, basso, accompanied by Charles Greenwood, and other instrumental numbers; a short talk on "The Community Guest," by Robert Newton Lynch; 12 m. to 1 a. m., Palace Hotel Dance orchestra, by wire telephony.

Opinions of Radiophans

"THERE ARE TWO SIDES," ETC.

RADIO EDITOR: Your Radio Magazine completely satisfies me, and I look forward to its receipt every Thursday.

Strange that several readers have written to you complaining of WJAZ. I live within eight blocks of that station.

Tuesday night the announcer read an attack on Anti-Saloon league and the nineteenth amendment as given by some "wet" congressman. I have never heard them make any "news" announcements before, except after midnight Wednesday. The "World Crier" gives us plenty of that.

Wednesday night WJAZ announced that they were going to drop down to 365 wave length at 1 a. m., because their McMillan news bulletin broadcasts were being interfered with by stations in Ireland, Germany, France and Sweden.

Several weeks ago they requested the Canadian stations to remain silent for the same reason.

I can tune every Chicago station out entirely, except them. I don't believe they stay on their alloted wave length, as many times I think I have them tuned out, only to have them come in and out again.

Their programs, except in spots, do not make me like them, nor do any of my friends speak a kind word for them.

Why do the government officials, against all rules of broadcasting, allow this station to continually advertise their own merchandise? Why not let other makers, too, get this same publicity.

No reason in the world for allowing this station to annoy us four straight hours and more every evening when we are so anxious to get some of the wonderful programs of the other Chicago stations.

Why don't they pattern after the good sportsmanship shown by WDAP, WMAQ and KYW when opera or other great events are given us, by remaining silent?

I checked up one night this week and found that almost one hour and three-quarters of the four hours broadcast was taken up by the announcer patting himself and the station on the back.

I dare you to put this up to your readers to vote on.

In short, I want to add my name and my many radio friends (names on request) to your list of protestors. In fact, the more I think of the many interesting programs from other local stations they have spoiled in this third largest city in the world where are located probably one-sixth of all the radio listeners in America, the more I wonder that influential papers like The Post, News, American and Tribune do not go to the front and give us some relief. They are exceeding their rights. Nothing wrong with my set. Don't intend to substitute a "Zenith," for it is so I can be sure to tune WJAZ out when I want to. I'll probably get still further disgusted and call my radio enjoyment off at 10 p. m. every night.—H. H. OLSON, 522 South Clinton Street, Chicago.

(EDITOR'S NOTE—And yet, Friend Olson, the writer knows of several owners of receiving sets even closer to WJAZ than you who have no difficulty tuning this station out at any and all times. We cite you to one owner, T. E. Hamilton, 5959 Magnolia avenue, who is just about the same distance, on a direct line, from WJAZ, as you are. To our own knowledge he has pulled in Havana, Cuba, while all the local stations were on the air, WJAZ included. And, furthermore, two weeks before he had never tuned a set in his life. Let us call your attention to the helpful articles last week and this week in our new department, "Home Radio Operation." Perhaps you can find a suggestion there that will make you as contented with your receiver and WJAZ as you are with The Post Radio section. Here's hoping, anyway.)

INTERFERENCE IN EVANSTON.

RADIO EDITOR: I noticed in your Radio Magazine that it was a violation to send code by an amateur between 8 and 10:30 p. m. There is a party living near me who is sending code during these hours which always bothers the concerts from the broadcasting stations for listeners-in. If you will give me the address of the department of commerce I would be very thankful.

I certainly enjoy every page of your Radio Magazine section. It is just as good as the high-priced monthly magazines. Keep up the good work.—FRANK PETERSON, 1935 Darrow Avenue, Evanston, Ill.

(EDITOR'S NOTE—Are you quite sure this interference is not caused by the Great Lakes station, or even some of the ships at sea who work on broadcast wave bands? They come in mighty hard sometimes. Write Radio Inspector Beale, Federal Building, Chicago. He looks after the 9th district complaints.

IT IS IN THIS ISSUE.

RADIO EDITOR: Like Mr. Jacobson, I am very much interested in the miners' superdyne. In your Dec. 27 issue you stated that this circuit was being given a thoro test in The Chicago Evening Post's radio experimental laboratories, and a report on its actions, details of construction and notes on operation would appear in an early issue.

I have been waiting very patiently for this article, but up to date have not seen same. I am very sure that it would be greatly appreciated by all interested if you could advise when this information will appear.—E. GUIBAULT, 2640 North Hamlin Avenue.

WELL, WELL, HERE'S PRAISE!

RADIO EDITOR: I read in your Radio Magazine complaints from different phans about this or that station interfering with their DX.

Isn't it time that these knockers get next to themselves and realize that it isn't the station's fault if they can't cut out its interference?

In this week's issue one says: "I can get hundreds of petitions for this station, presumably WJAZ, to close down six days a week. I live five blocks away, and have not heard of any set that can tune them out."

Let me tell you something, Mr. Knocker: "Chicago owns five different stations, and some one or other has to live near some station. While it is (presumably) WJAZ that bothers you, there's WDAP and KYW that bother me.

There is WMAQ which plays unfortunate tricks for some other unfortunate DX.

If each one of us should petition our respective interfering station to close down, then we will have no local stations.

Better move to some suburb and escape your interference. The station that some wish to petition to close down has very good programs, to my estimation.—P. J. MILLER, 1252 North Campbell Avenue.

A FAIR, SQUARE ANALYSIS.

RADIO EDITOR: Your article in the Jan. 17 issue of The Post, re air jam, gives everybody a fair and square analysis. It shows to those using the receiving sets how it is so necessary that they must be unselfish, and try to learn to tune better, and also improve their own sets. Everybody should realize that position.

And now I wish to explain where that unselfish spirit should end.

When a fairly selective three-tube set, which has had no trouble tuning in or cut any one Chicago station (while all the three most powerful were in operation) is now, or was last week (Thursday), unable to tune out KYW on the 180 degrees of the inductance and capacity dials, then I think it is doing an injury to broadcasting. Formerly, KYW tuned clear and sharp.

WMAQ also at times is all around the dial during recent weeks and WDAP has always taken up plenty of the dial space, but never the whole of it, so it appears as the the former two stations are endeavoring to see one better than its neighbors. Hope you receive many more protests.

I believe there should be a limitation to the number of statios, broadcasting at the one time. Also as to broadness of their tuning on a good selective tube set.

Your Radio Magazine is just one wonderful succession of radio gems.—W. J. HERBERT, 229 North Sacramento Boulevard, Chicago.

WELL, SHALL WE PRINT IT?

RADIO EDITOR: There are a large number of old navy operators in Chicago who used to copy press and dispatches on high-power wave lengths (above 8,000).

I am sure it would be to your advantage to include in your magazine at some future date instructions for the construction of a radio set of unlimited range, or, at least, up to 27,000 metters. You might mention such an idea in your magazine and see if any favorable letters are received.—RADIO READER.

SUBMITTED TO READERS.

RADIO EDITOR: I wonder if one of your radiophans could tell me at what station Harvey G. Gahl appeared Sunday evening at 6:30 p. m., Jan. 20, as I missed the call signals when he was signing off. I think your Radio Magazine is great. Keep up the good work.—A. J. BAKER, 3207 South Wells Street.

SUPER-HETERODYNE BLUE PRINTS.

RADIO EDITOR: Will you please advise me where I can obtain blue prints and instructions; also list of parts and accessories for the Armstrong super-heterodyne eleven-tube set described in your article Jan. 24?

Allow me to extend the congratulations of myself and a dozen friends on the best radio article for the mystified public ever published. Your radio magazine heads the list.—V. LAMONT, 201 South LaSalle Street, care Halsey, Stuart & Co.

(EDITOR'S NOTE—Most any radio dealer sells blue prints, and very likely of the circuit you speak.)

Universal Panel as a Cockaday

Continued from Page 11.

ary and absorption windings must be at least six inches long. The tube containing the antenna load winding must be approximately two inches in diameter.

The secondary coil is connected directly across the variable condenser illustrated at the left of the tuner. One side of the condenser and coil goes to the grid or G terminal of the terminal strip on the detector and two-step amplifier.

The other connection of the condenser goes to the plate or P and B of the terminal strip.

A wire from the ground terminal is run to the filament or F terminal.

If the set should be troubled with body capacity, grounding the rotor of the condenser of the absorption circuit will give relief. This connection is shown in the illustration at X.

In the diagram of the detector and two-step amplifier a slight change is necessary to adapt it for use with the four-circuit tuner.

In place of the grid leak as illustrated a .00025 grid condenser should be inserted. The grid leak should be connected from the grid terminal of the socket to the F terminal on the terminal strip or to the negative A lead.

Honeycomb Coils Next.

Beginning with next week's article I will commence describing and illustrating circuits employing honeycomb coils.

To avoid a shortage of three-coil mountings I would advise purchasing early if you have not already obtained one.

Experimenting and building circuits of honeycomb coils is a most fascinating and economical way of adapting various circuits. On account of the flexibility in the handling of all wavelengths and the possibilities of using honeycomb coils for the development of new circuits and the efficiency and low losses of that particular type, whether honeycomb or duo-lateral, they should form a desirable part of every amateur's accumulation of apparatus.

Records of DX Hounds

"THOUGHT IT "SILENT" NIGHT.

RADIO EDITOR: Listening-in station ICJ wishes to extend New Year's greetings to ye editor and all readers of the best radio magazine in the country, and hopes that the new year will be a most prosperous one for both the magazine and its readers.

DX Flyer, the official receiving set of station ICJ, and brother of "Old Reliable" (I think brother is the proper term, because they are both offsprings of the three-circuit family), got its dates twisted last Thursday night (Dec. 27) and thought it was silent night. When we first tuned in some one was singing "Stilly Night," and I guess that accounts for the mistake.

Yes, sir! As far as old DX Flyer was concerned it was silent night, for it went right thru every local station and brought in thirty-three out-of-town stations.

Following is a complete logging of stations tuned in at listening-in station ICJ on Thursday, Dec. 27, 1923:

6:15—WOAW (Omaha), Robert Melody Boys.

6:20—WLAG (Minneapolis), music from athletic association.

6:22—WDAF (Kansas City), road reports.

6:24—WOR (Newark), orchestra, "I Loved Her," etc.

6:35—KDKA, East Pittsburg, market reports.

6:36—WOC (Davenport), "Sandman" story.

6:45—WGY (Schenectady), talk on "Mah Jongg."

7:05—WWJ (Detroit), song, "Love Has Wings."

7:10—WEAF (New York), talk, "Hunting the Gorilla."

7:15—WCAP (Washington), selection from opera (Tongue Twister).

7:25—WFI (Philadelphia), Boy Scout program.

7:30—WHB (Kansas City), "Mighty Lak a Rose."

7:33—WJAX (Cleveland), overture from "The Flying Dutchman."

7:40—WHAS (Louisville), orchestra, "I Cry Myself to Sleep Over You."

7:42—WCX (Detroit), Cornell University Glee club.

7:55—WBAP (Fort Worth), piano solo (classical).

8:20—WIAO (Milwaukee), announcing.

8:35—WTAS (Elgin), orchestra, "Louisville Lou."

8:45—WNAC (Boston), soprano solo, "Aria" (in French).

9:00—WBZ (Springfield), time signals.

9:05—WOQ (Kansas City), orchestra, "I Love You."

9:10—WCAL (Northfield), vocal selections.

9:20—WFAA (Dallas), signing off.

9:25—KSD (St. Louis), University Glee club.

9:35—WMC (Memphis), announcing receipt of telegrams.

9:45—WBAH (Minneapolis), orchestra, "No, No, Nora."

9:55—KLZ (Denver), announcing "Some one hiding behind piano," etc.

11:10—WLW (Cincinnati), sacred songs by Choral society.

11:20—KOP (Detroit), orchestra, popular selections.

11:45—WTAM (Cleveland), testing, "Kiss Me Again."

12:15—KFI (Los Angeles), violin solos, "Meditation," "Memories."

12:30—WSB (Atlanta), special program, "Willie the Weeper."

1:15—KPO (Frisco), "Japanese Love Song," by Palace Hotel orchestra.

With the exception of Denver and Springfield every station listed above came in clear and loud. I got Frisco so loud I thought WDAP was re-broadcasting them. The Drake was re-broadcasting Kansas City and Cleveland, but Old DX Flyer brought the Pacific coast station in right thru them. I could not get KHJ on 395 meters, because WFAM on 390 was coming in like WTAS.

At 10 o'clock I turned off the tube and turned on the tub. You know, even us rabid DX fiends must find time to tune in on H20. This accounts for the sudden cessation between 9:55 and 11:10.

Last spring, when we north siders were getting WJAZ on the loud speaker, using only a crystal, it was our favorite, but oh boy! when we graduated to the ultra-audion, and got them all over the dials, it was a different story. Being only a little over a mile from them on an air line, I soon knew all the classical numbers of music.

While I heartily agree with every word ye editor said recently in his article on the congestion prevailing in Chicago air circles, I believe the manner in which it can be overcome is for radio listeners to make selectivity the prime factor in the selection of their circuits. The Post is helping toward this end by publishing only those circuits which have some degree of selectivity.

I have kept a record of all the stations tuned in while WJAZ was on the air. With the ultra-audion I did manage to break thru and get KSD and WOAW, but late in August I began to experiment with the three-circuit tuner, "Old Reliable," "DX Flyer," or whatever you want to call it, and it was then that I began to get all the enjoyment out of radio.

The following stations have fallen victims while WJAZ was broadcasting:

WOC, 484; WOAW, 527; WGY, 380; WLW, 309; WTAS, 286; KSD, 546; WBAP, 476; KDKA, 326; WLAG, 417; WIP, 509; WFAA, 476; WMC, 500; WTAM, 390; WDAF, 411; WSY, 360; WEAF, 492; WHB, 411; WSB, 429; WCX, 517; WCAP, 469; WSAI, 309; WCBD, 345; WDAR, 395; WJAR, 360; WBZ, 337; KFKB, 286; KHJ, 395; KFI, 469; WHAH, 360; KOP, 286; 2XB, WBAY, 492.

It takes real selectivity to tune in WSB, 429, when WJAZ is on 448 meters. Probably the height of selectivity that the Armstrong three-circuit tuner can accomplish is bringing KSD on 546 and WOAW on 526 in, while KYW with 1,000-watt power is going full blast on 536 meters.

During the month just past the old DX Flyer brought in over 550 long-distance stations. On silent nights it brought in from thirty-five to forty-three DX stations. On other nights its record was from fourteen to thirty-three stations. Seventy-three of the 550 were different stations, which includes San Antonio in the south; Regina in the north; Frisco in the west, and Boston in the east. And yet, in spite of it all, I can't get Havana on a Wednesday. (I am never home on Saturday night, so I lose this opportunity of fishing for them.) When PWX comes in, instead of WHAS and WOR around 400 meters, I will pass out the Havanas.

The telephone calls and letters continue to pour in. The Post Radio Magazine must have a wide circulation. One letter from Mississippi and one from Iowa. Boys, if we lived down in Mississippi we could get 2LO every night. The writer from that state tells me there is not a broadcasting station in the state. Move to Mississippi if you can't get selectivity. That's one solution to our air jam.

Talk about hogging the air, I think I am taking up too much of The Post's good space, so I am going to sign off for the year. Happy New Year, everybody.—IRVING JOHNSON, 4551 North Clark street, Chicago.

THEY CERTAINLY DO.

RADIO EDITOR: Wave traps help. I added a wave trap to a single-circuit regenerative set employing detector and two stages of audio-frequency and found I could eliminate all near-by stations and get real DX. These stations come out of my Magnavox while near-by stations are on:

CYL, Mexico City; CKCK, Regina, Canada; CFCN, Calgary, Canada; CKAC, Montreal, Canada; KFI, Los Angeles, Cal.; KHJ, Los Angeles, Cal.; KPD, San Francisco, Cal.; KGO, Oakland, Cal.; KGW, Portland, Ore.; WNAC, Boston, Mass.; WJAR, Providence, R. I.; WOAI, San Antonio, Texas; WJAD, Waco, Texas; WFAA, Dallas, Texas; WBAP, Fort Worth, Texas; KLZ, Denver, Colo.; KDAF, Denver, Colo.; PWX, Havana, and ninety-eight others. I am a satisfied R. C. S. owner.—HENRY JARACZ, 76 West Hickory Street, Chicago Heights, Ill.

139 ON ONE WD-12 TUBE.

RADIO EDITOR: The following is a list of the stations I have received on an WD-12 tube, using the circuit which I have submitted minus one-step:

CFAC, CFCA, CKCK, KDKA, KFDY, KFEL, KFFB, KFI, KFIX, KFJK, KFJX, KFKB, KFKX, KGW, KHJ, KLX, KLZ, KOP, KPO, KQV, KSD, KYW, PWX, WAAF, WAAP, WAAL, WAAK, WABA, WAAW, WBAD, WBAH, WBAK, WBAP, WBAV, WBAY, WBAV, WBAY, WBU, WBZ, WCAE, WCAH, WCAL, WCAP, WCAR, WCAS, WCAY, WCBD, WCE, WCK, WCX, WDAF, WDAJ, WDAR, WDAP, WDT, WEAF, WEAN, WEAO, WEB, WFAR, WFI, WGAL, WGM, WGR, WGF, WGY, WHAA, WHAH, WHAM, WHAS, WHAZ, WHA, WHB, WHK, WIAO, WIAI, WIAR, WIAS, WIP, WJAD, WJAN, WJAR, WJAD, WJY, WJZ, WKY, WLAG, WLW, WMAD, WMAJ, WMAK, WMAQ, WMAT, WMAY, WMC, WNAC, WNAV, WOAI, WOAN, WOAW, WOC, WOI, WOO, WOQ, WOR, WOS, WPAC, WPAD, WPAL, WPAH, WPAM, WPA, WRC, WRM, WSAH, WSAI, WSB, WSY, WTAM, WTAS, WWAE, WWAY, WWJ, ZXB, 3LOW, 5CD (Toronto), 5CV (Memphis), 9AEM, 9ARX, 9AUY, 9AWK, 9AAK, 9ARM, 9BA, 9BP, 9ABT, 9AV, 9BFD, 9XN, 9BRN, 9BAK—total, 139. —VERNON DAWSON, 160th Street and Myrtle, Harvey, Ill.

SOME RECORD, WE'D SAY!

RADIO EDITOR: I have been a constant reader of your Radio Magazine, which you publish every Thursday in your paper. I noticed in the column of "Pick-up Records of Phans" that some of them seem to have the best record with the "Old Reliable."

Some radiophan wanted to hear from some one having one of these three-circuit regenerative sets that could get distance. Well, here's a little competition. I have a three-circuit regenerative tuner with two steps of audio amplification, with a loud speaker. Fifty per cent of these stations were heard on the loud speaker. It is also a home-made receiver. Your Radio Magazine can't be beat. Keep up the good work. 2XI, Schenectady, N. Y.; WGY, Schenectady, N. Y.; KDKA, East Pittsburg, Pa.; WJZ, Newark, N. J.; WOR, Newark, N. J.; WLW, Cincinnati; WHK, Cleveland; WHAS, Louisville; WBT, Charlotte, N. C.; WSB, Atlanta; WGM, Atlanta; WKM, Memphis, Tenn.; NOF, Anicostia, D. C.; WRC, Washington, D. C.; WWJ, Detroit, Mich.; KOP, Detroit, Mich.; WLAG, Minneapolis; KOP, Detroit, Mich.; WJAP, Duluth, Minn.; WAAK, Milwaukee; WIAO, Milwaukee; WCAY, Milwaukee; WEAO, Columbus, Ohio; WOH, Indianapolis; WLK, Indianapolis; WOC, Davenport; WOI, Ames, Iowa; WHB, Kansas City, Mo.; WBL, Anthony, Kan.; WDAV, Muskogee, Okla.; WBAP, Fort Worth, Texas; WFAA, Dallas, Texas; KFAF, Denver, Colo.; KLZ, Denver, Colo.; KFAM, Denver, Colo.; KFEL, Denver, Colo.; WAAP, Wichita, Kan.; WIAA, Waupaca, Wis.; WPAH, Waupaca, Wis.; KHJ, Los Angeles, Cal.; WHAZ, Troy, N. Y.; WSY, Birmingham, Ala.; CJCG, Winnipeg, Manitoba; CFCA, Toronto, Ontario; WBZ, Springfield, Mass.; PWX, Havana, Cuba; WMC, Memphis, Tenn.; WCAE, Pittsburg; WOAN, Lawrenceburg, Tenn.; WTAS, Elgin, Ill.; WRM, Urbana, Ill.; WOAA, Ardmore, Okla.; WMAK, Lockport, N. Y.; WHA, Madison, Wis.; WHAD, Milwaukee; KFI, Los Angeles; WBAV, Columbus, Ohio; WAAC, New Orleans, La.; KGW, Portland, Ore.; WOAW, Omaha, Neb.; WGAR, Fort Smith, Ark.; WGR, Buffalo, N. Y.; WGAY, Madison, Wis.; WCK, St. Louis; KSD, St. Louis; WOS, Jefferson City, Mo.; KPO, San Francisco; KFKV, Milford, Kan.; CKCK, Regina, Saskatchewan; WCAH, Minneapolis; WOO, Philadelphia; WFI, Philadelphia; WDAR, Philadelphia; WJAB, Lincoln, Neb.; KFAV, Lincoln, Neb; WOAI, San Antonio, Texas; CFCN, Calgary, Alberta; WSAI, Cincinnati; WBAK, Harrisburg, Pa.; WNAV, Knoxville, Tenn.; WEAA, Flint, Mich.; WOAW, Omaha; WOQ, Kansas City, Mo.; WMAJ, Kansas City, Mo.; WHAH, Joplin, Mo.; WCAL, Northfield, Minn.; KFKX, Hastings, Neb.; WTAM, Cleveland; WBAM, New Orleans; WJZ, New York; WWAE, Joliet, Ill.; WHAM, Rochester, N. Y.; WPAM, Topeka, Kan.; 9BM, Montreal; WCAP, Washington; WDAJ, College Park, Ga.; WJAX, Cleveland.—HAROLD WEAVER, 733 South Kenneth Avenue.

ONE TUBE GETS 'EM.

RADIO EDITOR: This is a record-breaker for a one-tube home-made radio set. I picked up the following stations between 6 and 11 p. m: WOR, Newark, N. J.; WOAW, Omaha, Neb; WGY, Schenectady, N. Y.; WOC, Davenport, Iowa; WOO, Philadelphia, Pa.; WMC, Memphis, Tenn.; WWJ, Detroit, Mich.; WCBD, Zion, Ill.; WTAS, Elgin, Ill.; WHAZ, Troy, N. Y.; WOS, Jefferson City, Mo.; WDAF, Kansas City, Mo.; KSD, St. Louis, Mo.; WHB, Kansas City, Mo.; WFAA, Dallas, Texas; KFKX, Hastings, Neb.; WSB, Atlanta, Ga.; WBAP, Fort Worth, Texas. This is a good evening's entertainment for anybody who has a set that can get long distance on one W-D-11 tube, and your regular Thursday magazine is a wizard to us radio fans who build our own sets and do experimenting. Hope you will keep up the good work.—CHARLES E. ROGERS, 4409 North Lincoln Street, City.

PICKS UP CYL.

RADIO EDITOR: Have been wondering since last night, how many other "picked up" station CYL, Mexico City, last night (Jan. 7). Picked it up about 11:10 p. m. (C. S. T.), on a wave length of about 500 meters or a little more. The announcement was in English, to the effect that the Mexican newspapers were broadcasting in co-operation with papers of the United States. Signals very clear, and much louder than I get KHJ (Los Angeles). Got the call letters, "CYL" (Mexico City), three times. Would greatly appreciate verification, if possible.—G. PERLEE SMITH, 847 Eastern Avenue, Indianapolis, Ind.

TWENTY-SEVEN STATIONS SUNDAY.

RADIO EDITOR—I read the records of the DX hounds and I think I can shoot a couple across. How is this for a Sunday record? Time, place and selection heard:

Sunday, Jan. 6—2:16, WOC, Davenport, Iowa., "I Love to Tell the Story"; 2:48, 9BA, Chicago, Ill., calling 9BYD; 4:30, KYW, Chicago, Ill., world crier; 4:40, KDKA, East Pittsburg, Pa., services; 4:44, WCBD, Zion, Ill., services; 5:19, WTAS, Elgin, Ill., "March of the Wooden Soldiers"; 5:39, WLAG, Minneapolis, Minn., announcement; 5:45, WBAP, Fort Worth, Texas, signing off; 5:56, WSB, Atlanta, Ga., tenor solo; 6:00, WEAF, New York city, announcement; 6:06, WCAP, Washington, signing off; 6:13, WJAZ, Chicago, Ill., "To the Sea"; 7:08, WHK, Cleveland, Ohio, Cleveland trio; 7:37, WSY, Birmingham, Ala., announcement; 8:08, KFIX, Independence, Mo., "Holy Address"; 8:14, WCAD, Canton, N. Y., violin solo; 8:29, WHB, Kansas City, Mo., services; 8:36, WPAH, Waupaca, Wis., signing off; 9:51, WOAW, Omaha, Neb., "Love's Dream"; 9:56, WDAP, Chicago, Ill., "Have Thine Own Way"; 10:05, WOAI, San Antonio, Texas, violin solo; 10:15, WFAA, Dallas, Texas, weather.

Beat that, if you can. Total of twenty-two stations.—E. B. WISMAN, 8246 Dorchester Avenue.

BUSY NEW YEAR'S DAY.

RADIO EDITOR: Here is our record for New Year's eve on one of our own three-circuit sets using three tubes:

At 4:10, WDAF (Kansas City), popular music by orchestra; at 5:15, WOS (Jefferson City)), early program with a lecture (we also heard WOS later in the evening); at 5:26, WLAG (Minneapolis), children's hour; at 5:45 WFAA (Dallas) came on with an early program, and also later, at 8:45; at 6:40 WDAF (Chicago) came on with a health talk; at 6:45 WOAW (Omaha), with dinner program by Randall's orchestra; at 7:07 WOC (Davenport), with dance music; at 7:18 KSD (St. Louis) came on with theater entertainment; at 7:21 KDKA (Pittsburg), entertainment from a theater; at 7:25, WCBD (Zion, Ill.), announcement, etc. (later had a program from a church); at 7:41 WHA (Madison, Wis.), with a lecture; at 7:46 WHD (Kansas City), with announcements, etc.; at 8 WBAP (Fort Worth), with a dance program by the Texas Hotel orchestra; at 8:04 WSB (Atlanta), with vocal selections; at 8:41 CKCK (Regina, Sask.), with vocal numbers; at 8:52 WWJ (Detroit) came on with the Detroit News orchestra; at 9:02 CFAC (Calgary, Canada) came with selections from the Edison; at 9:11 KHJ (Los Angeles), with the children's hour; at 9:18 WMC (Memphis), with selections from a hotel orchestra; at 9:39 KFFQ (Colorado Springs), with vocal selections; at 9:43 WBAH (Minneapolis), with a dance orchestra; at 9:46 CKQC (Saskatoon, Sask.) came on with dance music from the phonograph; at 10:14 WEAF (New York city), with a dance orchestra, playing "Honolulu Blues"; at 10:21 WTAS (Elgin, Ill.), with announcements, etc.; at 10:26 WOO (Philadelphia); at 10:46 KFKX (Hastings, Neb.) relayed KDKA program of a church; at 10:56 KFEL (Denver, Colo.), with the signing off; at 11:02 KYW (Chicago), with time signals; at 11:10 KPO (San Francisco), with a female trio; at 11:12 WJAZ (Chicago) broadcasted the Oriole orchestra; at 11:58 WJAZ ann ounced that they would turn over the microphone to the hotel dining-room at midnight; at 11:45 WDAP (Chicago) announced that they were rebroadcasting the KSD program; at midnight WJAD (Waco, Texas) came in with their midnight frolic.

We then turned off the tubes, recording the DX logging at thirty-one stations.

We also hear the following stations often: KDYL, KFAF, PXW (Havana, Cuba), WGY, WHAS, WJAX, WTAM, CFCN, CFCJ, WAAP, WBAP, WRR, WEAY, WFAV, KFHP (Kearney, Neb.), KFJA, KOB, WOAE and WJAG. We are very proud of our three-circuit, and certainly agree that "Old Reliable," the three-circuit, is the best all-round receiving set. We hope the Radio section much success and sign off. We challenge anybody to pronounce this record false. — BOUCHER BROTHERS, Radio Experimenters, Kearney, Neb.

NO INTERFERENCE.

RADIO EDITOR: Inclosed is a list of long-distance stations I received Wednesday, Jan. 2. They are in the order I received them.

I have a one-tube set, using WD-11 tubes. Including everything, my set did not cost more than $15. My set consists of spider-web coils, 23-plate condenser, WD-11 tube, and grid leak and condenser.

I think I did pretty good, don't you?

WWJ, Detroit, 517; WOC, Davenport, 484; WCX, Detroit, 517; WCAE, Pittsburg, 462; WEAF, New York, 492; WDAF, Kansas, 411; WHB, Kansas, 411; WTAM, Cleveland, 390; KSD, St. Louis, 546; WHAS, Louisville, 400; WOS, Jefferson City, 441; WOO, Philadelphia, 509; WBAP, Fort Worth, Texas, 476. —WALTER SWINGLER, 6326 Ingleside avenue, Chicago.

HEARS 82 IN TWO NIGHTS.

RADIO EDITOR: Am inclosing a list of eight-two radio stations heard on the nights of Dec. 21 and 22. All the stations heard were QSA, and many of them, KDKA for instance, were heard on a loud speaker without an antenna or ground.

The night of Dec. 22 started the quiet period for American amateurs for the reception of European amateurs. This accounts for the small list (for two nights) of amateur stations heard. Nearly all the amateur stations heard were heard on Dec. 21, and most of the phone stations listed were heard Saturday afternoon and evening. The broadcasting stations were heard during the amateur quiet hours.

Am using a Zenith 1-R tuner with detector and single stage amplifier, for general work, but use the second stage for the loud speaker test mentioned above. Antenna consists of two wires in the attic of a low brick house.

Code—1AYT, 1BDT, 1BIP, 1BIQ, 1CLN, 1BIY, 3ADN, 4FZ, 4DJ, 5QL, 8AMP, 8AEG, 8BOO, 8BUL, 8CDI, 8COM, 8COP, 8CQS, 8CWR, 8NZ, 8PL, 8WZ, 9AAD, 9AAJ, 9AAR, 9AK, 9ALI, 9ARR, 9AXF, 9ACT, 9BAK, 9BIL, 9BKR, 9BDJ, 9BQD, 9BWP, 9BZD, 9BU, 9CCJ, 9CUI, 9CUS, 9CIH, 9DCT, 9DIW, 9DDR, 9DND, 9DNI, 9DHL, 9DLW, 9DRO, 9DP, 9CAX, 9ECB, 9EAR, 9IT, 9PO, 9ASH, 9DWX.

Phone—9AB, 9ACT, 9ASH, 9BUU, 9CYD, 9DNI, 9PO, 9VK, KDKA, KFHX, KOP, KSD, KYW, WIC (?), WDAP, WHAS, WGY, WJAZ, WLW, WMAQ, WOC, WTAM, WTAS, WWJ.—B. DUDLEY, Radio Station 9BB, A. R. R. L., asstant city correspondent.

TWENTY-EIGHT STATIONS.

RADIO EDITOR: Here are the stations I pulled in on Monday night, Jan. 7, on a single-tube Reinartz: WDAP, WMAQ, KYW, KDKA, WGY, WTAS, WBAP, WCAE, WOAW, WCBD, WOS, WOC, WCX, WGAR, WDAP, WLW, WHB, WRC, WHA, KSD, WBZ, WEAF, WMC, WFAA, WHAZ, WJZ, WDAR, WDR.

Your Radio Magazine is a "wow."—WALLY HICKS, 1707 Greenleaf Avenue, Chicago.

HEARS NEW OAKLAND STATION.

RADIO EDITOR: Picked up KGO, the new General Electric station at Oakland, Sunday morning at 6 o'clock with loud speaker. Volume and perfect modulation. They broadcast their first program Tuesday, Jan. 1, at 10 p. m., central time. When picked up they were testing under call letters 6XG on 312 meters. Perhaps Post readers desire this information.—IRVING JOHNSON, 1551 North Clark Street.

The Chicago Evening Post Radio Magazine

RADIO EXCHANGE

Radio Classified Advertisements will be inserted in this section at 5c per word per insertion. Minimum 10 words. Two initials count as one word. No display type, cuts or borders allowed.

5c a Word

If box number is desired, allow four extra words. Box answers will be mailed to advertisers free of charge. Address The Chicago Evening Post, Radio Department, 12 South Market-st.

SETS FOR SALE.

BASS RECOMMENDS, GUARANTEES AND INSTALLS the latest five-tube Radiodyne Atwater-Kent Number 10, the EQUAL of any, the PEER of most; selectivity the highest; Chicago installations made in one hour from receipt of order.
BASS CAMERA COMPANY,
Graflex Headquarters of America,
109 N. Dearborn-st. State 7410.

NEUTRODYNE RECEIVER—The best in radio; new, for $75, or complete with tubes, batteries, phones, loud speaker, etc., $125; nothing else needed; will make any set at low cost. SCHMALZIGAN, 218 E. Garfield-blvd. Ken. 1317.

COMPLETE SET—MADE OF beautiful substantial separate units; will sell complete or separately; can be arranged in any hook-up; also have crystal set. WOLSCHLAG. Phone Harrison 8014 during day.

WILL SACRIFICE—RADIO SET, combining 1 stage of tuned radio-detector and 2 stages audio; complete with new tubes, batteries, loud speaker and phones; worth $135; must sell $75. E. E. LEE, 2021 Mohawk-st.

ZENITH 3-TUBE SET—Complete with all batteries, tubes and loud speaker, $80; excellent condition; value $160; must sell; leaving city; act quick; call after 6:30 p. m. H. W. TALBOT, 6357 Lakewood-av. Phone Sheldrake 7220.

3-TUBE RADAK REGENERATIVE—Complete with tubes, storage battery, charger, "B" batteries, phone, victrola attachment; cost $200; sell for $110 cash. Phone Kenilworth 2586 evenings.

FOR SALE—CHEAP—10-WATT transmitter. 1035 Loyola-av.

SETS FOR SALE.

CRYSTALS—MAKE THEM yourself for less than cent each; very sensitive; surprising results; big profits; simple formula and directions sent on receipt of $1. D-238 Chicago Evening Post.

5-TUBE NEUTRODYNE—Complete with batteries, phones, loud speaker; works great; will demonstrate; also 3-tube regenerative set. 3510 W. 60th-st. Prospect 8746.

PARAGON—4-TUBE, in first-class condition; used only five months; will sell complete, with tubes and batteries, $125. Belmont 7730.

FOR SALE—4-TUBE NEW JONES' SYMphony; Kellogg made; list price $175; sell for $85; also 2-tube NEW Crosley VI, $25. Call Monroe 5291, MR. GARLAND.

ONE CROSLEY 4-TUBE SET, practically new, $40. Call Victory 4857, evenings.

ONE VARIOMETER COUPLER SET—Complete, $100; guaranteed results. Phone Stewart 5964.

1-TUBE REINARTZ—With phones, batteries and tube, $18. RICHARDS, 222 E. 59th-st.

TWO COLUMBIA SPLIT VARIOMETERS—Dials; new, $7.50. Telephone Juniper 4096.

ULTRA-AUDION—Complete; WD-12 tube, $25. Phone Nevada 3906.

AERIALS.

FIRST-CLASS AERIALS—Constructed reasonably. MR. SCHULZ, Hyde Park 0072.

SALES AND SERVICE.

I HAVE SOME BIG BARGAINS in radio sets, cabinets and parts; new lots every few days; sets repaired. SMITH, 3968 Drexel-blvd.

TROUBLE-SHOOTING AND REPAIRING—Reasonable charges. Call Graceland 5056 between 6 and 7 p. m. for appointments. WILLARD RADIO SERVICE.

OUT-OF-TOWNPHANS—As your agent we will purchase guaranteed parts or sets for you at low cost; investigate. B. SIMPKINS, 6617 Edison Park-av., Chicago.

EXCHANGE.

TRADE IN YOUR PRESENT SET for a brand new beautiful regenerative set, licensed under Armstrong; one, two or three tubes; long range; selectivity; easily operated; liberal allowance for your set; will demonstrate. D-201, Chicago Evening Post.

REPAIRS.

RADIO SETS REPAIRED—Rewired or rebuilt; satisfaction guaranteed or no fee asked; charges reasonable. SIDNEY H. STONE, 5233 Glenwood-av. Edgewater 0805.

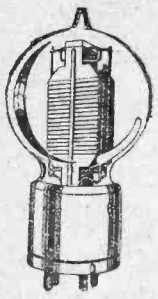
SETS MADE TO ORDER.

NEUTRODYNE SETS
ON ORDER ONLY—Made of best available parts. Sheldrake 1408 or Graceland 1387.

SETS MADE TO ORDER.

RADIO SETS MADE and Adjusted—Evenings after 5 p. m. Tel. (RILEY) Ravenswood 6404.

Western Electric VT-2 Tubes



5-Watt "E" Type CW-931

$12.00 Value

$7.45

All Other Tubes at Reduced Prices

Open Evenings Until 9 P. M. Sundays Until 5

CHICAGO SALVAGE STOCK STORE

509 S. STATE ST.

Automatic Electric LONG RANGE Phones

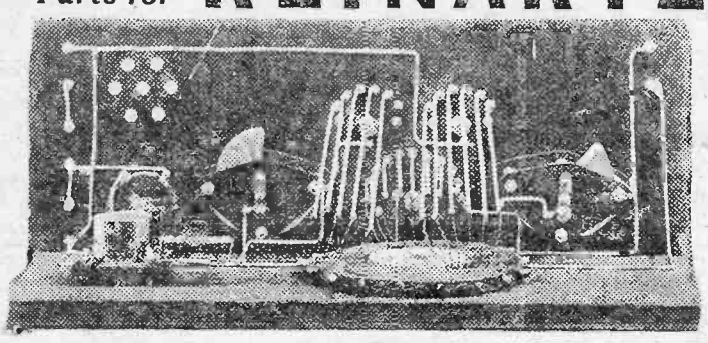
GENUINE Automatic Electric

Not Imitations!

$10.00 Value

$3.65

Complete Parts for REINARTZ



Reg. Price.		Consisting of	Our Price.
$1.89		7x18 Formica Panel	$1.70
1.00		Bakelite Socket	.45
1.50		Howard Vernier Rheostat	1.35
3.30		23-Plate Var. Condenser	1.45
3.10		11-Plate Var. Condenser	1.35
3.00	1	Schoonhoven Reinartz Coil	1.95
1.00		Freshman Variable Grid Leak and Condenser combined	.75
1.50	3	Switch Levers	.75
.80	8	Binding Posts	.40
.80	2	Dozen Switch Points	.40
.30		25 Feet Tinned Wire	.15
.50		Baseboard for Mounting	.25
1.00		Blueprint with complete instruction for assembling and wiring	.50

Regular Price, $21.69 Our Price ... **$11.45**

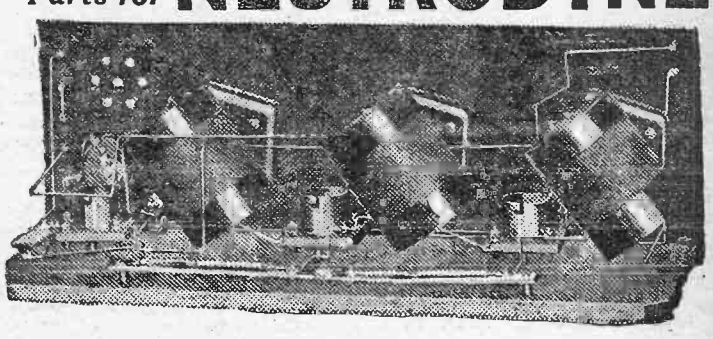
Complete parts for Detector and two-step with Vernier Condensers **$29.95**

SALVAGE MEANS Save : Service : Satisfaction

When you buy that radio apparatus from the Chicago Salvage Stock Store, the world's greatest radio store, you can be certain of these three things:

1. You have saved money through the hundreds of radio bargains made possible by our enormous buying power.
2. You have been served intelligently by men who are qualified radio experts.
3. You have bought quality apparatus because we handle nothing but brand-new merchandise GUARANTEED to give complete satisfaction.

Complete Parts for NEUTRODYNE



ATTENTION!

Set Builders Take Notice

No matter what the set, where you may have read about it, or how new it may be, we've got the parts for you—the best parts procurable at the lowest possible prices! You will find us even ahead of the times. Our experts are frequently posted on new developments in radio long before they appear in print.

Complete Parts —for—

Herald-Examiner Set	$5.95
Short-Wave Tuner	10.50
Haynes DX	9.95
Honeycomb Receiver	17.95
Ultra-Audion	8.95
Overland Circuit	8.25
Autoplex Hook-up	16.45
Long 45 Circuit	16.25
Superdyne Receiver	15.85

Important Any individual part (except the drilled panels in any of the outfits listed here) may be purchased separately at the special reduced prices listed under column headed "Our Price."

Freed-Eiseman or Fada Licensed Parts

1 7x21x3-16 drilled Formica Panel.
1 Howard Rheostat.
3 4-Inch Radion Dials.
3 John Firth Bakelite Sockets.
8 Binding Posts.
3 23-Plate Variable Condensers.
1 Wave Control Neutroformer.
2 Radio-frequency Amplifying Neutrofofmers.
2 Grid Neutralizing Condensers.
1 .00025 Micon Grid Condenser.
1 Marco Variable Grid Leak.
1 Baseboard for mounting.
25 Feet Tinned Copper Bus Bar Wire and complete instructions for assembling and wiring.

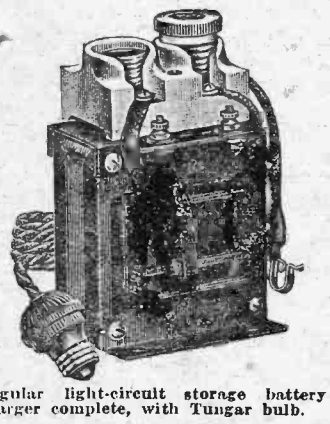
3-TUBE Our Price **$28.60**

4-Tube $44.65
5-Tube $46.25

Loud Talker with GENUINE Nathaniel Baldwin Unit

A Remarkable Value at **$10.00**

Thordarson Rectifying Transformer



Regular light-circuit storage battery charger complete, with Tungar bulb.

Very Special **$9.95**

2,000-Ohm **Head Sets**

$5.00 Value, **$2.45**

Complete Parts for Wave Trap

Consisting of	Our Price.
6x6½ Mission Finished Oak Cabinet	$ .95
6x6½ Formica Panel, Drilled and engraved	.50
Specially Wound Wave Trap Coil	1.95
23-Plate Variable Condenser	1.35
Bakelite Dial	.25
4 Binding Posts	.20

Construction Sheet FREE

Very Special **$5.25**

Complete Parts for Power Amplifier

1 Set of Push and Pull Thordarson or All-American Power Transformers.
1 Double Firth Socket.
1 Howard Power Rheostat.
8 Binding Posts.
5 Switch Points and Stops.
1 Switch Lever.
1 Cutler-Hammer Filament Switch.
1 7x9 Panel.
Baseboard and Instructions for assembling and mounting.

$25.00 Elsewhere

Our Price **$16.95**

Complete Parts for Erla Reflex

Consisting of	Our Price.
1 Variocoupler	$3.45
23-Plate Variable Condenser	1.45
2 Erla Sockets	1.30
1 Erla Reflex No. 1 Transformer	4.45
1 Erla A. F. Transformer	4.85
1 Erla .002 Mica Condenser	.30
1 Erla .001 Mica Condenser	.30
1 Erla .00025 Mica Condenser	.25
1 Erla Fixed Crystal Detector	1.00
1 Howard Rheostat	1.00
2 Bakelite Dials	.50
8 Binding Posts	.40
1 Dozen Switch Points & 4 Stops	.30
2 Switch Levers	.50
1 6½x14x⅛-inch Formica Panel	1.37

Our Price **$20.90**

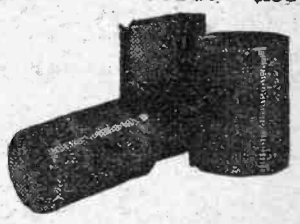
7x21 inch and 7x18 inch **CABINETS**

Special at **$2.95**

FORMICA

Made from Anhydrous Redmanol Resins

SHEETS TUBES RODS



We are prepared to furnish promptly and saw Formica panels of any dimensions. Cutting charge is included in the following prices:

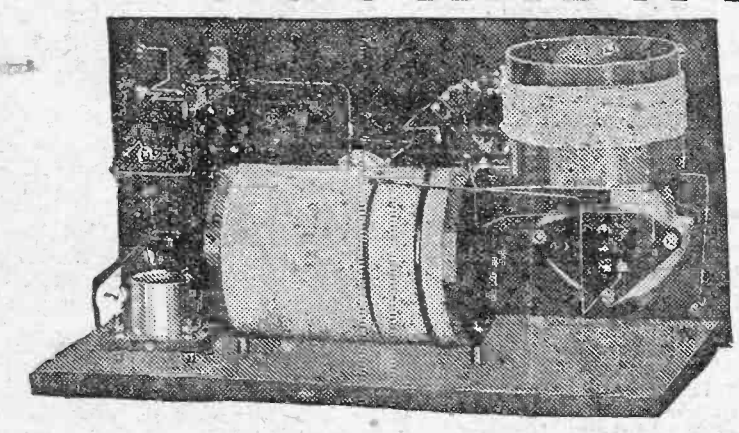
3-16-inch Formica, square inch... 2c
⅛-inch Formica, square inch.... 1½c
Tubing (2 to 4-inch diameter), per running inch.....10c

UV-201 Tubes $3.95

48,000-Ohm **Lavite Resistance $1.50**

Lincoln Collapsible Loop $4.45

Complete Parts for COCKADAY



Regular Price EACH		Consisting of	Our Price EACH
$3.00	1	Cockaday Coil	$1.95
1.00	2	Bakelite Dials	.25

Panels Drilled FREE

Specially drilled panels are included with each of the sets illustrated and described above. We give this free service only on panels included with complete sets.

PARTS (Continued)

$1.00	1	John Firth Socket	.45
1.00		Freshman Grid Leak and Condenser	.65
1.50	1	Howard Vernier Rheostat	1.35
1.00	1	Pacent Double Circuit Jack	.50
.10	8	Binding Posts	.05
.02	7	Switch Points	.01
.50	1	Switch Lever	.25
	1	7x14x⅛ Formica Panel	1.44
		Blueprint and Wire	1.00
	1	Baseboard	.25
$.30	2	23-Plate Condensers	1.45

Our Price **$11.95**

COUPLER COIL SETS FOR **SUPERDYNE $4.50**

NEW TYPE (UNIVERSAL) **BRADLEYSTAT $1.25**

Mail Orders Address

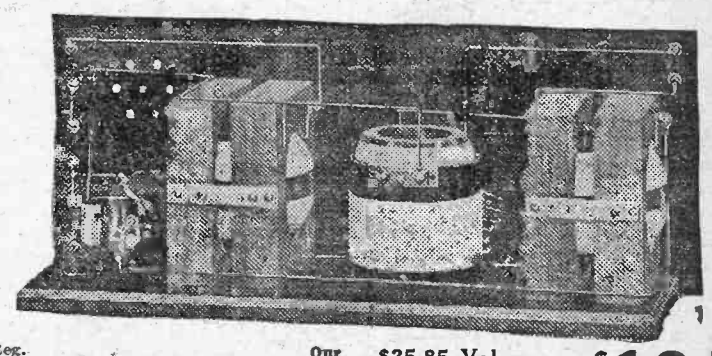
Dept. P-6, Chicago

Phone Wabash 4183

Be sure to get the right number—don't be misled by other advertisements.

509 SOUTH STATE STREET

Complete Parts for KNOCKED DOWN SHORT WAVE



Reg. Price		Consisting of	Our Price
$10.00	2	Mahogany Variometers	$3.90
5.00	1	Mahogany Variocoupler	1.75
3.00	3	Bakelite Dials	.75
1.00		John Firth Socket	.45
1.10		Howard Rheostat	1.00
2.25		Genuine Formica Panel	1.75
.80	8	Binding Posts	.40
.50		Switch Lever	.25
.40	12	Switch Points	.20
1.00		Freshman Grid Leak and Condenser Combined	.65
1.00		Complete Drawing for Assembly and Wiring	.50

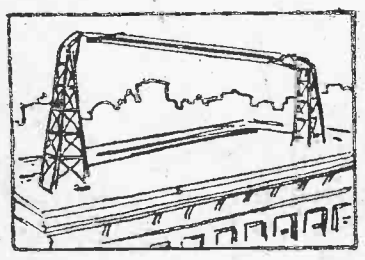
$25.85 Value Our Price ... **$10.50**

Easy to Build

Complete instructions for assembling and blueprints for wiring are included with each outfit. Instructions written so everyone can understand them. No special skill or technical knowledge required—a few hours and you're ready to tune-in New York, Los Angeles—any of 'em!

THE CHICAGO EVENING POST

RADIO MAGAZINE



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THURSDAY, FEBRUARY 7, 1924.

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BROADCASTING

HOME RADIO

RADIO SETS

HOOK-UPS

AMATEUR RECEPTION

HOME-WORKSHOP

RADIO SCIENCE-

RADIO PROGRAMS

LOCAL NEWS

U.S. RADIO NEWS

FOREIGN RADIO NEWS

DEALERS NEWS

MANUFACTURERS NEWS

JOBBER NEWS

NEW EQUIPMENT-

COMMERCIAL

RADIO PRACTICE-

D.X. RECORDS

INVENTIONS

RADIO STATIONS

AMATEUR TRANSMISSION

HOME LABORATORY

Charles Ray, famous movie actor, listening in on his "Superduc De Luxe" receiver, construction data of which appears in this issue of the Radio Magazine.

IN THIS ISSUE

New "Superduc de Luxe" Receiving Set Described in Detail—Description of Three-Honeycomb-Coil Receiver on Universal Panel—Designer's Article on a Complete Tube Set for Less Than $10—Story of Buffalo's Big Broadcasting Station WGR.

Broadcasting Stations and Schedules

Central, or Chicago time, is shown on all stations. If necessary to ascertain local time on any station deduct two hours from time shown for Pacific coast stations, one hour from time shown for the Rocky mountain stations and add one hour to those stations using eastern time. Hawaiian island time is four hours and a half slower than Chicago time. In the list the call number of the station is first given, followed by the location, the owner's name, wave length used and broadcasting schedule in order named. THE POST is making a thoro canvass of all stations in order that this directory may be complete and accurate. Changes are so frequent in stations and schedules that no list can be satisfactory which is not corrected frequently. Corrections and additions to this list will be made from week to week. Stations are urged to co-operate by sending information of changes in schedule to Radio Editor, The Chicago Evening Post.

CFAC—Calgary Herald, Calgary, Canada; 430 meters; Fred Carleton, director and operator; silent Monday, Wednesday and Thursday; Tuesday, day, 1 to 1:30, night, 7:45 to 7:55; Friday, day, 1 to 1:30, night, 7:45 to 8:45 and 11 to 12.

CKAC—La Presse, Montreal, Canada; 430 meters; J. M. Carter, announcer and director; day, 4, music; 4:30, weather and stock reports; special Tuesday, Thursday and Saturday, night, 7, kiddies stories in French and English; 7:30 to 10 lectures in French and English, music; Sunday, day, 4, sacred music.

CKOC—Wentworth Radio Supply company, Hamilton, Ont.; 410 meters H. Slach, operator; silent nights, Tuesday, Thursday; Saturday, night, 7:30 to 9; special Sunday night church exercises, 7 to 8.

CYL—Mexico City, D. F. "El Universal"; 500 meters; Reul Azcarraga, director; G. Obregon Jr., announcer (Spanish), Sendel Hodges, announcer (English); daily, 12:54 p. m., news and weather; 8:24 p. m., war bulletins from the war and navy departments; Tuesdays and Fridays, 8:24 to 8:54 p. m., music; Sunday, 7:24 p. m., war bulletins.

KDKA—East Pittsburg, Westinghouse Electric and Manufacturing company, 326 meters.

KDPM—Cleveland, Ohio, Westinghouse Electric and Manufacturing company, 270 meters.

KDPT—San Diego, Calif., Southern Electrical company, 244 meters.

KDYL—Salt Lake City, Utah, Telegram Publishing company, 244 meters.

KDYM—San Diego, Calif., Savoy theater, 280 meters.

KDYQ—Oregon Institute of Technology, Portland, Ore., 360 meters; program director, L. E. Simson.

KDYQ—Portland, Ore., Oregon Institute of Technology, 360 meters.

KDYW—Phoenix, Ariz., Smith Hughes & Co., 360 meters.

KDYX—Honolulu, Hawaii, Star Bulletin, 360 meters.

KDZB—Bakersfield, Calif., 1402 20th street. Frank E. Seifert, 240 meters.

KDZE—Seattle, Wash., The Rhodes company, 455 meters.

KDZF—Los Angeles, Calif., Automobile Club of Southern California, 278 meters.

KDZI—Wenatchee, Wash., Electric Supply company, 360 meters.

KDZQ—Denver, Colo., Nichols Academy of Music, 360 meters.

KDZR—Bellingham Publishing company, Bellingham, Wash., 261 meters; 50 watts; operator and announcer, A. M. Brown; silent Thursday; night, 9 to 10, local talent, phonograph music.

KFAD—Phoenix, Ariz., McArthur Bros, Mercantile company, 360 meters.

KFAE—Pullman, Wash., State College of Washington, 360 meters; director, H. V. Carpenter; program manager, A. J. Kralowse; silent Tuesday, Thursday, Saturday, Sunday, night, 9:30 to 11; educational lectures.

KFAF—Western Radio corporation, Denver, Colo., 360 meters. Silent nights, Sunday and Wednesday. Nights, 9 to 10.

KFAJ—Boulder, Colo., University of Colorado, 360 meters.

KFAN—Moscow, Idaho, The Electric shop, 360 meters.

KFAR—Hollywood, Calif., Studio Lighting Service company (O. K. Olsen), 280 meters.

KFAU—Boise, Idaho, Independent School District of Boise City, Boise High school, 270 meters.

KFAV—Venice, Calif. Abbot Kinney company, 224 meters.

KFAW—Santa Ana Calif., The Radio Den (W. B. Ashford and H. T. White), 280 meters.

KFAY—Medford, Ore., Virgin's Radio service, 283 meters.

KFBB—Havre, Mont., F. A. Buttrey & Co., 360 meters.

KFBC—San Diego, Calif., W. K. Azbill, 278 meters.

KFBE—San Luis Obispo, Calif., Reuben H. Horn, 360 meters.

KFBG—Tacoma, Wash., First Presbyterian church, 360 meters.

KFBK—Sacramento, Calif., Kimball-Upson company, 283 meters.

KFBL—Everett, Wash., Leese Bros., 224 meters.

KFBS—Trinidad, Colo., Trinidad Gas and Electric Supply company and the Chronicle News, 360 meters.

KFBU—Larimie, Wyo., The Cathedral (Bishop N. S. Thomas), 283 meters.

KFCB—Phoenix, Ariz., Nielson Radio Supply company, 238 meters.

KFCD—Salem, Ore., Salem Electric company, 360 meters.

KFCF—Walla Walla, Wash., 707 Baker building, Frank A. Moore, 360 meters.

KFCH—Billings, Mont., Electric Service station (Inc.), 360 meters.

KFCK—Colorado Springs, Colo., Colorado Springs Radio company, 258 meters.

KFCL—San Antonio, Calif., Los Angeles Union Stock yards, 360 meters.

KFCM—Richmond, Calif., Richmond Radio shop (Frank T. Doeing), 360 meters.

KFCP—Ogden, Utah, 2421 Jefferson avenue, Ralph W. Flygare, 360 meters.

KFCY—Houston, Texas, Fred Mahaffey, Jr., 360 meters.

KFCY—Le Mars, Iowa, Western Union college, 252 meters.

KFCZ—Omaha, Neb., Omaha Central High school, 258 meters.

KFDA—Baker, Ore., Adler's Music store, 360 meters.

KFDD—Boise, Idaho, St. Michael's cathedral, 252 meters.

KFDH—Tuscon, Ariz., University of Arizona, 360 meters.

KFDJ—Corvallis, Ore., Oregon Agricultural college, 360 meters.

KFDL—Denver, Colo., Knight-Campbell Music company, 360 meters, 50 watts.

KFDO—Bozeman, Mont., 420 West Koch street, H. Everett Cutting, 248 meters.

KFDP—Des Moines, Iowa, Hawkeye Radio and Supply company, 278 meters.

KFDR—York, Neb., Bullock's Hardware and Sporting Goods (Robert G. Bullock), 360 meters.

KFDU—Lincoln, Neb., Nebraska Radio Electric company, 240 meters.

KFDV—Fayetteville, Ark., Gilbreth & Stinson, 360 meters.

KFDX—Shreveport, La., First Baptist church, 360 meters.

KFDY—Brookings, S. D., South Dakota State College of Agriculture and Mechanic Arts, 360 meters.

KFDZ—Minneapolis, Minn., 2510 South Thomas avenue, Harry O. Iverson, 231 meters.

KFEC—Portland, Ore., Meier & Frank company, 360 meters.

KFEJ—Tacoma, Wash., 1724 South Jay street, Guy Greason, 360 meters.

KFEL—Denver, Colo., Winner Radio corporation, 360 meters.

KFEQ—Oak, Neb., J. L. Scroggin, 360 meters.

KFER—Fort Dodge, Iowa, Auto Electric Service company, 231 meters.

KFEV—Casper, Wyo., Radio Electric Shop, 263 meters.

KFEX—Minneapolis, Minn., Augsburg Seminary, 261 meters.

KFEY—Kellogg, Idaho, Bunker Hill and Sullivan Mining and Concentrating company, 360 meters.

KFEZ—St. Louis, Mo., American Society of Mechanical Engineers (F. H. Schubert), 360 meters.

KFFB—Boise, Idaho, Jenkins Furniture company, 240 meters.

KFFE—Pendleton, Ore., Eastern Oregon Radio company, 360 meters.

KFFO—Hillsboro, Ore., Dr. E. S. Smith, 229 meters.

KFFP—Moberly, Mo., First Baptist church, 275 meters.

KFFQ—Colorado Springs, Colo., Marksheffel Motor company, 360 meters.

KFFR—Sparks, Nev., Nevada State Journal (Jim Kirk), 226 meters.

KFFV—Lamoni, Iowa, Graceland college, 360 meters.

KFFX—Omaha, Neb., McGraw company, 278 meters.

KFFY—Alexandria, La., Pincus & Murphy, 275 meters.

KFFZ—Dallas, Texas (portable), Al. G. Barnes Amusement company, 226 meters.

KFGC—Baton Rouge, La., Louisiana State university, 254 meters.

KFGD—Chickasha, Okla., Chickasha Radio and Electric company, 248 meters.

KFGH—Standard University, Cal., Leland Stanford university, 360 meters.

KFGJ—St. Louis, Mo., Missouri National guard 138th infantry, 266 meters.

KFGL—Arlington, Ore., Arlington garage, 234 meters.

KFGP—Cheney, Kan., Cheney Radio company, 239 meters.

KFGQ—Boone, Iowa, Crary Hardware company, 226 meters.

KFGV—Utica, Neb., Heidbreder Radio Supply company, 224 meters.

KFGX—Orange, Texas, First Presbyterian church, 250 meters.

KFGZ—Berrien Springs, Mich., Emmanuel Missionary college, 268 meters.

KFHA—Gunnison, Colo., Colorado State Normal school, 252 meters.

KFHB—Hood River, Ore., Rialto theater (P. L. Beardwell), 280 meters.

KFHD—St. Joseph, Mo., Utz Electric Shop company, 226 meters.

KFHF—Shreveport, La., Central Christian church, 266 meters.

KFJR—Stevensville, Mont., Ashley C. Dixon and Son, 258 meters.

KFJV—Dexter, Iowa, Thomas H. Warren, 224 meters.

KFJW—Towanda, Kan., Le Grand Radio company, 22½ meters.

KFJX—Cedar Falls, Iowa, State Teachers' college, 229 meters.

KFJY—Fort Dodge, Iowa, Tunwall Radio company, 246 meters.

KFJZ—Fort Worth, Texas, Texas National Guard, 112th Cavalry, 254 meters.

KFKA—Greeley, Colo., Colorado State Teachers' college, 248 meters.

KFKB—Milford, Kan., Brinkley-Jones Hospital association, 286 meters.

KFKR—Lakeside, Colo., Denver Park and Amusement company, 248 meters.

KFKQ—Conway, Ark., Conway Radio laboratories, 224 meters.

KFKV—Butte, Mont., F. F. Gray, 283 meters.

KFKX—Hastings, Neb., Westinghouse Electric and Manufacturing company, 286 meters.

KFKZ—Colorado Springs, Colo., Nassour Bros. Radio company, 234 meters.

KFLA—Butte, Mont., Abner R. Wilson, 283 meters.

KFLB—Menominee, Mich., Signal Electric Manufacturing company, 248 meters.

KFLD—Franklinton, La., Paul E. Greenlaw, 234 meters.

KFLE—Denver, Colo., National Educational Service, 268 meters.

KFLH—Salt Lake City, Utah, Erickson Radio company, 261 meters.

KFLP—Cedar Rapids, Ohio, Everette M. Foster, 240 meters.

KFLQ—Little Rock, Ark., Bizzell Radio shop, 261 meters.

KFLR—Albuquerque, N. M., University of New Mexico, 254 meters.

evenings, 9, news bulletins; 9:30, weather; 10, studio programs, lectures, entertainment.

KLZ—Denver, Colo., Reynolds Radio company, 360 meters.

KMJ—Fresno, Calif., San Joaquin Light and Power corporation, 273 meters, 50 watts; R. C. Denny, operator and director; Wayne Freund, announcer; Tuesday, Friday and Sunday night, 10 to 11.

KMO—Tacoma, Wash., Love Electric company, 360 meters.

KNJ—Roswell, New Mexico, Roswell Public Service company, 250 meters.

KNT—Aberdeen, Wash., Grays Harbor Radio company (Walter Hemrich), 263 meters.

KNV—Los Angeles, Cal., Radio Supply company, 360 meters.

KNX—Los Angeles, Cal., Electric Lighting Supply company, 360 meters.

KOB—State College, New Mexico, New Mexico College of Agriculture and Mechanic Arts, 360 meters. Daily, time signals, weather, news, crop reports; Monday, Wednesday, Friday night, 8:30 to 9:30, concerts.

KOP—Detroit Police department, Detroit, Mich., 286 meters; daily except Sunday; 1 p. m., to 6:30 p. m.

KPO—San Francisco, Cal., Hale Brothers 423 meters; silent Friday; Sunday night, 10:30 to 12, concert; Monday, 10 to 11, organ, 11 to 12, dance music; Tuesday, Wednesday, Thursday nights, 10 to 11, studio program, 11 to 12, dance music; Saturday night, 10 to 2 a. m., dance music.

KQP—Hood River, Ore., Apple City Radio club, 360 meters.

KQV—Pittsburg, Pa., Doubleday-Hill Electric company, 360 meters.

KQW—San Jose, Cal., Berkeley Daily Gazette, 278 meters.

WAAN—Columbia, Mo., University of Missouri, 254 meters.

WAAW—Omaha, Neb., Omaha Grain Exchange, 360 meters, 500 watts: Daily except Sunday, 9:45, 10:45, 11:45, 12:45, 1:15 and 8, world markets; final report Saturday at 12:45 p. m.

WAAZ—Emporia, Kan., Hollister-Miller Motor company, 360 meters.

WAAB—Harrisburg, Pa., Dr. John B. Lawrence, 266 meters.

WABC—Anderson, Ind., Fulwider-Grimes Battery company, 229 meters.

WABD—Dayton, Ohio, Parker high school, 283 meters.

WABE—Washington, D. C., Young Men's Christian association, 283 meters.

WABG—Jacksonville, Fla., Arnold Edwards Piano company, 248 meters.

WABH—Sandusky, Ohio, Lake Shore Tire company, 240 meters.

WABI—Bangor, Me., Bangor Railway and Electric company, 240 meters.

WABA—Lake Forest, Ill., Lake Forest college, 266 meters.

WABJ—South Bend, Ind., The Radio Laboratories, 240 meters.

WABK—Worcester, Mass., First Baptist church, 252 meters.

WABL—Storrs, Conn., Connecticut Agricultural college, 283 meters.

WABM—Saginaw, Mich., F. E. Doherty Automotive and Radio Supply company, 254 meters.

WABN—La Crosse, Wis., Waldo C. Grover, 234 meters.

WABO—Rochester, N. Y., Lake Avenue Baptist church, 252 meters.

WABT—252 meters; Washington, Pa.; owner, Halliday Hall.

WABW—Wooster, Ohio; 234 meters; 20 watts.

WABX—Mount Clemens, Mich.; 270 meters; 150 watts.

WBAA—West Lafayette, Ind., Purdue university, 360 meters.

WBAD—Minneapolis, Minn., Sterling Electric company, 360 meters.

WBAH—Minneapolis, Minn., The Dayton company, 360 meters.

WBAN—Paterson, N. J., Wireless Phone corporation, 244 meters

WBAO—Decatur, Ill., James Millikin university, 360 meters.

WBAP—Fort Worth, Texas, Wortham-Carter Publishing company (Star-Telegram), 476 meters, 750 watts: Silent Saturday and Sunday nights. Operator, E. L. Olds; supervisor, H. W. Hough; announcer, "The Hired Hand." Daily program, 11 a. m., markets, aviation, weather; 12 noon, 1, 2, 4 p. m., markets and information; 5 p. m., financial news; 8:30 to 11:45 p. m., concert.

WBAV—Columbus, Ohio, Einer and Huphins company, 390 meters, 500 watts. Director, R. S. Bohannan; program director Miss Helen Mears; announcer, H. E. Day. Daily except Sunday, 12:30 to 1, markets and news. Monday evening, 8 to 10, music.

WBAW—Marietta, Ohio, Marietta college, 246 meters.

WBAX—Wilkesbarre, Pa., 66 Gildersleeve street, John H. Stenger, Jr., 360 meters.

WBAY—New York, N. Y., Western Electric company, 492 meters.

WBBA—Newark, Ohio, Newark Radio Laboratories, 240 meters.

WBBC—Sterling, Ill., Sterling Radio Equipment company, 229 meters.

WBBD—Reading, Pa., Barbey Battery Service, 234 meters.

WBL—Anthony, Kan., T. & H. Radio company, 261 meters.

WBS—Newark, N. J., D. W. May, Inc., 360 meters.

WBT—Charlotte, N. C., Southern Radio corporation, 360 meters.

WBU—Chicago, Ill., City of Chicago, 286 meters.

WBZ—Springfield, Mass., Westinghouse Electric and Manufacturing company, 337 meters.

WCAD—Canton, N. Y., St. Lawrence university, 280 meters.

WCAE—Pittsburg, Pa., Kaufmann & Baer company, 462 meters; daily, 11:30, weather; 2:30, news; 3:30, stocks; 5:30, dinner music; 6:30, children's stories; 7:30, music; Sunday, 2 p. m., people's radio church service, Rev. Dr. George W. Shelton; 6:30, music.

WCAG—New Orleans, La., 2813 Calhoun street, Clyde R. Randall, 268 meters.

WCAR—Columbus, Ohio, Entrekin Electric company, 286 meters.

WCAJ—University Place, Neb., Nebraska Wesleyan university, 360 meters; station director and announcer, J. C. Jensen; daily, 10:30 a. m., weather; Tuesday, 6 p. m., children's stories; Thursday, 8 p. m., lectures and music.

WCAK—Houston, Texas, 2504 Bagby street, Alfred P. Daniel, 360 meters.

WCAL—Northfield, Minn., St. Olaf college, 360 meters.

WCAM—Villanova, Pa., Villanova college, 360 meters.

WCAO—Baltimore, Md., Sanders & Stayman company, 360 meters; daily, 10:55, time signals; 11 a. m., weather; 11:05, music; Monday and Wednesday, 7 p. m., music.

WCAP—Washington, D. C., Chesapeake & Potomac Telephone company, 469 meters.

WCAR—San Antonio, Texas, Alamo Radio Electric company, 360 meters.

WCAS—Minneapolis, Minn., William Hood Dunwoodie Industrial institute, 246 meters; director, M. R. Bass; operator and announcer, F. P. Upton; Monday, 7 to 7:30 p. m., music; Tuesday, 8:15 to 9:30 p. m., music and educational programs (9:30 to 10:45 on alternate weeks); Wednesday, 6:30 to 7, music and technical lectures; Thursday, 7 to 7:30 p. m., notes on radio and code practice.

WCAT—Rapid City, S. D., South Dakota State School of Mines, 240 meters.

WCAU—Philadelphia, Pa., Durham & Co., 286 meters.

WCAV—Little Rock, Ark., J. C. Dice Electric company, 360 meters.

WCAX—Burlington, Vt., University of Belmont, 360 meters.

WCAY—Milwaukee, Wis., Kesselman O'Driscoll company, 261 meters.

WCAZ—Carthage, Ill., Carthage college, 246 meters.

WCBA—Allentown, Pa., 1015 Allen street, Charles W. Heimbach, 280 meters.

WCBB—Greenville, Ohio, K. & K. Radio Supply company (Charles H. Katzenberger), 240 meters.

WCBD—Zion, Ill., Wilbur G. Voliva, 345 meters.

WCK—St. Louis, Mo., Stix, Baer & Fuller Dry Goods company, 360 meters.

WCM—Austin, Texas, University of Texas, 360 meters.

WCX—Detroit, Mich., Detroit Free Press, 517 meters.

WDAD—Lindsborg, Kans., Central Kansas Radio Supply company (Wm. L. Harrison), 360 meters.

WDAE—Tampa, Fla., Tampa Daily Times, 360 meters.

WDAF—Kansas City, Mo., Kansas City Star, 411 meters.

WDAG—Amarillo, Texas, J. Laurance Martin, 360 meters; J. L. Martin, director and operator; broadcast Tuesday and Thursday at 8 p. m.

WDAH—El Paso, Texas, Trinity Methodist church (South), 268 meters; station director, A. C. Arnold; announcer, John Burke; Sunday, 8:30 a. m., and 12 midnight; Thursday, 8:30 p. m., concert.

WDAI—Syracuse, N. Y., Hughes Radio corporation, 246 meters.

KFHH—Neah Bay, Wis., Ambrose A. McCue, 261 meters.

KFHJ—Santa Barbara, Cal., Fallon & Co., 360 meters. Manager, S. Haskings. Evening—8 to 8:40 p. m., news bulletins, bed-time story; 11 to 12, music.

KHR—Seattle, Wash., Star Electric and Radio company, 283 meters.

KFHS—Lihue, Hawaii, Clifford J. Dow, 275 meters.

KFHX—Hutchinson, Kan., 407 East 1st street, Robert W. Nelson, 229 meters.

KFI—Los Angeles, Cal., Earle C. Anthony (Inc.), 469 meters.

KFIB—St. Louis, Mo., 5666 Vernon avenue, Franklin W. Jenkins, 244 meters.

KFID—Iola, Kan., Ross Arbuckle's garage, 246 meters.

KFIF—Portland, Ore., Benson Polytechnic institute, 360 meters.

KFIK—Gladbrook, Iowa, Gladbrook Electric company, 234 meters.

KFIL—Louisburg, Kan., Windisch Electric Farm Equipment company, 234 meters.

KFIO—Spokane, Wash., North Central high school, 252 meters.

KFIQ—Yakima, Wash., Yakima Valley Radio Broadcasting association, 242 meters.

KFIU—Juneau, Alaska, Alaska Electric Light and Power company, 226 meters.

KFIX — Independence, Mo., Reorganized Church of Jesus Christ of Latter Day Saints, 240 meters.

KFIY—Seattle, Wash., Brott laboratories, 236 meters.

KFIZ—Fond du Lac, Wis., Daily Commonwealth, 237 meters.

KFJB—Marshalltown, Iowa, Marshalltown Electrical company, 248 meters.

KFJC—Seattle, Wash., Post Intelligencer, 233 meters.

KFJD—Greeley, Colo., Weld County Printing and Publishing company, 236 meters.

KFJF—Oklahoma City, Okla., National Radio Manufacturing company, 252 meters.

KFJI—Astoria, Ore., Liberty theater (E. E. 236 meters.

KFJK—Bristow, Okla., Delano Radio and Electric company, 233 meters.

KFJI—Ottumwa, Iowa, Hardsacg Manufacturing company, 242 meters.

KFJM—Grand Forks, N. D., University of North Dakota, 229 meters.

KFJQ—Grand Forks, N. D., Electric Construction company (portable), 252 meters.

KFMO—Fayetteville, Ark., 263 meters, 100 watts.

KFMR—Sioux City, Iowa; 261 meters; 10 watts.

KFMS—Duluth, Minn.; 275 meters; 100 watts.

KFMT—Minneapolis, Minn.; 231 meters; 5 watts.

KFMU—San Marcos, Texas; 240 meters; 20 watts.

KFMW—Houghton, Mich.; 266 meters; 50 watts.

KFMX—Northfield, Minn.; 283 meters; 500 watts.

KGB—Tacoma, Wash., Wm. A. Mullins Electric company, 360 meters.

KGG—Hallack & Watson Radio Service, Portland, Ore., 460 meters, 50 watts. Day—2:45 to 3, news. Evening—7:30 to 8, phonograph and sporting news; 9:30 to 10, press and police reports; special Wednesday and Sunday, 11 to 12 midnight, singing concert.

KGN—Portland, Ore., Northwestern Radio Manufacturing company, 360 meters.

KGU—Honolulu, Hawaii, Waiwiwi Beach, Marion A. Mulrony, 360 meters.

KGW—Portland, Ore., Portland Oregonian; 492 meters: Day—1:30, weather; 5:30, lectures and children's hour. Evening—10, music; 11, lecture; 12, music.

KGY—Lacy, Wash., St. Martin's college 258 meters; 10 watts; evening, 10 to 11:30.

KHQ—Seattle, Wash., 419 13th avenue, Louis Wasmer, 360 meters.

KJQ—Stockton, Cal., 615 East Main street, C. O. Gould, 360 meters.

KJR—Seattle, Wash., Northwest Radio Service company; 283 meters; daily except Saturday and Sunday, 7:30 to 8:15 p. m.; Monday, Wednesday and Friday, 9:30 to 10:30.

KJS—Los Angeles, Cal., Bible Institute of Los Angeles, 360 meters.

KLS—Oakland, Cal., 2201 Telegraph avenue, Warner Brothers, 360 meters; director, Miss A. Warner; announcer, S. Warner. Week days, 1:30 to 3; Friday evening, 10 to 11; Sunday afternoon, 2 to 3.

KLX—Oakland, Calif., The Oakland Tribune, 509 meters; 500 watts; silent Sunday;

KSD—St. Louis, Mo., Post Dispatch (Pulitzer Publishing company), 546 meters.

KSS—Long Beach, Cal., Prest & Dean Radio company and Radio Research Society of Long Beach, Cal., 229 meters; 10 watt; Boy Scout news.

KTW—Seattle, Wash., First Presbyterian church, 360 meters.

KUO—San Francisco, Cal., Examiner Printing company, 360 meters.

KUS—Los Angeles, Cal., City Dye Works and Laundry company, 360 meters.

KUY—El Monte, Cal., Coast Radio company, 360 meters.

KWG—Stockton, Cal., Portable Wireless Telephone company, 360 meters.

KWH—Los Angeles, Cal., Los Angeles Examiner, 360 meters.

KXD—Modesto, Cal., Modesto Herald Publishing company, 360 meters.

KYQ—Honolulu, Hawaii, Electric Shop, 360 meters.

KYW—Chicago, Ill., Westinghouse Electric and Manufacturing company, 345 meters.

KZM—Oakland, Cal., 13th and Harrison streets, Preston D. Allen, 360 meters.

KZN—Salt Lake City, Utah, The Deseret News, 360 meters: daily except Sunday 9 to 10:30 p. m., music, addresses, stories, news.

KZV—Wenatchee, Wash., Wenatchee Battery and Motor company, 360 meters.

NAA—Arlington, Va., U. S. Navy dept., 435 meters; daily except Sunday, 8:45 to 9:40 a. m., markets; 11:25 to 11:40, markets; 12:45 to 1:20 p. m., markets; 2:25 to 3:40 p. m., markets; 9:05 to 9:20 p. m., weather.

WAAB—New Orleans, La., 137 South St. Patrick street, Valdemar Jensen, 268 meters.

WAAC—New Orleans, La., Tulane university, 360 meters.

WAAD—Cincinnati, Ohio, Ohio Mechanics institute, 360 meters, 25 watts, range, 50 miles.

WAAF—Chicago, Ill., Chicago Daily Drovers Journal, 286 meters: Daily except Sundays and holidays, 8:10, 10:45, 12:40, 3, 4:30 p. m., markets; 10:30, 12:30 p. m., weather.

WAAH—St. Paul, Minn., Commonwealth Electric company, 360 meters.

WAAM—Newark, N. J., I. R. Nelson company, 263 meters.

THE CHICAGO EVENING POST TABLOID RADIO SCHEDULES

These stations are those most commonly tuned in evenings by the Chicago broadcast listeners. The time given is central standard. Pacific coast time is two hours earlier than that shown here. Mountain time is one hour earlier, and eastern time one hour later. Evening program schedules only are given. This list was compiled by The Chicago Evening Post Radio Department and is protected by copyright.

STATION	Miles	Met	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Chicago—									
KYW, Comm. Edison Bldg.		536		6:30- 9:30	6:30-12:00	6:30- 9:30	6:30- 9:30	6:30-12 m.	6:30- 9:30
WAAF, Union Stock Yards		286	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00			
WMAQ, Hotel La Salle		536		7:00- 9:55	7:00- 9:55	7:00- 9:55	7:00- 9:55	8:00-10:00	
WDAP, Drake Hotel		360		7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	9:15-10:30
WJAZ, Edgewater Beach Hotel		448		10:00-12:30	10:00-12:30	10:00-12:30	10:00-12:30	10:00- 2:00	6:00- 9:00
Suburban—									
WCBD, Zion, Ill.	39	345	8:00- 9:00				8:00- 9:00		
WIAB, Rockford, Ill.	77	252	9:00-				8:00-		12:00-
WRM, Urbana, Ill.	120	360			8:50- 9:30				
WTAS, Elgin, Ill.	37	275			7:30-10:00				
Eastern—									
KDKA, East Pittsburg	430	326	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WBZ, Springfield, Mass.	802	337	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	
WEAF, New York City	912	495	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00
WGI, Medford Hillside, Mass.	875	360	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	7:30- 9:00
WHAZ, Troy, N. Y.	748	380	8:00- 9:30						
WGY, Schenectady, N. Y.	698	280	6:45-11:30	6:45- 9:00	6:45- 9:00	6:45- 9:00	6:45-11:30	6:45- 9:00	
WGR, Buffalo	472	319	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	
WHN, New York City	912	360	1:15-11:00	1:15-11:00	1:15-11:00	1:15-11:00	1:15-11:00	1:15-11:00	
WJY, New York City	912	405							2:30- 6:60
WJZ, New York City	912	455	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	
WOO, Philadelphia	677	509	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	
WRC, Washington, D. C.	612	469	8:00-10:00		8:00-10:00		8:00-10:00		
Midwest—									
WCX, Detroit	245	517	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00		
WJAX, Cleveland	323	390		7:30- 9:30		8:00-10:30			
WLAG, Minneapolis	358	417	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	
WLW, Cincinnati	262	309	8:00-10:00	10:00-12:00	8:00-10:00	10:00-12:00			
WOC, Davenport	105	481	7:00-11:00		7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WTAM, Cleveland	323	300	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30
WWJ, Detroit	245	517	8:30-10:00	8:30-10:00	8:30-10:00	8:30-12 m.	8:30-10:00		
Southern—									
KSD, St. Louis	270	546	8:00-11:00	8:00-11:00	8:00-11:00		8:00-11:00	8:00-11:00	
WBAP, Fort Worth, Texas	855	476	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00		
WDAF, Kansas City, Mo.	430	411	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	
WFAA, Dallas, Texas	853	476	6:45- 9:30	6:45- 9:30	6:45- 9:30	6:45- 7:30	6:45- 9:30	6:45- 9:30	9:30-11:00
WGV, New Orleans	858	350	7:00- 8:00		7:00- 8:00			7:00- 8:00	
WHAS, Louisville	271	400			7:30- 9:00				4:00- 5:00
WHB, Kansas City, Mo.	430	411		7:00- 9:00		7:00- 9:00	7:00- 9:00		8:00-10:00
WMC, Memphis	480	500	8:30-	11:00-12:00		8:30-	11:20-12:00	8:00-10:00	8:00-10:00
WOAI, San Antonio, Texas	1,080	385		9:30-10:30				9:30-10:30	
WOS, Jefferson City, Mo.	337	441	8:00- 9:30		8:00- 9:30		8:00- 9:30		
WSB, Atlanta, Ga.	605	428	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	7:30- 9:00
Pacific Coast—									
KFDB, San Francisco	1,910	509	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30
KGW, Portland, Ore.	1,895	492	1:00-1 a.m.	10:00-11:00	10:00-11:00	10:00-11:00	1:00-2 a.m.	10:00-11:00	9:00-10:00
KHJ, Los Angeles	1,795	395	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	8:45-10:00	10:00-12:00
KPO, San Francisco	1,910	423	6:30-12 m.	6:30-12 m.	7:30-12:00	6:30-12 m.		6:30-12 m.	10:30-12 m.

Continued on Page 14.

Edited by a Staff of Regular and Special Contributing Writers.

The RADIO MAGAZINE Section is edited with the view of giving authentic news of the radio broadcasting field and authoritative information on the subjects of home construction of receiving and transmission sets, of the operation and maintenance of apparatus, and as an exchange of opinion for its readers.

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THURSDAY, FEBRUARY 7, 1924.

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Radio Is Sent In as Pinch Hitter

By John A. Menaugh.

PHANS, meet Bambino Radio, the pinchhitter. He is young and tender, but he carries a lusty wallop in his antenna.

He has rescued passengers and crews from sinking ships at sea, he has traced the wanderings of runaway balloons and blimps and he has performed black magic on the battle-front, but now he comes to bat in a new role.

Just last Monday evening radio was called in to help rescue passengers on trains stalled in the snow storm which swept Chicago and points north and west. Then in addition to the train relief duty, radio was put to work shooting news dispatches to western towns cut off by the storm.

Chicago-bound passengers, stalled in the snowdifts on two trains, one on the Chicago and Northwestern and the other on the Soo line at Waupaca, Wis., were rescued by means of radio. With telegraph communication destroyed by the blizzard, railroad officials in Chicago learned of the plight of the snowbound tourists thru a wireless message sent out from broadcasting station WPAH at Waupaca.

A relief train bearing food and blankets immediately was dispatched.

More than a dozen other stalled trains also were served with the aid of KYW, the Westinghouse Electric broadcasting station in Chicago. Its operators kept in touch with local railroad dispatches thruout the night. According to radio messages six Chicago and Northwestern trains, in addition to the one at Waupaca, were stalled. Two were at Reedsville and the others at Waukesha, Sheboygan, Green Bay and Manitowoc.

Altho Monday is silent night in Chicago KYW and WMAQ were in the air at intervals from early in the evening until late at night. The writer heard both of them patiently trying to get in touch with Omaha and the Wisconsin towns.

Radio came to the aid of the news organizations efficiently. All western telegraph wires succumbed to the storm, and it was impossible to get in connection with newspapers between Chicago and the coast. Northern and southern wires were also down, and it was only with difficulty that communication was maintained with the east. The Associated Press had to discontinue its western service via wire.

RADIO, yesterday a bewildering manifestation to all except the smart high school boy and the technical expert, today is the hobby and delight of countless thousands of ordinary and unscientific adult citizens, their wives and daughters and their uncles and aunts.

Verily, radio has come to stay. It is here to remain with us just as is the automobile and the motion picture. It is not a passing fad like the bicycle, for when the bicycle was perfected it was complete in all respects and had nothing new to present. On the other hand, radio brings something new every day. Our receiving sets of today appear to be almost everything they should be; the ones of tomorrow, no doubt, will be entirely different. The whole world will be at everyone's call before long, and then after that there will be new devices in a steady procession along the unlimited years of the future.

Interest cannot die down when progress keeps it always awake. If you don't think folks are interested now, look into a few of the many radio shops in the loop and outlying districts and see whether the dealers are busy. And that is only a smell of what it will be in the future.

JUST be patient, phans, the little old Night Prowler will be prowling again before long. He had an understudy on the job last Monday night, but the understudy's equipment was not the best. He heard a lot of chatter which he couldn't identify and got interested in train relief work of the local stations. Of course, KDKA came in loud enough with its concert band to demand attention.

LOCAL FEATURES TO BE BROADCAST

This is gentlemen's week. Page the ladies. (1) Ralph Emerson at the Barton organ, a new feature of WDAP'S program; (2) W. Remington Welch, organist, and Ed Olmstead, announcer, of KYW; (3) Abram Sophins, violinist, WJAZ, Feb. 10, and (4) Julius R. Kline, who will read Lincoln's Gettysburg address from WMAQ, Feb. 12.

Radio Programs

The continued interest of "radiophans" in good music is witnessed by the excitement aroused in WJAZ's series of "Artist Recitals" Sunday evenings from 8 to 9 o'clock. During the opera season these programs included many of the stars from the Auditorium. But the good work still continues.

Sunday, Feb. 10, Abraham Sopkin, violinist; Joseph Brinkman, pianist, and Esther Gielc, soprano, will appear on the "artist" bill.

The first appearance of radio entertainers in public seems to be making quite a hit. The KYW outfit is bringing down the house at McVickers this week.

WDAP announces the addition of a new feature. Ralph Emerson, playing on the Barton organ, will entertain Chicago radio bugs, following this schedule: Sunday, 5 to 6 p. m.; Tuesday, 8 to 8:30; Wednesday, 10:10 to 10:25; Thursday, 8 to 8:30; Friday and Saturday, 10:10 to 10:35.

Lincoln's birthday will be celebrated over at WMAQ by the reading of the Gettysburg address and a talk on Lincoln.

Below are given the complete schedules of all the Chicago and suburban broadcasting stations and those of the out-of-town stations which are most commonly tuned by local radiophans.

These schedules are a regular daily feature in The Chicago Evening Post.

On Thursday of each week a complete list and schedule of every broadcasting station in the United States is published in The Chicago Evening Post's sixteen-page Radio Magazine section.

CHICAGO STATIONS

Central Time Is Shown.)

KYW—Located in Commonwealth Edison building 536 meters; Wilson J. Wetherbee, director.

Day—6:30 a. m., news and markets; 10 a. m., market reports; 10:30 a. m., financial news and comment; 10:58 a. m., naval observatory time signals; 11 a. m., market reports; 11:05 a. m., weather report; 11:30 a. m., news and comment of the financial and commercial market; 11:30 a. m., table talk by Mrs. Anna J. Peterson.

Evening—6:30 p. m., news, financial and final market and sport summary, furnished by the Union Trust company, Chicago Journal of Commerce and United States department of agriculture; 6:50 p. m., children's bedtime story; 7 p. m. to 7:30 p. m., concert by Clyde Doerr's orchestra from the Pompeiian room of the Congress hotel, and Joska DeBabary's orchestra from the Louis XVI room of the Congress hotel; 8 to 8:20 p. m., twenty minutes of good reading, by Rev. C. J. Pernin, S. J., head of department of English, Loyola university, Chicago; 8:30 to 9 p. m., musical program of the Edison Symphony orchestra, at Orchestra hall, Chicago. Mr. Morgan L. Eastman, director; Herbert Gould, bass soloist: March, "The Fairest of the Fair (Sousa); "The Dance of the Serpents, (Baccallari); "The Floral Dance," (Moss); "The Living God," (O'Hara); "Coppolia," ballet, (Delibes); 9:05 p. m., report furnished by the Chicago Motor club; 9:15 p. m., program furnished by the National Live Stock and Meat board. The subject of the evening will be "Twelve Minutes of Practical Meat Cooking," by Grace Viall Gray, lecturer and writer, Home Economics specialist.

WAAF—Located at Union stock yards; 280 meters.

Day—Live stock reports at 8:40, 10:30, 10:45 a. m., 12:30, 12:45, 4:30 p. m.

Evening—No schedule.

WMAQ—Located on Hotel LaSalle; 447.5

Continued on Page 13.

Details of Ray's De Luxe Receiver

By Lewis E. Hagerman.
(Technical Editor of Radio Magazine.)

MANY phans since the original announcement of the "Superduc" in The Post Radio Magazine are just learning the true joys that can be derived from a radio receiver. Up to the present time they have been accustomed to receive, along with their concerts and speeches, an accompaniment of hissing, scratching and other noises caused by improper methods of producing regeneration and local interference.

The "Superduc," as many have found out, is absolutely void of any unnecessary noises, its only rival in clarity and beauty of tone being neutrodyne.

It has given me great pleasure read the many complimentary ters I have received, commenting the operation of the "Superduc" s Of course, some have had trouble, b in practically all of the cases it wa due directly or indirectly to mechan ical defects in the apparatus used, es pecially in the variometer.

In accordance with the many re quests and after much experimenting in The Post Radio laboratory, I have ready to present to you a "Superduc De Luxe."

The circuit is basically the same a the original, the changes merely being the addition of one variable condense across the secondary of the variome ter and a potentiometer to control th potential of the B battery.

Give Fine Tuning.

The above additions give you extremely fine tuning and maximum control over the oscillation of your tube.

The set as shown uses the following parts:

One split variometer.
One 11-plate vernier condenser.
One 23-plate vernier condenser.
One 400-ohm potentiometer.
One filament control switch.
Three double circuit jacks.
One 6-ohm rheostat.
Two 30-ohm rheostats.
One 5-1 audio-frequency transformer.
One 3-1 audio-frequency transformer.
One variable grid leak and condenser.
Three VT sockets.
Nine rubber-top binding posts.
One 7x28x3-16-inch panel.
Bus bar wire, screws, etc.

The set as used by Charles Ray and which is shown on the next page in two views, one of the front, giving the panel layout and spacing of apparatus, and one of the inside, showing an idea of the spacing of the transformers and sockets and of the wiring, was made of glass.

We do not advise the ordinary experimenter, however, to use glass, as it is very fragile and, unless the proper machinery is available, it is almost impossible to drill without cracking or breaking.

To mount the apparatus on the panel, lay it out as nearly like the photograph as possible and mount, placing the apparatus in the following arrangement, from left to right: Twenty-three-plate condenser, variometer, 11-plate condenser, variable grid leak, potentiometer, with filament control switch directly below, 6-ohm rheostat, and then the two 30-ohm rheostats with jacks beneath. To wire, follow the schematic diagram which accompanies the photographs.

Continued on Page 4.

Data on Ray's New "Superduc De Luxe" Set

Continued from Page 3.

taking some care to keep the wires as far apart as possible in the tuning unit.

Use Care in Wiring.

It is not advisable to wire your set by following the photographs, as the wiring is very intricate at times and therefore is not shown clearly in the picture.

In order to obtain the maximum results from the "Superduc de Luxe" it is naturally advisable to use the best parts obtainable, but very good results can be obtained with inexpensive parts. The price of the complete parts might be anywhere from $30 to $70, depending entirely upon the builder's pocketbook; altho, as the National Radio company says, "Good apparatus pays."

Either dry cell or storage battery tubes may be used. If dry cell, the best tubes suitable would be WD-12s. If storage battery, the best tubes would be one UV-200 or C-300 and two UV-201As or C-301As. Of course, if dry cell tubes are used, the ohmage of the rheostats as given in the list of parts will have to be changed to three 6-ohm rheostats instead of one 30-ohm and two 30-ohm.

In the tuning of the set, the variometer, 11-plate condenser and detector tube rheostat are the most critical adjustments, the grid leak not being as important as heretofore.

To operate, connect B batteries, A batteries, aerial and ground and plug phones in detector jack; light tubes and tune in station with variometer and 11-plate condenser; adjust grid leak and potentiometer and bring to maximum with 23-plate condenser.

Entire World to Listen In on Coolidge Talk

Rotary clubs, the world over, will hear President Coolidge deliver an address on behalf of the Chicago Rotary club on the evening of Washington's birthday—the nineteenth anniversary of the Rotary Club of the World.

The President will speak at 10 o'clock (eastern time) from the White House in Washington. WCAP will broadcast the talk from that city; WEAF (New York) and WJAR (Providence) will cover other eastern territory.

WJAZ (Zenith-Edgewater Beach) will handle the speech for Chicago.

Arrangements are pending to broadcast the President's message thruout Europe thru the co-operation of the American Radio Relay league and licensed amateur broadcasters. The official consent of England, France, Germany and Italy is necessary to complete the plans.

George L. Treadwell, secretary of the Rotary club of Chicago, who has charge of the broadcasting, says that by voice and by telegraph the President's talk will reach every Rotary club in the world.

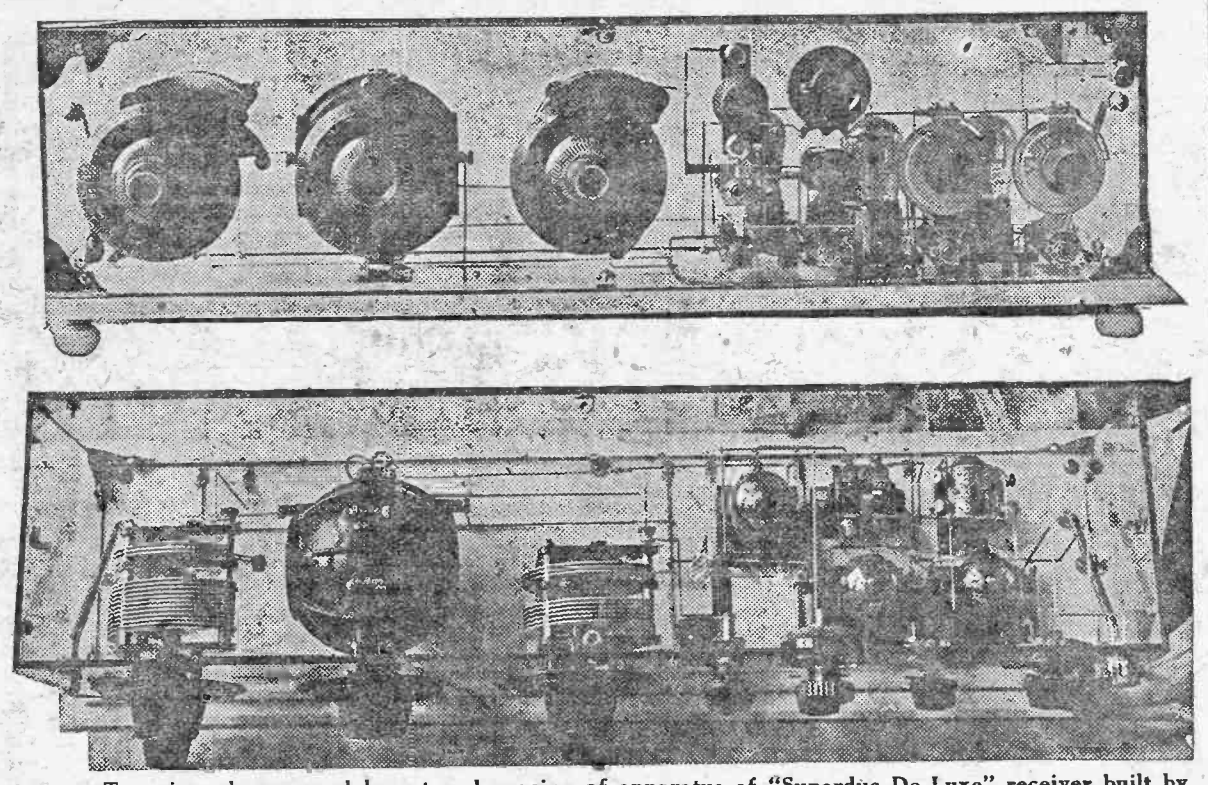
Other stations which will participate in the broadcasting are WLW, Cincinnati; KGO, Oakland; WGR, Buffalo; KDKA, Pittsburg; WGY, Schenectady; WOAI, San Antonio; WJAX, Cleveland; KFL, Los Angeles; WOO, Philadelphia; WHAS, Louisville; WDAF, Kansas City; WLAG, Minneapolis; WSB, Atlanta; WBAP, Fort Worth; KGW, Portland; WMC, Memphis; KSD, St. Louis, and WOAW, Omaha.

Makes $25 Look Like $75

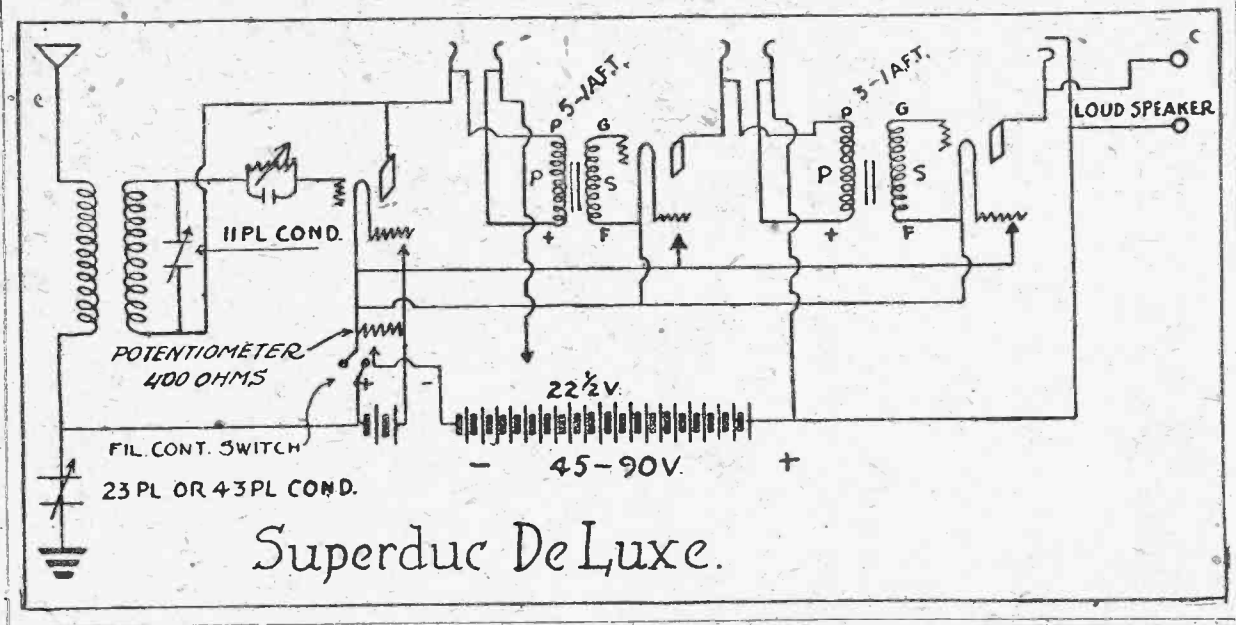
H. F. Kains submits to his brother novices a method that he found very successful and also inexpensive when drilling glass panels. It surely makes a $25 set look like a $75 one if care and accuracy are employed. First, take a thin piece of board and layout and drill holes the same as you would if you were working on bakelite. Now melt some paraffin or beeswax and apply while warm to board. Place board and glass together and allow to cool. Now make a mixture of 1 ounce of camphor, 1½ ounces turpentine and 8 drams of ether. Apply with brush or cloth to drill constantly and do not run drill to fast so as to burn it. It cost him 45 cents and he drilled three panels with splendid results.

See Classified Ads, on Page 15.

CONSTRUCTION DETAILS OF CHARLES RAY'S "SUPERDUC DE LUXE" RECEIVING SET



Top view shows panel layout and spacing of apparatus of "Superduc De Luxe" receiver built by Lewis B. Hagerman, technical editor of the Radio Magazine, for Charles Ray, the actor. Lower view gives an idea of the internal wiring.



Highly Amplified Radio Makes London Deaf Hear

According to a recent dispatch from London, a 77-year-old man, who has been deaf for thirty years, has heard once more thru the use of radio receiving apparatus.

Tests conducted at Marconi house, London, indicate that not only this man, but a great many others, including some who have been deaf from birth, are able to perceive music when amplified to great volume by means of radio amplifiers.

Some of them actually hear the sounds, if any portion of their auditory nerve is active, no matter how deeply buried within the head it may be.

Others are only able to feel the rhythm of the vibrations. In other cases the success of these tests has strained the emotions of the engineers who have witnessed the joy of those who find themselves perceiving sounds for the first time in years, or even in their lifetime.

Experiments will be continued to develop this phase of radio so that it may be applied in a practical manner.

Insulators of Porcelain

Aerial insulators should be made preferably of glazed porcelain, as hard rubber and composition insulators have not as much tensile strength and insulating qualities. They are also subject to decomposition when exposed to the weather.

Phone Tip Jacks Handy

Phone tip jacks gradually are replacing binding posts on phone aerial and ground and battery connections. The connection is quickly made and positive in its grip.

Radio Popular? Here's Proof

WHAT more proof do you want than this of the popularity of radio? The facts were presented recently by Pierre Boucheron, member of a large radio corporation. They summarize:

563 licensed broadcasting stations in the United States.

3,000,000 radio receiving sets.

10,000,000 listeners.

250,000 persons connected with the industry.

3,000 manufacturers of radio supplies.

1,000 wholesale distributers and jobbers.

25,000 retail dealers.

1,000 newspapers which carry radio news.

3,000 weeklies with radio sections.

30 radio periodicals.

50 magazines carrying radio sections.

250 books on radio.

Seven radio trade papers.

$17,000,000 estimated expenditure by American public during 1923 for radio material.

Balkans Get Radio

The first large broadcasting station in the Balkans is being built near Belgrade, Serbia. It will be operated by the postal service and will afford dissemination of news and other information in that area.

French Musicians Refuse to Have Music Broadcast

After several months of co-operation with the broadcasting stations in the Eiffel tower and in the suburbs of Paris, certain French musicians have decided that no longer will they permit their concerts to be broadcast without payment.

The Paris orchestra, for instance, now refuses flatly to allow its concerts to be broadcast, and the Union of Dramatic and Lyric Artists and the Syndicate of Musicians have both instructed their singers and instrumentalists not to allow the broadcasters to transmit their efforts.

Part of the difficulty is understood to have been occasioned by the fact that various restaurants and dance halls in Paris have discharged their musicians and instead have installed radio receivers.

You will find the classified advertisements on Page 15.

More Efficient Amplification Is Real Radio Need

The outstanding need of radio today, both for the enjoyment of the art and to promote its further development as a sound industry, is more efficient amplification.

Not only research engineers but manufacturers agree that the wider use of better amplification is the next stage of development of the utility. This will not only vastly increase the number of radio users, but immeasurably improve the standard and quality of results obtained in homes thruout the land.

To be sure, amplification is already used with a vengeance. Vengeance is often the precise word! Too much of it sounds like an alley cat singing to its mate: "Last night on the back fence I loved you best of all."

Radio's supreme need is amplification without distortion. As Claude F. Cairns, president of the Acme Apparatus company, transformer engineers and manufacturers, has pointed out, "to amplify is easy, but to amplify so that no distortion or change in the sound is made requires apparatus designed and constructed by specialists in amplification. In all amplifiers there are transformers and vacuum tubes.

Heart of Amplifier.

The transformer is the heart of the amplifier. Unless the proper transformer is used, the singer's voice in New York is distorted into squeals and squawks in Chicago. The voice will be amplified, but the tone and the rich natural quality will not be preserved without a proper transformer."

The general public is realizing more every day that amplification is the most important single factor in radio. It is so fundamental that without amplification radio today would be impossible. Changing electric waves to sound waves wouldn't mean much if they couldn't be heard plainly. Amplification builds them up so that they are clear and easy to hear. Amplification is used at the transmitting station as well as at the receiving instrument. Faint whispers thousands of miles away become clear, living voices in the homes of millions.

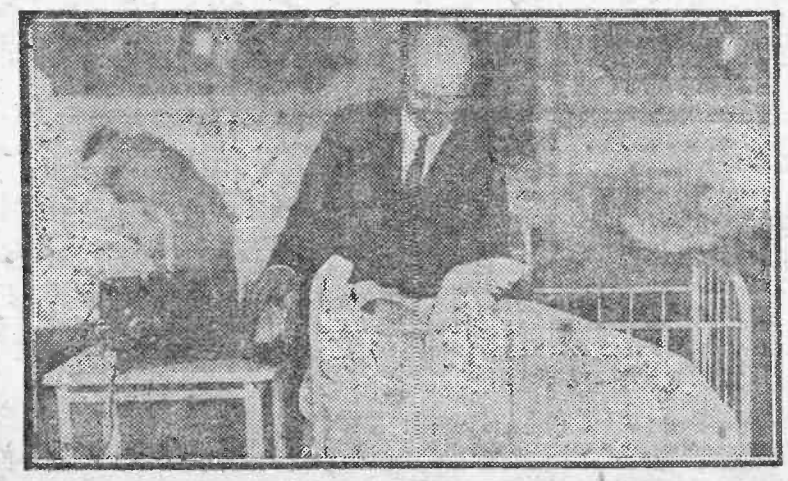
Sound Is Multiplied.

Amplification is multiplication. The small amount of sound energy generated by the voice or violin string at the broadcasting station is changed to electrical energy and then multiplied or amplified millions of times. This large amount of energy is then put into an antenna and radiated out into space as an electromagnetic wave. When this wave strikes a similar antenna thousands of miles away it gives up to it a small amount of this energy to be amplified again, so that a whole roomful of people at the remote point can listen and understand.

"In a very real and vital sense," to quote Mr. Cairns, "the key to radio is amplification, and the public is increasingly realizing this. Even more important, they are demanding amplification which gives not only volume but quality of sound—amplification without distortion."

Continuous Whistles in Set

The continuous whistles in your receiver, which persist even when you are not touching your controls, come from near-by regenerative sets, which are reradiating, or acting as miniature transmitters, because their operators are not tuning them properly. You do the same to your neighbor when you allow the detector tube to oscillate. Keep the tube turned down just below the oscillating point. Your receiver won't reradiate then, and not only will your neighbor thank you but also you will get much clearer reception of signals.



PUTTING THE BABY TO SLEEP BY RADIO—Photo shows Dr. W. M. O'Gormer following out the suggestion of Mayor Hague of Jersey City and using radio to put babies to sleep at the Mothers' institute, Jersey City, N. J.

Reminiscences of Vacuum Tube Research Work

By F. S. McCullough.

(Research Engineer, Westinghouse Electric and Manufacturing Company.)

The forerunner of the vacuum tube was the experiment of Edison in 1883, when he observed an electric current between the plate and a hot filament in a vacuum. At the same time some German scientists were working on it.

The work of Edison was followed by Preece, Fleming and Thompson, English scientists. It was not until 1898 that Sir J. J. Thompson suggested an explanation of this phenomenon. About this time Marconi introduced radio telegraphy. Sir J. A. Fleming applied the vacuum tube for detecting radio signals in 1904. In 1905 DeForest, an American, changed this vacuum tube. The new tube was able to amplify the signals. Then in 1913 E. H. Armstrong invented an electric circuit, which with this tube was capable of producing oscillating currents suitable for sending radio waves or regenerating received signals. By regenerating we mean multiplying these signals hundreds of times.

This, briefly, is the history of the vacuum tube. Larger tubes of this type are used at the broadcasting stations. For transcontinental telephone transmission, telephone companies are using a similar tube. In appearance the vacuum tube looks somewhat like an electric light bulb. It has a glass bulb for maintaining a vacuum. This bulb is sealed in a metal base mounted inside the tube; there is a heated filament surrounded by a complicated metallic structure. The radio engineer knows this as the grid and plate. The outside of the structure is a thin metal plate formed into a cylinder or an oval.

Wire Coil Is Grid.

Between this plate and the filament you will see a wire coil or a mesh. This is the grid. Now imagine a stream of electrical particles shooting out from the filament and across the space thru the grid to the plate. This grid acts like a door. By opening and closing this door you can vary the amount of current that goes thru; only you open and close this door electrically and not mechanically. Just like a small child can open a door for a grown-up person, so can the small electric currents open a door for large electric currents. That is exactly how a vacuum tube works.

To produce this tube, the scientists and engineers had to solve quite a number of technical and scientific problems. Years of research and millions of dollars were spent on developing the materials, the methods and the machinery for the manufacture of these tubes.

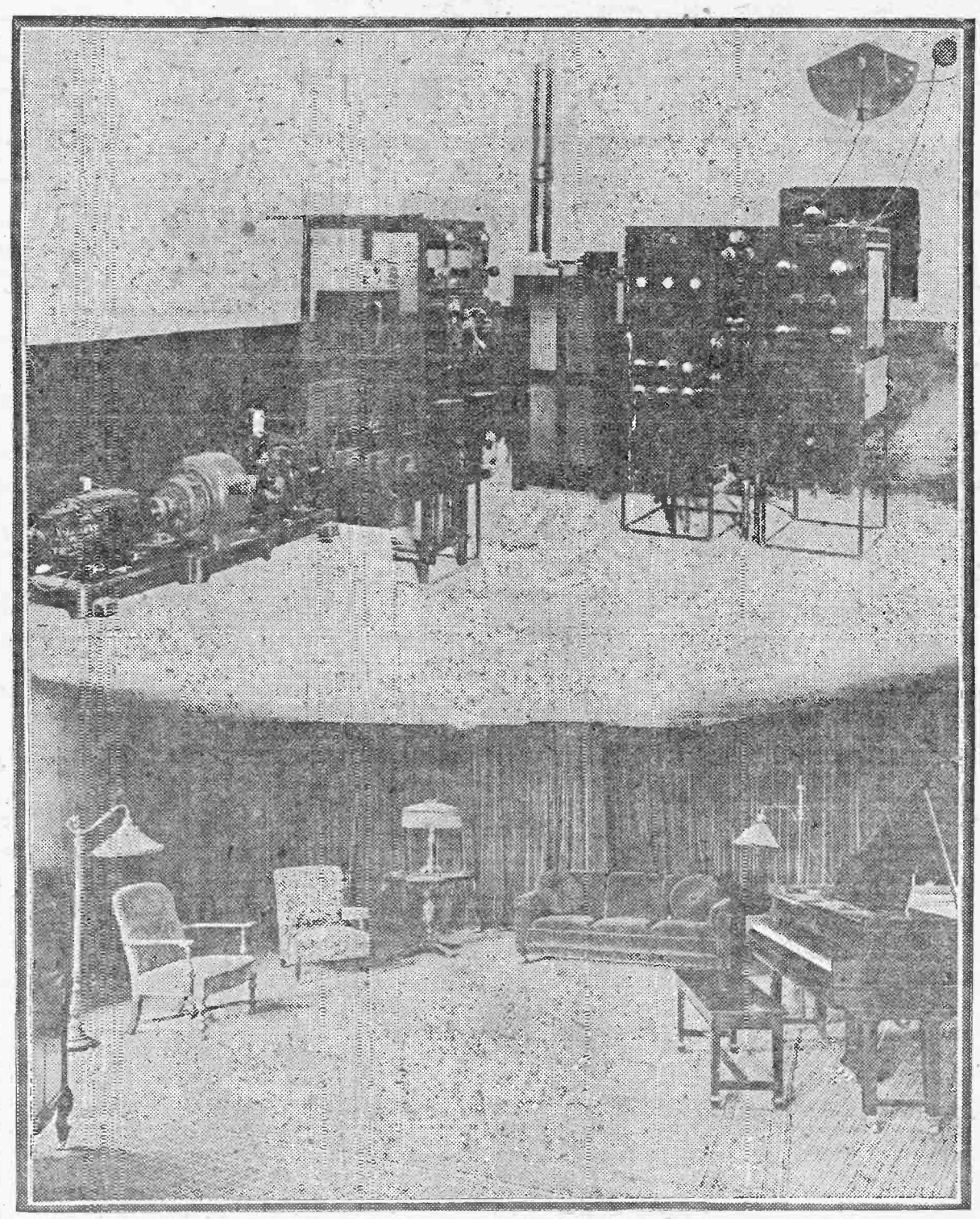
To give you an idea of what these problems are, let us compare the vacuum tube to an electric light globe. In an electric light globe we have a vacuum which has about one-millionth of ordinary air. In a vacuum tube there is ten million times less air than in an electric light globe. Imagine the trouble of getting this vacuum. When you get nearly this far, the glass walls and the metal parts inside of the tubes begin to give off gas. Before vacuum tubes were invented, the scientists did not even know that the glass and the metals could contain gas. Now they had to find a way to remove the gas and make sure no more gas would come out after the tube is in service. It may be interesting to observe that with all this vacuum an average receiving tube will still contain about ten to twenty billions of atoms of gas. You have seen tubes with a bright filament and a dim filament.

Work on Dry Cells.

Some need a storage battery, while others will burn with a dry cell. It is seldom realized that a dry cell tube takes but one-twentieth as much power as a storage battery tube, yet it gives the same service. However, a large amount of experimental work had to be done before this small amount of power could be made to do the work. The engineers had to develop a filament of extremely fine dimensions. This filament is one-fourth of one-thousandth of an inch thick and ten-thousandths of an inch wide. This means that it would take four thousand of these filaments to make up one inch if laid side by side. This filament must be then coated in a delicate manner with a layer of active material. When you consider that this filament must be mounted in the center of the coil one-sixteenth of an inch wide, you will get some idea of what the difficulties are.

The other extremes in vacuum tubes are the power tubes at the broadcasting stations. These tubes are made at the present time in sizes which range up to 1,000 kilowats. This means that they are capable of delivering about 1,300 horse power of radio energy to an antenna. Of course, no broadcasting station is now allowed to use such an amount of energy. When this will be allowed, one broadcasting station will be able to reach the extreme ends of the earth. This day is not far distant. A few years from now you may be able, on your set, to listen to one station in London and another in Peking.

Buffalo Station Is One of the Most Powerful in Country



Two photographs of Buffalo broadcasting station WGR. At the top is shown the broadcasting room and the various instruments used. The lower picture is that of the concert-room.

OF INTEREST to Chicago radiophans and others of the midwest should be the following description of Buffalo's radio broadcasting station, WGR, which is heard in this locality nearly every evening. WGR's programs are among the best. —The Editor.

"HIGHEST in the world but one" is the cage antenna 350 feet high that rises above Hotel Statler, Buffalo, N. Y. Listeners from London to Honolulu have spent happy evenings enjoying the music sent out from his gigantic monument, but few have seen the intricate mechanism that "puts the program on the air."

This antenna, which belongs to broadcasting station WGR of the Federal Telephone and Telegraph company, is supported by masts eighty feet high and 150 feet apart. The same masts offer support to the maze of wires which form the counterpoise.

Below, on the nineteenth floor of the building, is the operating-room equipped with the newest machinery, installed direct from the Federal factory. This room contains the generators, the power amplifier and the modulating, oscillating and monitoring equipment. In the picture accompanying this article are shown the generators which supply the plates and filaments of two 250-watt oscillators and two modulators of the same power.

Generator Noises Stilled.

An effective power filter, also located here, hushes all sounds. By the use of this mechanism the hum of the generators is completely stilled.

On the eighteenth floor of the hotel are located the office and studio. Capacity microphones, each with an adjacent voice amplifier, catch the programs from the studio.

Heavy carpets, velour drapes and pongee silk ceiling make the studio perfect in sound transmission. The voice of the most brilliant soprano will wake no reverberations in the room, but will go out thru the microphones to the thousands of listeners unmarred by echoes.

Other sets of microphones are connected by a mile cable with the transmitter from the grill dining-room and local ballrooms.

From the dining-room organ of Hotel Statler each noon Albert Bouchard gives radio listeners a twenty-minute program of classical music. At 4 o'clock daily Miss Martha Coupl offers a program of "tea-time music." At 6:30 each evening the Vincent Lopez Dance orchestra entertains the jazz hounds.

Station Kept. Busy.

On each Monday, Tuesday and Friday evening a program of semiclassical music is put on the air. The station rests little, however. Special concerts and talks are not unusual on intervening nights.

The avowed desire of WGR is to keep in touch with the "unseen" public. In addition to the usual staff of announcers and managers, a large group of letter clerks is employed at the office. These people keep records of letters from England to Hawaii and Paris (as well as Podunk). They seek to learn the tastes of their audience and request opinions of "phans" on jazz and opera.

"We wish to serve" is the motto of WGR.

Care Must Be Used in Selection of Loud Speaker

Sooner or later the radio enthusiast wants to lay aside the head phones and replace them with a loud speaker in order that radiophone service may be used for dancing or for otherwise entertaining a roomful of persons. When that time comes, the prospective purchaser is confronted with one of his most stubborn problems.

The simplest form of loud speaker is one that makes use of existing receivers without extensive alterations of the receiving and amplifying units. For instance, there are horns available which may be fitted to the regular telephone head set. Such horns are provided with soft rubber gaskets and sometimes with clamps so that the regular head set may be held in place while the sound waves from both receivers travel thru the horn and are amplified by resonance.

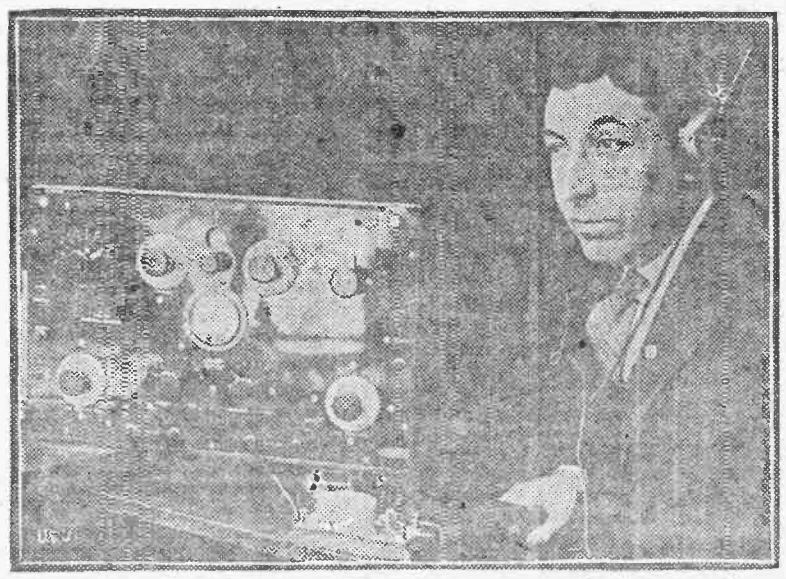
However, where something of a more ambitious nature is wanted it becomes necessary to use a special type of speaker. The simple kind are those which make use of an ordinary phone receiver placed in the base of the horn. Usually the horn is constructed of a special composition material to handle the tone and quality of the reproduction. There are all kinds of such devices on the counter, ranging from horns of pressed paper or wood pulp, built in the general form of the channels of the human ear, to pressed copper reflectors of conventional design.

One of the most popular types of speakers consists of a uniquely designed metal horn mechanically attached to the mechanism of a special telephone receiver in which the standard mica diaphragm is replaced by a strong corrugated metal diaphragm which will stand practically any amount of abuse without damage.

Tuning Is Not Chance

Turning dials at random is not tuning. You may run into some stations by accident, but the chances are you only will pull in the near-by stations, which you can't help to tune in. Learn the science of tuning if you would enjoy your set.

See Classified Ads, on Page 15.



FARMERS' BEST FRIEND—He has the farmers' interests at heart—J. C. Gilbert, head of the radio market service of Uncle Sam's department of agriculture, who sees that daily radio market reports never fail to go to the thousands of farmers of the country. Not only that, but Gilbert keeps tab on the types of radio sets used "back on the farm" and recommends what he thinks best for the use of the farmers.

Only Obstacle in Way of Television Remains One of Pure Mechanics

By Milton Bronner.
(N. E. A. Service Writer.)

LONDON, Feb. 7.—You sit in your office in Chicago and, picking up the telephone, say:

"I would like to talk to Mr. Blank of Blank & Co., London, England."

After a short pause:

"Hello, Jim, old fellow. It's great to hear your voice. You are looking much stronger than when I last saw you. Your face is fuller and you look fit for anything that comes up. Now about that deal——"

With land wires across the country and wireless across the seas you hear the person with whom you are speaking, as on the ordinary telephone of today. But what is more, you SEE him.

Is it a scientist's dream?

Edouard Belin, Frenchman, who has invented a method of sending photographs by telegraph, says he already has such an apparatus working over small distances.

Prof. Fournier d'Albe, inventor of the optophone to enable the blind to read thru their ears, says television will be accomplished by the end of the present year.

Prof. A. M. Low, who had charge of the British royal air force experimental works during the war and who has nearly 140 inventions to his credit, including sending photograhps by wireless, says television will be accomplished in a crude fashion in about ten or twenty years.

Sir Oliver Lodge, world-famous scientist, says television will be a fully accomplished fact in about a century.

I had a talk with Prof. Low about television.

"Basically," said he, "the only obstacle in the way of television is one of pure mechanics. The theory is worked out. The method is all mapped out.

"When a number of us, working in different countries, discovered a method of sending photographs by telegraph, we also thereby discovered the principle which will one day give us television.

"In simple terms, transmission of photographs by telegraph or wireless is brought about by the transmission of light thru a sensitized photographic plate which acts upon photo-electric cells. These, in turn, send vibrations along a wire or thru the ether to a receiving set. These vibrations open or shut a little shutter arrangement which permits rays of light to fall upon a sensitized plate. The latter receives exactly the picture that was on the plate at the sending end of the line.

"Now the problem of television consists in substituting your eyes for the plate at the receiving end. In sending a photograph by wireless, about fifteen minutes are required. To make the same impression upon the eye the sending would have to be cut down from fifteen minutes to about four-fifths of a second.

"This first television will, of course, not be in colors. It will be in black and white. The matter of colors would be worked out later just as it being done in ordinary photography."

Prof. A. M. Low, famous radio inventor, with his wireless transformer, one of his products.

Here's a Super-Simple Set

To make simple radio, secure any make crystal detector and connect as follows: To catswhisker arm connect aerial lead-in and one end from your phone cord. To cup of crystal detector connect ground wire and the other end of phone cord. To tune adjust catswhisker on crystal and secure sensitive spot and enjoy it. In order to throw off station not wanted find better spot on crystal.

Be sure to read the Classified Advertisements on page 15.

Counterpoise Best Ground

Counterpoise ground makes the best for transmitting. Where possible spread it out under the aerial, about eight to ten feet from the earth, radiating from the receiver. If space does not permit place it five feet or more above roof. If metal roof even higher, but aerial must be raised as high as possible.

Patience in Tuning

If you can tune-in one long-distance station, do not condemn your set if you cannot pick up other stations. The fact that you tuned-in one is proof the set is efficient. The trouble lies with you. Be patient, practice often, and above all, do not be ashamed to ask some one to show you how to tune your particular type of receiver.

"Ignorance and Bliss"

Some persons "operate" a receiver for months, feeling secure in the belief they are getting all that it is capable of producing. There comes along some insisting friend who has a more thoro knowledge of correct tuning, and disillusions them with a few turns of the dial. Most any sort of a vacuum tube set will bring in distant stations if operated properly.

Watch Your Batteries

The best radio receiving set in the world will not operate effectively on rundown batteries. Keep your storage battery fully charged, or if you use dry cells, see that they are full of pep. If not, replace them. Test your "B" batteries with a voltmeter, and throw those units away that fall below 40 per cent normal.

Day and Night Reception

Daylight radio reception is not near so good as night reception. Do not expect to pick up stations as distant during the day as you can in the evening. It can't be done.

Broadcast Twice Weekly by WTAS

Often heard, seldom seen, Lou Fordan, who is broadcast twice weekly from WTAS, Elgin. Altho this station is owned and operated by Charles Erbstein, his name is never mentioned by the announcer. "Tommy, Willie, Annie, Sammie, WTAS, Elgin" is the name known to the phans.

Wally Schang, star catcher of the New York Yankees, is a radio bug. From the expression on Wally's face it would seem he had just picked New York out of the air and had heard some good news from Owner Jake Ruppert as to his salary for the coming season. Schang's Boston terrier, Scotch, is also much interested in the working of the radio, as is apparent from a glance at the picture. Schang has taken on considerable weight since the close of the season, but says he has several big years back of the bat still in his system.

HOME WORKSHOP

Simple Explanation of Why Solder Is Necessary

Soldering is necessary in radio work because of feeble currents and it is necessary to insure perfect contacts. This is not so necessary in heavier electrical currents. Two wires, seemingly, may form a perfect contact when twisted or entwined. However, a thin film of air separates them, either partly or completely so. It may not be distinguishable to the naked eye, but, nevertheless, exists and is sufficient to prevent feeble currents crossing it. By replacing this air film with a film of solder perfect contact is insured. Leakage thru imperfect or unsoldered connections forms one of the chief causes of failure in amateur or homebuilder construction.

Coils for DX Crystal

Charles G. Grant, 140 South Dearborn, in an interesting account of the Hagerman long-distance crystal hookup states: "After experimenting with many kinds of tuning units, I have found that I have found that the variometer is the best coil to use with the crystal for volume and distance." He continues:

"An English radio magazine recently recommended a winding of 30 turns on the stator and 20 turns on the rotor. This achieved an excellent result, but further experimenting proved that winding 26 turns on the stator and 30 on the rotor made a noticeable improvement. It was discovered that the heavier the wire used the better the result. The average commercial variometer has too much material in its construction. Home-made coils mounted on four-inch pasteboard tubes for the stator and three and one-half inch for the rotor are the best. A solid shaft with a knob or dial is used on one side and a hollow shaft thru which the ends of the rotor wires may be drawn is used on the opposite side.

"These variometers work well with a 43-plate condenser on the ground for distance reception, but get more volume locally with only the variometer and the crystal. The use of the condenser improves tuning locally, however. I have my set arranged so that I can cut out the condenser at will. I also use both a fixed crystal and a synthetic crystal with the adjustable cat whisker. The fixed crystal is used to determine rapidly whether signals are coming in or not and the other crystal detector is used to get the maximum volume.

"This set with a hundred feet of outside aerial and a radiator ground gets Elgin and Zion City at any time they are broadcasting and gets local stations on a loud speaker made of a phone unit and a ten-cent megaphone. At night the reception on the loud speaker is quite audible all over a good-sized room."

Radio and Phonographs

Radio sets are not as easily operated as a phonograph. You can't just turn a knob and bring in at will stations from coast to coast. There are several steps to be taken in the operation of a radio receiver, and these must be taken in orderly sequence. Learn these steps and adhere to them religiously and you will find immeasurable pleasure in your receiver.

Voltmeters Tell What Your Tube Voltage Is

Voltmeters used on a receiver to watch filament voltage add to the life of vacuum tubes. All tube manufacturers specify the voltage limitations of their product. Simply turning on a six-volt battery on a 201-A tube and guessing that a sufficient drop in voltage between battery and rheostat will give the proper value is taking chances. By attaching a voltmeter to your set and connecting all tubes to it by switches will enable you to tell just what each filament is consuming. Adjustment of rheostat to control voltage then can be done.

Tight Battery Connections

Most of the trouble from poor reception of the come-and-go type can usually be traced to broken or loose conncetions in the battery leads and in the telephone cord. It is usually advisable to tighten up the wires used for connecting the B batteries in series every so often to make sure that they are making good contact with the terminals.

Water on Battery Plates

Keep water well over the tops of the plates in your storage battery. Do it before charging if possible. However, distilled water may be added after, altho it will give "water reading" which tells nothing. Use battery so filled for awhile and then recharge.

Be sure to read the Classified Advertisements on page 15.

Phones Are Most Delicate of All Radio Devices

The most sensitive of all mechanisms is the head set of phones. It surpasses in delicate adjustment the finest electrical receiving instruments and may be operated on as little as sixteen billionths of one ampere of current—an almost unthinkable measurement. In fact, were it not for this supersensitive instrument there would be no radio.

The phones pick up the complex vibrations which come into our set, varying from the faint whispering melodies to the high pitched violin or the heavy roll of the organ, and transcribe them almost accurately to our listening ears. Perhaps there is on other article manufactured for which the buyer must depend on the integrity of the maker for the quality as much as in the purchase of the head set.

As there are many makes on the market, one needs to learn something of their various parts in order to be able to judge somewhat of their merits. In assembling the head set we find five important elements. The shell usually made of a hollow, moulded, insulated material, is sometimes metal and has machined threads and a cover which fits perfectly. Just inside the shell the permanent magnets are firmly attached. These are made of flat steel rings, magnetized, and have attached to their poles two pole pieces. Upon these are wound the bobbin coils as high as 10,000 turns of number forty insulated wire. The bobbins are placed in a space of a fraction of a cubic inch.

The diaphragm is attached to the large end of the shell which is ground off parallel to the pole faces. It is a thin circular piece of metal and very flat, placed over the contents of the shell and held in position by the powerful pull of the permanent magnet. This pull is so great that there is a slight curving of the center of the diaphragm toward the magnet. By accurate scientific reckoning, the exact distance is determined, that is, that the diaphragm shall be placed very close to the tops of the pole faces but not touching. The nearer the diaphragm is to the pole faces the more sensitive will be the receiver, but the diaphragm must be far enough away to move freely or clear reception will be impossible.

After the parts which fit into the shell are properly assembled, the cover, which is hollowed in the center with opening thru which the sound can pass, is screwed on. As the signal passes plate "D," the combined action of filament and battery B draws it thru the coils R R at P and causes a variation of the magnetic pull on the diaphragm. As the diaphragm comes into contact with the air it causes atmospheric disturbances which set up sound waves that are conveyed to the ear.

There is practically very little gained by knowing the number of ohms in any head set. The ohms measure the direct current resistance only. In fact, it is said that one manufacturer wound his bobbins with German silver wire which offered magnificent resistance, but what it did to the radio currents no one knows, for they were never heard. Therefore, an important item to remember is that the other elements in the head set must be accurately gauged in order that the rated ohms may mean something to the buyer. That is, if the sensitivity of the set and the clear reproduction over a wide band of frequencies is excellent, then the number of ohms given is in all probability accurately measured.

Radio sets are sometimes scrapped when in reality the trouble lies in the phones, either poor when purchased or made so by improper usage. The permanent magnets may become demagnetized by dropping, clicking together or in numberless other ways, due to carelessness.

To test out phones to see if they are in good working order we may moisten a piece of paper and place it between a penny and a nickel. A click should be heard in the phones when the tips come in contact with the coins. If no sound is heard they should be returned, or if we are expert enough we may endeavor to locate the difficulty ourselves. Remove the cap very carefully and slide the diaphragm off from the shell sidewise as the pull on the diaphragm by the magnet might bend and make it useless if lifted directly off. The edge of the diaphragm may then be held against one pole face.

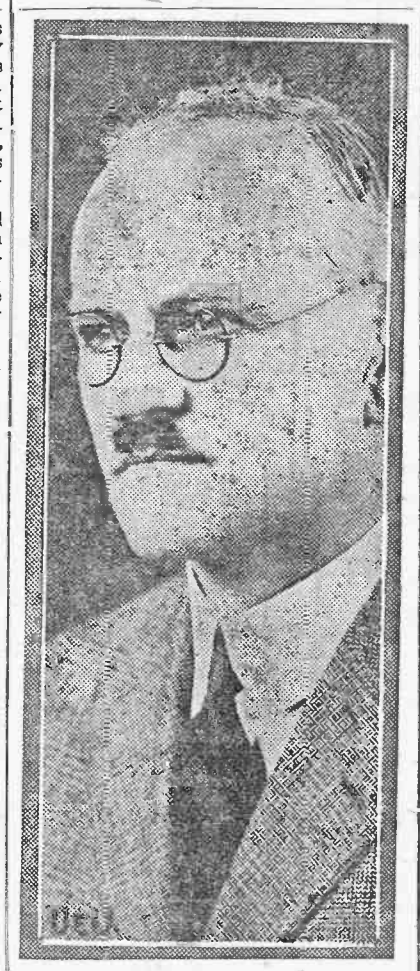
If the magnets are in good working order they will support the weight of the diaphragm. If they cannot do this they should be sent to the factory and remagnetized. If we remove the receiver cap and diaphragm, we must see that no dust or moisture remains in the case. It is also well to see that the cord attached to the phones is carefully handled, as a twist or bend which causes some slight imperfection will interfere materially with good reception.—Crosley Radio Weekly.

Nickel-in-the-Slot Radio Set

D. J. Richardson's nickel-in-the-slot radio receiving set in operation in a barber shop. This set will be displayed at radio show in Washington March 19 to 26.

Dryden Named Sears-Roebuck Station's Chief

The newly appointed director of the Sears-Roebuck Agricultural foundation's radio broadcasting station is L. P. Dryden. This will be the only exclusively agricultural broadcasting station in the country and is to be erected on a 130-foot aerial. post on



L. P. Dryden.

the top of the company's nine-story Tower building. The fourteen-story tower will be used as the other post.

Work on the re-enforcements already has been started and the radio apparatus is expected to arrive within a few days. According to Mr. Dryden the station will be completed and ready for its opening broadcasting program about March 1.

The new station will have a wave length of 448 meters. It will be a 500-watt station, employing two motors, and will carry a class B license—the highest issued by the government. The studio will be located on the eleventh floor. The operating room will be on the fourteenth. In addition to the main studio, there will be a downtown branch in the loop district, with special leased wires thruout the city for the entertainment features of the programs, which will include the best music and theatrical talent. The balanced programs will be furnished by the agricultural foundation, of which Samuel R. Guard is the director.

The station will develop a new type of forensics for radio, different from any now in use. By having the station in the open district and free from absorption by its own and other buildings, it is estimated by Mr. Dryden that it will be possible to put more energy in the air than any other Chicago station. It will be the largest station built by the Western Electric company.

Broken Phone Cords

Some telephone cords, thru twisting and kinks, become broken, altho the insulation hides the break. Roll the cord between your hands, back and forth. If the music comes and goes the wires inside are broken and the cord should be replaced with a new one.

Know Your Receiver and Circuit to Enjoy It

The fact that your set worked all right at one time is proof it will work all right again. The trouble is more likely to be with you. Either you have abused the set or neglected it in some way.

Do not condemn the set or the circuit until you have determined the cause.

The man who gets the most service and satisfaction out of his automobile is the one who understands something about its operation and makes simple adjustments when trouble first shows up, thus preventing more serious trouble later.

This rule applies to radio receiving sets. Obtain a diagram of your circuit. Open up your cabinet and compare its wiring and mechanism with the diagram. Begin at the aerial binding post and trace the wiring from one instrument to another, with the diagram before you.

If needs be take a sheet of paper and draw, however crudely, all the instruments and their connections on this sheet and then compare this with the schematic diagram and the set itself.

Repeat this process until you have a mental picture of each inch of your set which you can recall whenever you wish.

Study carefully the nature and purpose of each instrument. A twenty-five-cent handbook on radio reception will give you the basic principles of radio reception and the receiving instruments that make it possible.

Equipped in this manner you will be in a far better position to really enjoy your receiver, even if you never expect to do your own construction and repairing.

Score Another for Radio.

It is said the common telephone receiver has developed American left ears to a higher sensibility of sound. Radio phones, being clamped to both ears, ought to make both ears better. ears better.

Why Not Write 'Em?

Not long ago I was fitting up a crystal set for a friend, and after a considerable time had passed with no results, his little girl innocently exclaimed: "Perhaps they don't know that we have got one yet!"—C. Mason.

Radio Marvels to Be Displayed at Capital Show

Marvels greater than those Alice beheld in Wonderland are promised by reports from Washington to be demonstrated at a radio show in the capital, March 19 to 26. The rapid developments of the last few years will be topped with a great display by the army and navy, the bureau of standards and independent inventors.

The presence of the patent office has made Washington the "Greenwich Village" of the radio world, and "phans" from New York to San Francisco are awaiting the exposition.

C. Francis Jenkins, inventor of the radio picture transmitter, will demonstrate his remarkable machine. He claims by the use of this device to print from one exposure pictures on negatives in hundreds of distant cities.

Shoots Pictures Thru Ether.

Some months ago the successful trial of the picture transmitter was announced. At this time Mr. Jenkins placed his lens in an inside room where the exposure was made. The picture was recorded on a photographic plate in another room separated from the first by a brick wall. Since that demonstration, the apparatus has been perfected until its power of "shooting" pictures thru the ether is limited only by the power of the broadcasting station operating the machine.

Army engineers have boasted, "we are at least two years in advance of the wizards employed by commercial manufacturers." They have no hesitation in making their statement good at the Washington radio show. Maj. Gen. George O. Squier, chief signal officer, promises the real sensation of the meet.

When the great airship, "Shenandoah" was torn loose from her moorings in Lakehurst, N. J., and swept in front of a terrific gale that split her nose cover, it was her radio equipment that kept her in constant communication with the land. A duplicate of the apparatus on the "Shenandoah" will be displayed at the exhibit.

Show Radio Compass.

The radio compass, used to give ships warning and to correct locations in fog, will be another feature of the navy display.

No show is complete without a nickel-in-the-slot machine. A "listen-for-a-nickel" receiving set, devised by D. J. Richardson, will operate thru the convention. Apparatus which enables the public to know that the set is working before the nickel is paid is attached to the receiver.

President Coolidge, a confirmed phan, is expected to open the display, which is under the direction of the Radio Merchants' Association of America.

Maybe you'd like to sell your set—and that's exactly the set some one else wishes to buy. Advertise it in the Classified Section of this magazine. 5 cents per word. See page 15.

Fine-Tuning, Three-Honeycomb-Coil Receiver Mounted on Universal Panel

THE accompanying diagram shows how to make your Universal panel set into a three-honeycomb-coil outfit. This is one of the finest tuning circuits known and will prove more than satisfactory to the phan who has no prejudice against panel-mounting his coils.—The Editor.

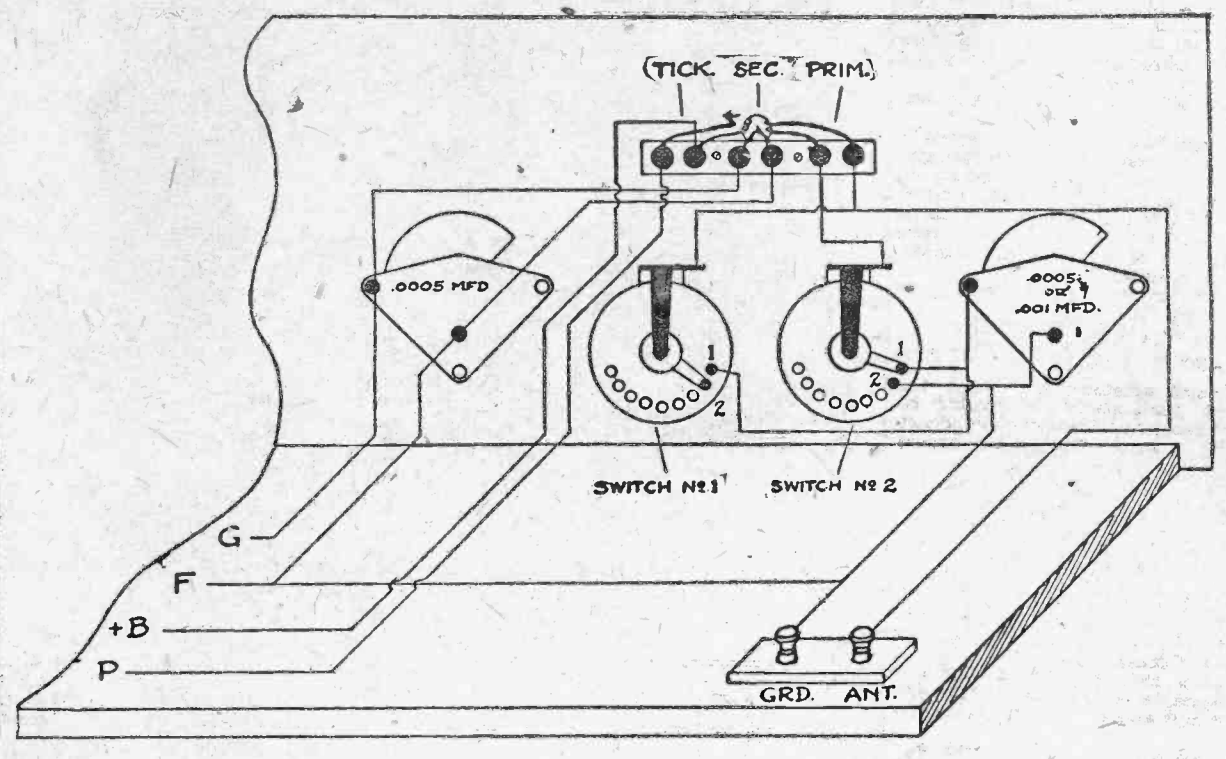
By Benjamin E. Freund.
(Chief Engineer Radio Division Crosland Pfaff Engineering Laboratories.)

HERE is a solution for those who are troubled with local interference. Almost all who have invested in radio to the extent of having a tube set have sooner or later wished that their sets were capable of pulling in long distance while local stations were broadcasting.

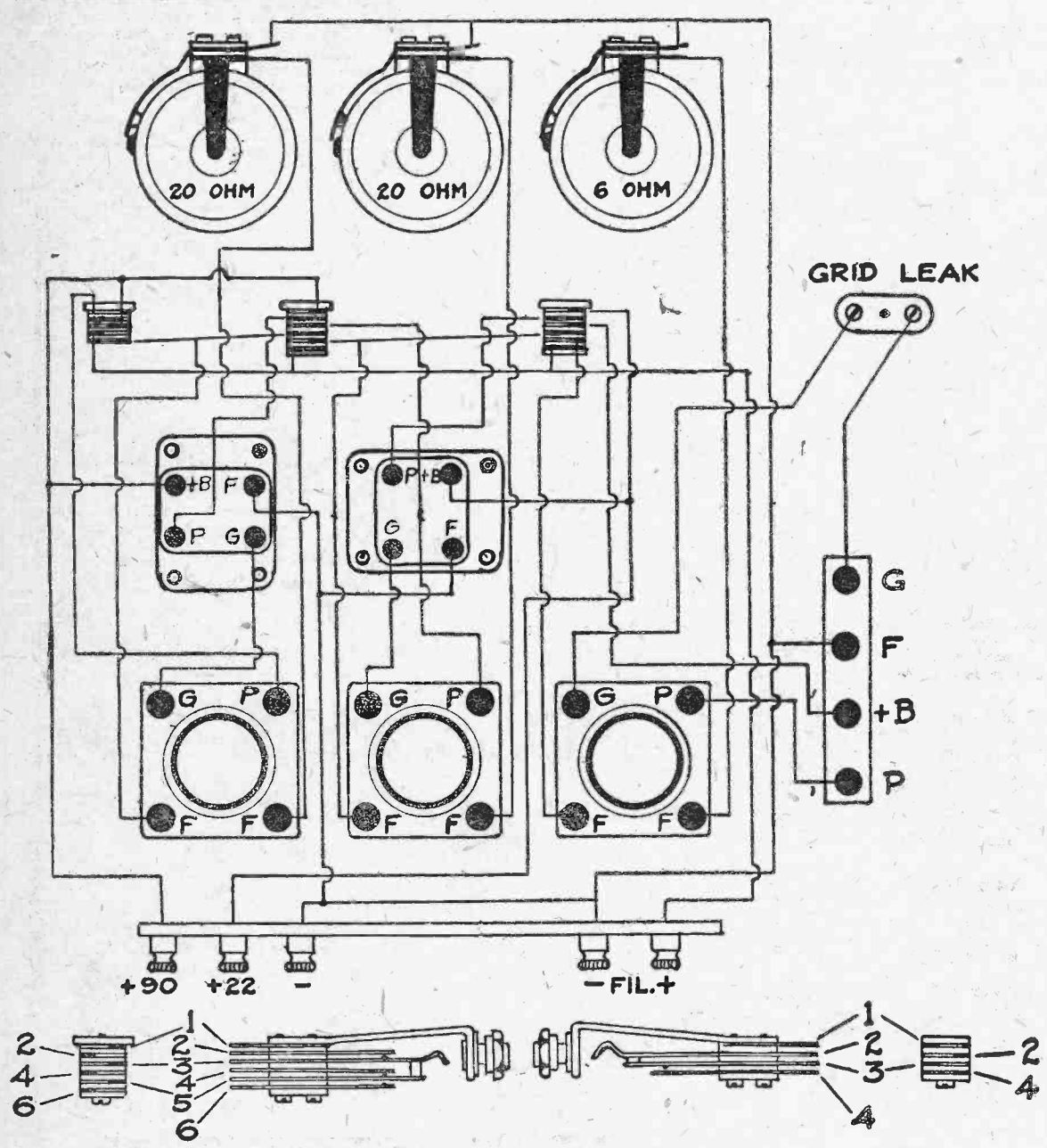
There probably is no type of receiver which is better capable of fulfilling these requirements than a good selective regenerative receiver.

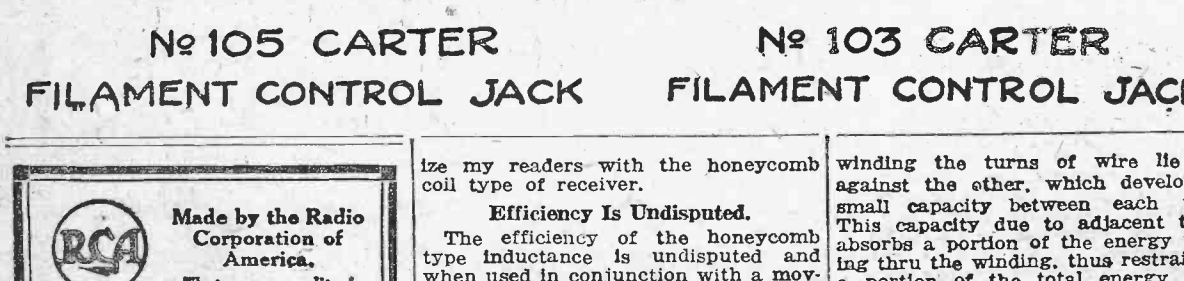
We all know that a properly built regenerative receiver will bring in distant stations, but very few of them can make the accomplishment while our powerful local stations are doing their bit.

It is because I believe there is a desire for a receiver which can overcome this difficulty of getting thru Chicago that I am going to familiarize my readers with the honeycomb coil type of receiver.



Benjamin E. Freund





№ 105 CARTER FILAMENT CONTROL JACK

№ 103 CARTER FILAMENT CONTROL JACK

Efficiency Is Undisputed.

The efficiency of the honeycomb type inductance is undisputed and when used in conjunction with a movable coil mounting almost any degree of coupling can be had, which is a much desired feature in order to obtain sharp tuning.

The circuit which I am going to describe in this article is the three-circuit regenerative receiver using feedback for regeneration. Three honeycomb coils are the necessary inductances in this circuit.

There are two such types of coils; one is honeycomb wound and the other duo-lateral wound. The duo-lateral is a more improved winding and is a little more efficient.

Difference in Winding.

The difference lies in the winding of one layer above the other. In the honeycomb type the layers are wound so that the turns of one layer fall directly above one another, while in the duo-lateral type the parallel layers are wound so that the turns of one parallel layer fall not directly above, but in between the turns of the adjacent parallel layer. The reason that coils are wound in such a fashion, while it is much easier to wind them straight, is that in straight winding the turns of wire lie one against the other, which develops a small capacity between each turn. This capacity due to adjacent turns absorbs a portion of the energy passing thru the winding, thus restraining a portion of the total energy from going thru the effective part of the circuit. In the honeycomb and duo-lateral types of coil the turns are spaced a fraction of an inch apart. This spacing of turns reduces the capacity between turns, thus reducing the amount of energy, which is absorbed to an almost zero, which makes the inductance highly efficient for long-distance reception.

Efficient Coils Needed.

It can easily be seen that if a long-distant signal which is very weak enters a circuit which has high internal capacity wound coils the greater part, indeed probably the entire energy will be absorbed or lost in the inefficient winding; so efficiently wound coils are one means of using whatever energy enters the coil to the best advantage.

Of course, the amount of energy which will enter the receiver depends upon the distance from which the signal is received and the efficiency of the antenna. Efficiently wound coils with an inefficient antenna are as bad as a good antenna with a poor receiver. Both are vital qualifications fod good reception.

A good receiver which is to tune out strong local impulses so that weak impulses will be utilized without being hampered or interfered with by the local stations must be able to tune very sharply to the desired wavelengths.

One of the best ways of obtaining sharp tuning is by very loose coupling between primary and secondary circuits. When honeycomb or duo-lateral coils are used in conjunction with a movable mounting the coupling can be made as loose or tight as desirable.

Must Separate Stations.

The looser the coupling the more difficult it is to tune, so that coupling should be made as loose as is necessary to separate the interfering station with the desired one.

This difficulty in tuning when loosely coupled is called "sharp tuning." Sharp tuning is the key to selectivity. This loose coupling is obtained by separating the distance between the primary and secondary coils. The illustration shows a Columbia geared three-coil honeycomb mounting. The gearing of the coils is a very good feature, making it possible to obtain a vernier adjustment on the coupling of coils.

The tickler coil adjusts the regeneration by feeding back the energy after it has once passed thru the tube. The energy is fed back thru induction from the tickler coil, back into the secondary coil, allowing it to be again put thru the detector tube, but greatly amplified the second time.

Regeneration is a great aid to weak long distant signals. This can also be controlled by the coupling of the tickler coil to the secondary; it also having a geared adjustment. For broadcast stations a 50-turn coil should be used in the primary, 75-turn coil in the secondary and 100 turns in the plate circuit or tickler. As the coils are of a fixed value, variable condensers are used for tuning. The illustration of the tuning unit shows the arrangement of apparatus on the Universal panel looking from the rear of the panel. The secondary coil is tuned by a .0005 or 23-plate condenser, being connected in shunt. If a 23-plate condenser is to be used in

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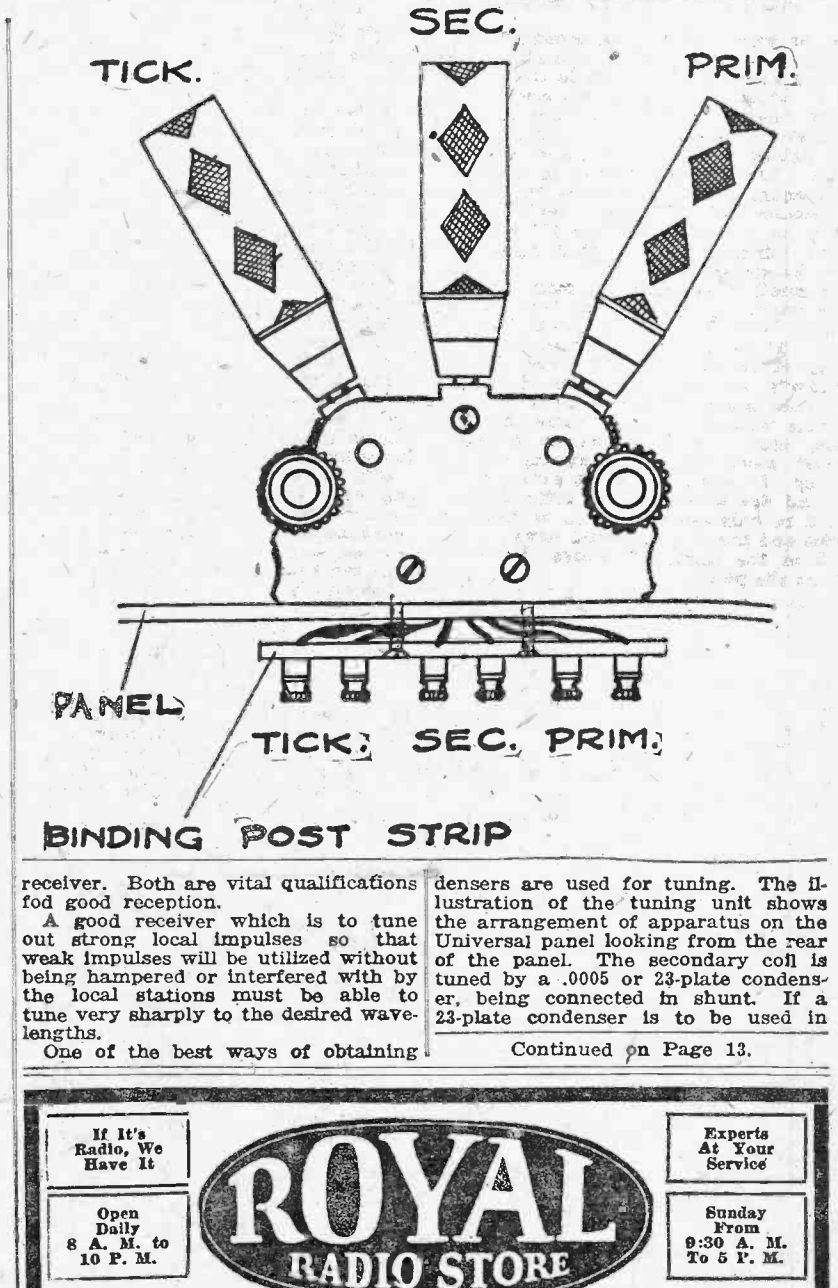


Two Causes of Whistling in Receiving Sets

BY JOHN V. L. HOGAN.
(Former President Institute of Radio Engineers.)

THERE are two kinds of whistling interference. Both are caused in the same general way. One kind sounds, in the telephones or loud speaker, like a high note of practically constant pitch and strength. It may quaver a little in pitch and may gradually increase or decrease in intensity or in pitch, but the sound is generally an almost uniform high note.

If you listen to distant stations on the 833 kilocycle (360 meter) wave you have often heard such a uniform whistle in the background. Sometimes it is not strong enough to prevent fairly good reception, but whenever you can hear it you may expect the quality of music or speech to be partly or wholly spoiled by it.

This kind of whistle almost always is caused by interference from a distant transmitter that has accidentally changed its wave frequency. For example, let us suppose that you are listening to WEAF, whose normal wave frequency is 610 kilocycles. If WOC, in Davenport, Iowa, is sending at its proper wave frequency of 620 kilocycles it will not interfere. But if (as has happened once or two) WOC's wave-frequency should drop, say, to 613 kilocycles, there would be a whistle in the background of each station's programs.

What Listeners Would Hear.

People living about half way between the two stations might hear cross-talk in addition to a very loud whistle. People who were too far from either one of the stations to hear its programs, but who could hear the other, would be troubled by the whistle.

If the waves of the two interfering stations are, as we have assumed, 610 and 613 kilocycles, the whistle that is heard, whenever both waves are received, has a pitch of three kilocycles or 3,000 cycles. This corresponds to the highest "G" on the piano keyboard. The whistle always is of a pitch equal to the difference in the frequencies of the two interfering waves, as in this case where 613 kilocycles minus 610 kilocycles equals three kilocycles.

As another example we may consider whistling interference between WJZ in New York and WJAZ in Chicago. These stations normally use waves of 660 and 670 kilocycles, respectively, and the difference of ten kilocycles is enough to prevent a troublesome whistle. But, on some occasions, either or both waves have slipped away from the normal frequency. If they became, for example, 662 and 664 kilocycles the difference would be only two kilocycles or 2,000 cycles and the whistle would have the pitch of the third "C" above middle "C" on the piano.

Beat or Heterodyne Interference.

Interference of this kind, where two inaudibly high frequency waves (such as radio waves of 610 and 613 kilocycles) interact to produce an audible frequency equal to their frequency difference is called beat or heterodyne interference.

A quite similar effect is had in music, for if two sounds of almost equal pitch or frequency are played together their waves will interact to produce pulsations or beats at a rate equal to the difference in their frequencies.

Constant-pitch whistling interference caused by interfering broadcasting transmitters is becoming more and more scarce, for most of the stations are doing better in holding to their assigned wave frequencies.

The only cure for it is to keep the stations adjusted to radiate their correct wave frequencies, and there is nothing that either you or I can do to stop such cases as do occur, except to report them to the broadcasting station that is interfered with.

If it were not for the fact that this inter-station whistling is so much like the second kind of whistling interference, and so convenient for explaining it, I would not have been justified in giving it so much time.

I hope that the foregoing has made clear to you that whenever your receiver picks up two continuous radio waves whose frequencies are quite nearly alike, you will hear a whistling note whose pitch is equal to the difference in the radio wave frequencies.

Another Type of Whistle.

This brings us to the second type of whistles, which are usually not uniform in pitch or intensity and which are not caused by interference between broadcast transmitters. These whistles change in pitch, either uniformly or in jumps, and sometimes slowly and sometimes so rapidly that they sound like chirps. Sometimes they are faint in the background. Sometimes they are so loud that they completely spoil reception from powerful near-by broadcast stations.

If you have a simple regenerative receiver of any type, you have heard just such whistles as you turned the tuning knobs. When you have had your tickler coupling or your plate variometer too far up the scale, you have heard a loud whistle in your telephones or speaker and have probably noticed that you could control its pitch by turning your tuning dial.

Your Set Is Transmitting.

I wonder how many of you realize that when you hear such a whistle in your own set, a whistle that drowns out the station you are listening to and whose pitch you can control on your own tuner, you are making the same kind of interference for all your radio neighbors for thousands of feet around you?

When your receiver whistles in this way, it is acting as a miniature transmitting station, and is not only bothering your own reception, but is sending out radio waves that make interfering whistles in the receivers of all your neighbors.

The whistle is the same kind of beat note that I already have explained, but its pitch usually varies because the wave sent out by the oscillating receiver is changing in frequency as the tuner knobs are turned.

To stop a regenerative set from making such interference, you need only reduce the tickler or regenerative variometer dial setting until the receiver stops generating oscillations. You can tell that it has stopped interfering because you will no longer hear the loud whistle.

Locate Offender and Tell Him.

Whenever you hear a loud, varying whistle of this kind, a whistle whose pitch you cannot control with your own tuner, you may be sure that it is caused by some radio neighbor of yours who either does not appreciate the trouble he is causing or who is too careless or too inconsiderate to keep his receiver from oscillating.

If you know anyone of this kind you should make it your job to explain to him how essential it is, for the general benefit of his near-by radio friends, that he shall never allow his regenerative set to send out these interfering, whistling waves.

If you have a receiver that is capable of causing this kind of interference you should be very careful not to let it oscillate.

It would be much better if every single, double or triple circuit regenerative were replaced by another kind of outfit that would not radiate, or were modified so that it would no longer bother near-by radio listeners.

U. S. Prints Tests of 16 Audio Amplifiers

Measurements of voltage amplification of audio-frequency amplifiers are discussed in letter circular 98, which has just been issued by the bureau of standards for free distribution.

This circular gives the results of voltage amplification measurements made on sixteen audio-frequency amplifiers which were on the market during 1921-22. All these amplifiers employed transformer coupling. Measurements were made over a frequency range of 400 to 2,100 cycles per second.

The amplifiers studied are referred to by arbitrary reference numbers rather than by a statement of the manufacturers' names and model number, the method followed being the same as that used in measuring the voltage amplification of amplifers, the subject of letter circular 86.

Hears U. S. with Loop, and Yet Is in France

A French amateur, J. Plotard, has obtained particularly interesting results in receiving American broadcasting with a loop. During his experiments at night he has received under excellent conditions, among others, stations WOR and WHAZ, operating on 360 and 400 meters.

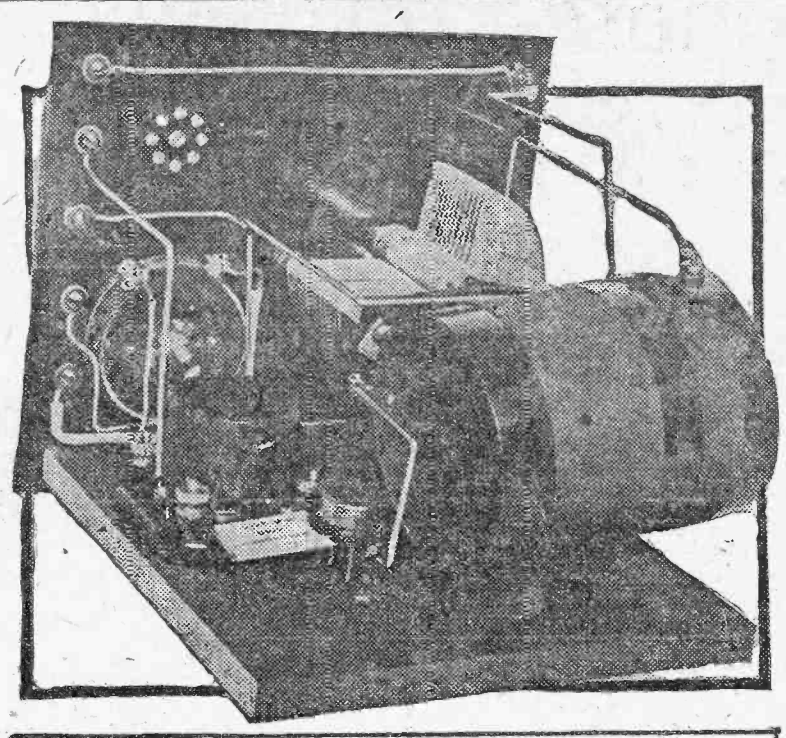
Plotard does not use a heterodyne. His receiver contains three stages of radio-frequency, transformer coupled, a galena detector, and several stages of audio-frequency, as needed. The crystal is connected in the secondary of the last radio frequency transformer, which also is provided with a .0005 variable condenser to tune the plate circuit and thus secure regeneration.

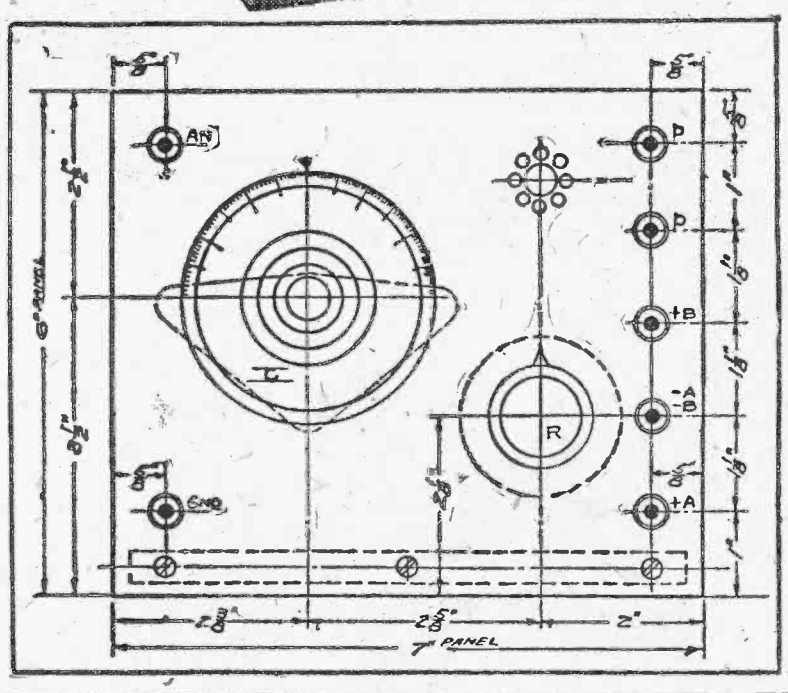
The loop consists of two turns separated 5 centimeters (1.95 inches) and is 4 meters by 2.5 meters (13.2 by 8.25 feet) in size, the wire is a large seven-strand cable.

Complete Tube Receiver Set Can Be Assembled for Less Than $10

Designer Claims He Can Bring In Outside Stations with Ease.

By John B. Rathbun.



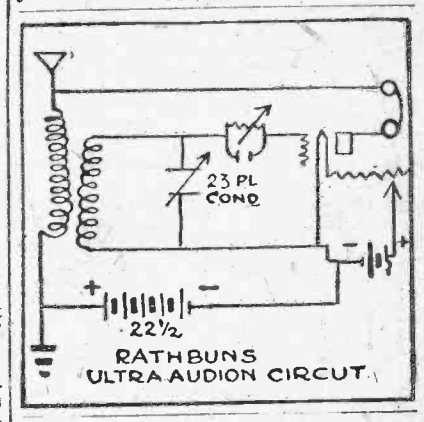


WHILE the old Ultra-Audion has long held a prominent place in the field of "flivver" radio receivers, yet it is far outdone in many particulars by the simple regenerative set about to be described and which I have modestly dubbed the "Wizard." Like the Ultra-Audion, it has only a single tuning central—a 23-plate variable condenser—but in other respects it is entirely different, since it belongs to the sharp tuning two-circuit class, while the Ultra is only a single-circuit receiver, with rather indifferent selectivity.

So sharply does the "Wizard" tune that one can get thru the jam of local high-powered stations with ease and bring in out-of-town stations with little loss in signal strength. An idea of its selectivity may be had from the fact that the station WJAZ is tuned out completely within two blocks of that station by only a short movement of the dial. The range is much better than that of the Ultra and the signal strength on local is terrific, almost strong enough to operate a loud speaker in many cases. This is due to the intense regeneration made possible by the combined direct feedback to aerial and the high ratio between the primary and secondary coils.

Less Than $10.

Having told how good we are in regard to all-around performance, the next startling announcement will be the cost estimate of building the set. It costs very little more than the Ultra-Audion, and the materials, less phones, batteries, tubes and aerial, will be considerably less than $10, nearer $5 than $10 if the buyer does a little judicious shopping. This price, of course, is for the materials alone, which are later assembled by the purchaser, the labor being contributed by the phan himself at a merely nominal



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Radiophungrams

Somewhat Overused.

Gladys and Elsie, aged 9 and 12 years respectively, were airing their radio knowledge for the benefit of a group of admiring playmates.

"Father says they've changed the wavelengths again," said Gladys.

"Oh, well," replied Elsie, "you can't expect the wavelengths to last for very long because, you see, there are many more people using them now."

A Note by Wireless.

While the wind was blowing strongly a few days ago, a piece of paper happened to lodge on an aerial wire. A small boy, accompanied by his mother, looked up, saw it, and cried out: "Look, mother! Some one has just got a message thru."

Taking It Seriously.

The small son had the ear phones on and was listening very intently. His father, noticing his keen interest, remarked to him that he should sit down.

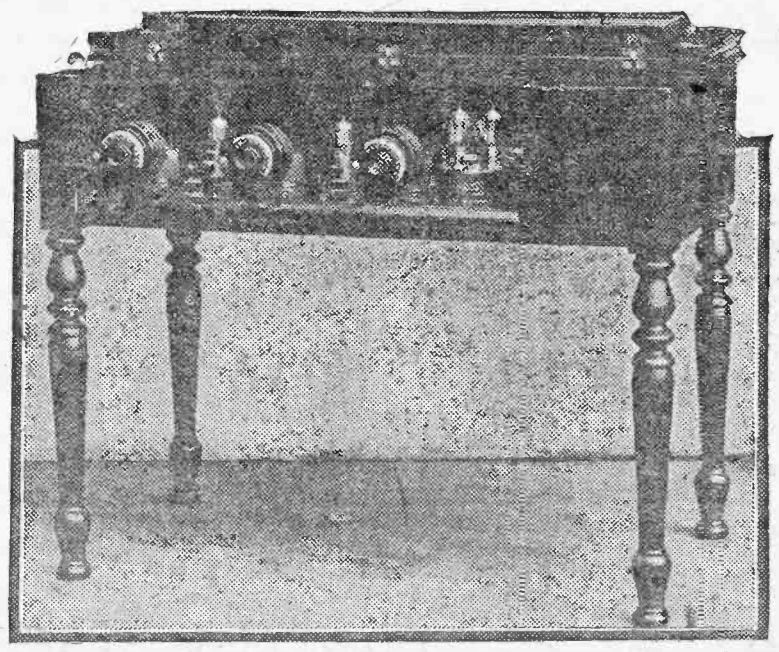
"I mustn't do that, daddy," replied the little fellow very seriously. "The man at the other end just said that we were to stand by for two minutes."

Pump Loop and Listen.

European trade papers announce a collapsible loop aerial, which has its wire attached to a rubber tube similar to a bicycle tire. To operate it you pump it up, which extends the "loop."

Be sure to read the Classified Advertisements on page 15.

UNIQUE RADIO CONSOLE



The above is a cabinet designed and patented by L. J. Kellner of the Haverford company to accommodate the new Atwater-Kent Radiodyne set. In it is incorporated a loud speaker, space for the set and compartments for all A and B batteries, and a charger. It is a radical departure from the ordinary run of console radio cabinets, being made of piano finish mahogany and elaborately perfect in every detail. This cabinet eliminates the aversion shown by many phans for base mounting apparatus, as, when the set is not in use, the cabinet can be closed; thereby protecting the set from dust or accidental injury to the tubes.

Why Novices Do Not Succeed in Radio-Frequency

Receiving sets that employ radio-frequency amplification, easily can tune out local interference. They also cover a wider range (greater distance), and where two stages of audio-amplification are used give sufficient volume for the most exacting.

However, radio-frequency has its drawbacks, which, until recently, have been so serious that receivers employing this form of amplification have not been popular.

The radio-frequency transformers have been at fault. Manufacturers, however, in recent months, have developed transformers that respond fairly successfully to the radio-frequency currents which are very high. The type that permits variations to meet the different wavelengths is the best.

There also has been trouble with the inherent capacity—small as it is—of the vacuum tubes. The Hazeltine idea of the neutrodyne, which neutralizes this capacity in the tubes, has eliminated this difficulty to a considerable extent.

Yet, even, with recent improvements, radio-frequency possesses too many difficulties for anyone but an expert to tackle.

Radio-frequency sets consist of one, two or three vacuum tube amplifiers that strengthen the current before it is fed into the detector or rectifying tube. One tube, alone, is of little value. Two or three tubes usually are employed.

Radio-frequency is intended to increase the receiving range, but does not increase the output current—that is the one that goes into the phones or loud speaker.

There always has been considerable trouble in operating radio-frequency sets. Not only are the number of controls increased, but because of the wave lengths used in broadcasting considerable difficulty has been experienced in getting efficient results.

With a perfectly neutralized set and transformers that respond to the varying frequencies, there still remain three disadvantages to the novice tuner. The complication of tuning three critical circuits, in addition to the detector and standard audio-amplifier, which latter must be added to insure loud-speaker volume, is one disadvantage. The second is that local stations do not respond so well as distant stations. The third is that of the difficulty of neutralization. Few set owners have either the knowledge or the facilities for neutralization. If the tubes are neutralized by the maker all goes well until one or more of the tubes burns out or must be changed for one reason or another. Changes in tubes means re-neutralization of each new tube inserted. Tubes, too, change their capacities thru old age and constant usage. When they do this they must be re-neutralized.

Radio-frequency presents too many difficulties for the inexperienced, but in the hands of a capable radiophan gives exceptionally good results.

WDAP's Clever Singer of Songs

Jerry Sullivan, inimitable songster heard from station WDAP, Chicago. Mr. Sullivan's photograph has appeared before in the Radio Magazine, but without proper identification.

COMPLETE TUBE RECEIVER SET $10

Continued from Page 8.

figure. About three hours' time will be required, providing that the panel is not drilled with an ice pick or nail. It is also assumed in this time estimate that the builder possess a real screw driver and can at least borrow a soldering copper. If a few small drills are not at hand, extend the estimated time from three hours to three weeks.

The Circuit.

No revolutionary principles are claimed for the "Wizard" circuit. It is a redesigned adaptation of a very old "oscillator" which dates back to 1914 or even earlier, but in making certain substitutions the older circuit has been greatly simplified and its performance has also been greatly improved. The substitution of a modern type fixed coupler for the older variocoupler, with its tap switches and other complications, has been a greater step in advance than would appear on the surface. The losses incident to the tap switches are eliminated, tuning controls are reduced from four to one, and "logged" tuning is made possible whereby the position of the condenser dial corresponds exactly to a given wavelength at all points within the range of the instrument. Dispensing with the variocoupler also reduces the cost by several dollars, an important item with the majority of beginners.

In looking at the inductance coil (L1-L2) we see that it contains two separate windings, a combined primary and tickler coil (L1) and a secondary coil (L2). The primary (L1) is connected to the aerial at (a) and the ground at (g, the plate (P) of the tube also being connected at the end (a) for supplying regeneration. Across the ends of the secondary coil (L2) is a variable 23-plate condenser (.0005 m f.), which is the only tuning control. Connections from the secondary terminals (d and (e) run to the grid condenser and leak (GC-GL) and to the grid return line, respectively. Thus the aerial circuit and plate circuit are practically independent of one another except for the common connection to the (A) terminal of the filament battery.

Primary and secondary coils are "loosely coupled" to give selectivity, or, in other words, the coils are spaced five-eighths of an inch apart. This distance is of the greatest importance and should be observed in making up the coil. Both coils are wound with No. 26 double cotton-covered wire. The primary (L1) contains twenty-five turns and the secondary (L2) has seventy-five turns. Both coils are wound on a three-inch diameter cardboard or bakelite tube which has a length of four inches. For those who do not wish to go to the trouble of winding these coils, they may be had ready made from nearly any radio dealer for a moderate sum and in very convenient form for mounting. They are known as "selector coils" and are supplied with brackets for direct mounting on the back of the variable condenser (C), thus reducing the number of wiring connections.

Vernier Condenser Best.

While any type of variable condenser (C) can be used with success, yet it will be found that a vernier condenser is preferable, as the tuning is extremely critical on some stations. Regeneration, or the volume of sound, is controlled by means of the filament rheostat (R) and this should be a vernier type or else a rheostat having a resistance of at least 25 ohms. In cases where UV-199 or C-299 tubes are used, a 30 to 40 ohm rheostat is a necessity. For WD-11, WD-12, UV-200, C-300 or UV-201 tubes, use a 6-ohm vernier type rheostat. For the C-301A or UV-201A, use a 25-ohm rheostat.

Any type of standard tube can be used, either dry battery or storage battery types. Hard amplifier tubes work very well with B battery voltages ranging from 22.5 to 67 volts, and give a comparatively great signal strength on the high-plate voltages. The B battery voltage for the soft detector tubes ranges between 16 and 22.5 volts, and the latter voltage cannot be exceeded without loss in volume. Some claim that the soft detector tubes, such as the UV-200 or C-300, are more sensitive and give greater range, but this has not been my experience. The filament voltage or A battery voltage, of course, depends upon the tube adopted, and varies from the 1.5 volts required by the WD-12 to the 3 volts for the UV-199, and the 6 volts for the C-300, UV-200, C-301A and UV-201A.

It is highly important that the outside stationary plates of the variable condenser (C) be connected to the grid circuit, or, rather, that the outside plates of the condenser be connected to the coil end (d). If this is not done, then you are certain to have trouble in tuning, due to "body capacity." For the same reason, the inductance coil should be mounted well to the rear of the cabinet so that the movement of the hand will not detune the set. A square sheet of tin foil, about one-half larger than the diameter of the condenser, will eliminate much of the body capacity effect if placed between the condenser and panel. This tin foil sheet should then be "grounded" by connecting it with the ground post end or to the (B) post. Take care that no metal parts of the condenser come into contact with the tin foil at any point, cutting out a one-half hole around the condenser shaft and placing heavy paper over the screw heads.

It will be found that the grid condenser (GC) should have a capacity of .00025 mf, the mica plate type being preferable. The grid leak (GL) should be of the "pencil-mark" type, by which the leak can be adjusted by drawing a pencil line between the two screws. By alternately drawing a heavy pencil line and then partly rubbing it out by the eraser, a point will be found where the reception is the clearest and loudest. After this is once done, there is no need of further adjustment until the tube is replaced by a new one.

A 6x7-inch panel, ⅛ or 3-16 inches thick, is amply large enough for the set. This, of course, should be of some insulating composition such as Formica, Condensite, Bakelite, Radion or any of the similar materials. Do not use a wood panel under any conditions, as the leakage will seriously interfere with the operation.

Use No. 14 square-tinned copper "bus wire" for making the connections between the various parts, and make soldered joints wherever practicable. Keep the wire out of contact with all metal parts except those to which is connected, and keep the wire out of contact with the wood base board. Scrape connections at all points where the wire is placed under the binding screws to insure perfectly clean contact surfaces. Good, clean connections and good insulation are imperative. Tighten down the binding screws so that there is no possibility of their working loose and, further, scrape the four blades in the tube socket at the points where the prongs of the tube make contact. Also see that the four binding posts in the socket are tight.

The Aerial.

An outdoor aerial, of course, is the preferable type and may be a single copper wire forty to seventy-five feet in length. An aerial longer than seventy-five feet does little toward increasing the range and does reduce the selectivity of the set. In other words, a very long aerial "broadens the tuning" so that nearby stations cannot be tuned out. Good porcelain or moulded mica type insulators should be used for the support of the wire. When the set is located above the first floor, an indoor aerial will give good results if the wire is from thirty-five to ninety feet long. In fact, the writer has received nearly all of the large stations east of the Rockies on an indoor aerial consisting of ten strands of bell wire woven back and forth between the picture mouldings of his dining-room. The width of the room at this point averages about nine feet (it is in a bay window) so that he has a total of 10x9, equal to 90 feet of wire up.

Tuning In.

With an aerial of ordinary length, the set will tune in on all stations from 250 to 600 meters wavelength with the coils as shown. If your aerial is very long, then you may have to remove a few turns from the coil (L2) at the end (e) before you can reach the lower wavelengths. Do not remove any wire from the end (d) and do not touch the coil (L1) in any case. With a very short aerial it may be necessary to add a few turns to (L2) at the end (e), but these corrections are not likely with aerials between forty and seven-five feet.

For tuning in between the two extreme wavelengths it is well to take station KYW on 436 meters, as the upper range, and station WTAS of Elgin on 286 meters as the lower range. If you can get these two stations with a little margin of condenser movement on either side o fthe dial settings, it is certain that you can get all the other broadcasting stations.

To tune the set, turn up the rheostat until the tube lights and a rather strong rushing hiss is heard continuously in the phones. Now turn the condenser dial back and forth until you strike the carrier wave of a station. The wave makes itself known by a "tweet-tweet" noise in certain positions of the condenser dial. Now turn the condenser dial very slowly in the vicinity of the carrier wave until the voice or music is heard. This is a very careful adjustment and may mean turning the dial thru only one division. The strength of the signal or the cleaning up of "mushy," indistinct signals is controlled by turning the rheostat up or down until the maximum of clear, loud speech is heard. In other words, regeneration is controlled by the rheostat, as with the Ultra-Dudion. If the tube should screech or howl, or if the signals should sound all mushed up, turn the rheostat down. This is all there is to it.

In the meantime adjust your grid leak for maximum signal strength by making a heavier or lighter pencil mark between the two screws under the metal cap. This will take a little time and patience, but it only needs to be done once. It is best to remain tuned in on some rather faint stations while varying the weight of the pencil mark until the best weight of line is discovered.

AMPLIFICATION.

Any type of amplifier can be used, either one or two stages of audio. The amplifier is connected to the phone or output posts as usual.

Predicts Underground Transmission Will Do Away Largely with Radio Aerial

Copyright, Harris & Ewing

Dr. James H. Rogers testing his underground antenna.

Inventor Hears Foreign Stations Thru Wire Run into Soil.

By Harold B. Matson.

WASHINGTON, Feb. 7.—Dig a hole in your back yard and place your radio "aerial" in it, if you would be up to date.

That is, of course, granting that Dr. James Harris Rogers, famous inventor, has proved his theory. Some time ago he started experimenting with underground antennae. Today Dr. Rogers, resuming his work after a short illness, freely predicts that underground transmission will supersede aerial transmission.

Dr. Rogers reveals that perfect communication was carried on with points 200 miles away, during experiments he conducted. Interference, he declares, is practically eliminated, difficulties of day reception are reduced to a minimum, and the power required for transmission is considerably less than for aerial antennae.

One of Dr. Rogers' underground sets consists of a loop antenna let down into a metal-lined and metal-covered well. He has practically abandoned his high strung aerial on the roof of his laboratory, nightly hearing foreign stations on his submerged aerial.

Broadcasting Is Easier.

Dr. Rogers believes underground transmission to be an important development in radio science, and predicts it will make possible the concentration of broadcasting at a group of powerful stations.

"These stations," he believes, "will be located at strategic points over the country. Reception will be clear and strong in every set, interference from so many different wavelengths being eliminated. The stations will operate something like a telephone switchboard, tuning in for the programs they desire to rebroadcast in their vicinity.

"Communication with trans-Atlantic and trans-Pacific points will be among the usual things. But all of this will come only thru underground and submarine transmission," Dr. Rogers says.

Used During War.

While Dr. Rogers thus would eliminate the weaknesses of radio communication, other inventors are continuing their attempts to perfect aerial transmission.

One of the tasks before the radio division, bureau of standards, is to eliminate "fading" and to devise means to confine broadcasting to its particular wave-length. Once this is done the aerial should enjoy as clear and strong reception as Dr. Rogers claims for the underground apparatus.

Dogs Antenna Shy

The ether about station KFKX, the experimental station of the Westinghouse Electric company in Hastings, Neb., is highly charged electrically, at least the dog population of that section will tell you so.

Two stray dogs came wandering within the inclosure which surrounds the station, and which serves to prevent anyone from coming in contact with the insulated counter-poise when the station is in operation.

They played around the grounds, and were running under the counter-poise system, which is placed only two feet above the ground. Suddenly, an agonizing yelp was heard, and two streaks of black and brown fur and dogs came running wildly for the gate.

The current had been turned on in the antenna, just preparatory to broadcasting, and the animals became caught between the highly charged counterpoise and the ground, thus forming the circuit which effectively "grounded" the radiating system.

Today there is no need to keep dogs out of the KFKA inclosure. They have passed word around to the canine population that the atmosphere about the place is decidedly unhealthy for dogs.

How to Make Aerials Selective with Coils

Sometimes non-selective receivers become so thru aerials that have not the proper natural wave length. A loading coil placed in the antenna circuit will increase the wave length of the aerial wire. A variometer makes a good loading coil because it can be varied.

A .001 variable condenser, however, is better. It has the advantage of increasing the ratio of inductance to capacitance when tuning to a given wave-length. An increase in this ratio means increased selectivity or less liability to interference from stations transmitting on different wavelengths. Close tuning is very desirable, but adjustments, of course, are increased.

If the receiver is of the two-circuit type it will be necessary also to load the secondary circuit of the tuner. If it is a three-circuit set then also the tuned-plate circuit should be loaded. Wound coils of the proper value, which must be determined by experiment, will answer in these cases.

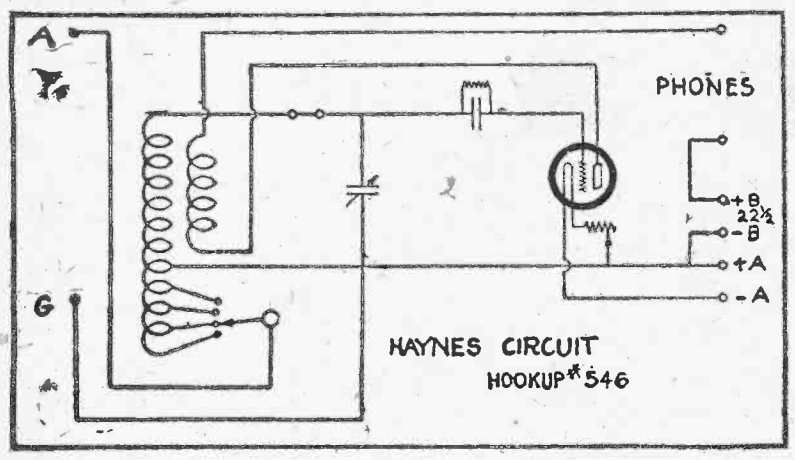
You will find the classified advertisement section interesting. See Page 15.

Questions You Ask and Answers We Give

HAYNES CIRCUIT.

1230—CHICAGO: Have tried the Haynes circuit, using a Dubilier Ducon as an aerial or antennae; results as follows: Heard Edgewater Beach hotel from 11:55 to 12 o'clock, after which I received nothing at all, either Saturday or Sunday. The parts I used are radio non, UV-200 tube rheostat, freshman condenser and grid leak combined, .00025 cap, Bremer Tully variable condenser, .00025 cap, and a 180-degree variocoupler constructed as follows: Stator 4 inches in diameter wound with forty-eight turns of No. 24 silk-covered wire, and rotor 3½ inches diameter wound with forty-three turns No. 24 silk-covered wire, and sold by a local radio store, and believe this variocoupler winding was the cause of no results. If so, kindly advise how I should wind it. Kindly advise what should be done to make this circuit work properly and send what information you may have on this circuit.

Your trouble with the Haynes receiver is due to the fact that you are using a Ducon plug. If you would use an outside aerial



Q. & A.—1230: An exceedingly selective DX receiver.

much better results would be obtained. Your apparatus is O. K. Hook-up is shown.

GOOD RECEIVER.

1231—CHICAGO: I have been much interested in your magazine, and am writing regarding advice concerning a radio set, reasonable in price, comparatively easy to tune, that will bring in circuits at a distance of 500 miles, from South Haven, Mich. Your magazine is very instructive, and you are to be complimented upon putting such a valuable magazine before the public.

A good single-tube circuit with a range of about 1,000 miles is shown.

HOW TO TUNE SET.

1233—CHICAGO: Let me congratulate you on your radio section, this new addition to your good paper The Chicago Evening Post. I have found it very helpful to me, and also full of live, interesting and new information. I at the present time am subscribing to three radio magazines, and have found that I would rather have your sixteen-page Thursday radio section than all three magazines combined. They cost me a little, but as to benefits your paper beats them all. I would now ask for some help regarding the following: How can I tune three-circuit regenerative set, Armstrong patent, comprising two bakelit variometers, one coupler (all molded), two-three plate condensers and vernier rheostat with .00025 variable grid leak and condenser? I have read your instructions in regard to tuning a set like this, but it was not exactly clear enough in regard to tuning. What I want is something like this: You first place your coupler at right angles, then tune your plate until you hear the station coming in, etc.

To tune your set proceed as follows: Have variometer completely enmeshed, turn your rheostat three-quarters on, tune in your stations with rotor of variocoupler and taps, clear up with grid variometer and increase volume with plate variometer and rheostat. If the set flies into oscillations, reduce filament voltage and regeneration with plate variometer and rheostat.

RADIO-FREQUENCY.

1232—CHICAGO: Inclosed is the hook-up I am now using. I want to add a stage of radio-amplification. Will you please add the additional? I have got an Esten variometer, WD-12 tubes and an 11-plate condenser. Can I use the variometer instead of buying a radio-frequency transformer?

One stage of radio-frequency on your set would not work efficiently. We are mailing a two-tube frequency circuit wherein you could use your apparatus and get the results you are looking for.

A FEW QUESTIONS.

1255—CHICAGO: Accompanying are two sketches of my receiving set (three-circuit Armstrong regenerative). Type and length of aerial and makes and values of apparatus are shown on the schematic drawing. I would like information regarding the following, preparatory to placing my set in a cabinet: (1) Is secondary variable-condenser in proper place in secondary circuit? Would a 23-plate vernier condenser give sufficiently better results to justify expense of change? (2) Please give the proper method of tuning this set, starting from the point where all switches are open and the three rheostats set at maximum resistance. At present I am operating with the amplifier rheostats at zero resistance, and detector rheostat with about seven-eighths of the resistance out of circuit. As you will notice, there are some half-dozen controls. Are

FREE SERVICE

QUESTIONS asked on any subject pertaining to radio will be answered in this department in either the daily edition or the Radio Magazine published each Thursday. No charges are made for this service.

Due to the immense volume of letters being received by the Question and Answer department, the following restrictions must be made:

All letters must be plainly written in ink and perferably typewritten, and only on one side of the paper.

Drawings, hook-ups, etc., must be on a separate sheet from question and clearly drawn, showing values of parts.

Do not ask for panel layouts, construction details, etc., for a set unless they have appeared in the columns of this magazine. Self-addressed and stamped envelope must be inclosed. Address all your letters to Radio Questions and Answers Department, The Chicago Evening Post, 12-14 South Market Street, Chicago.

there not some "most efficient points" where several of these controls can be set so as to reduce the number to be varied in practical tuning? (3) After less than a week's operation I notice a reduction of volume and find upon examination that the wire attached to the positive terminal of the "A" battery is badly corroded. The set and battery are in a room heated by hot air. The top of the battery is kept clean and dry. What causes the wire from the positive terminal to corrode? (4) My "A" storage battery has heavy wire handles sunk into the wooden case, and when I remove battery for charging I find a rather dense white deposit on the handles where they enter the wood and from which the lacquer has worn off. I applied paraffin and it has now disappeared. What was this deposit and what caused it? (5) Does the location of the plate variometer as shown, instead of being adjacent to the plate, lessen the regenerative action of the set? Does the phone condenser work as well when the plate variometer is in the position shown? (6) Is "regeneration" and "feed back" the same, and if so, is it necessary for the plate variometer to be so placed physically as to produce coupling with any portion of the primary circuit? (7) In "A" and "B" battery connections many circuit diagrams require negative "B" to positive "A." My set seems to work best negative "A" to negative "B." Which is theoretically correct; which is correct in practice? (8) A fixed condenser is connected to the primary circuit (lead-in) and to a point in the secondary circuit between the grid leak and the grid variometer. Removal of this condenser reduces the volume very much. Should the condenser be there? Theoretically? (9) The inside aerial is thirty-four and one-half feet long and consists of three wires permanently bound together as shown and two other wires connected to the permanent aerial by four single pole single throw switches. I have a 43-plate variable-condenser in the primary circuit and a series-parallel switch to throw it in series, in parallel, or out of the circuit entirely. Is this aerial too short for good results, considering the presence of the primary condenser? (10) What is proof or indication of a tube oscillating? Must the amplifier tubes both oscillate also for efficient operation; for maximum volume? (11) Just before I changed from a pencil-mark grid leak to the present Freshman variable leak I noticed a small "roar" in the receivers which would drown out the voice or music from a distant station. This roar would clear up for a moment when I touched the grid terminal of my detector tube or the plate terminal of the same tube. After the set had been in operation for several hours the roar seemed to disappear. To what is this "roar" due and how can I correct it? We appreciate the up-to-date Radio Magazine that The Chicago Evening Post is now conducting.

Below are answers to your questions: (1) Your secondary condenser is of the proper size and placed in the right position. (2) To describe the tuning of a three-circuit regenerative set is practically impossible, as every set has its characteristics and cannot be tuned mechanically. (3) The corrosion of the wire leading to the positive terminal of the "A" battery is natural. It is caused by the chemical action of the acids in the battery upon the copper wire. (4) The white deposit on the handle of your battery was caused by the chemical action of the acid upon a metallic object, as set forth in No. 3. (5) The position of the plate variometer is O. K. Altho the leads are rather long, we do not believe this would have any appreciable effect upon the regeneration. (6) Regeneration and feed-back are one and the same thing. It is not necessary for the variometer to be placed in inductive relation at any part of the circuit. (7) The polarities of your "A" and "B" batteries determine upon the filament leads of your transformer and the grid return of your detector tube. Both combinations are used. (8) Theoretically, a fixed condenser from the aerial to the grid leak is unnecessary. This helps your set because of the fact that you are using a small inside aerial. (9) Your aerial is the best you could construct under the circumstances. Much better results could be obtained, tho, with an outside aerial of one wire in a straight line of 100 feet long, six to eight feet above all obstacles. (10) To determine whether a tube is oscillating or not, touch the grid lead from the variometer to the grid leak. If the tube is oscillating a click will be obtained when you touch the wire with your finger and when you draw it away. (11) The roar you mention was caused by the fact that your tube was oscillating too freely. A variable grid leak should eliminate this. It also might be cut down by reducing the filament voltage on the detector tube.

A SILENT CIRCUIT.

1269—CHICAGO: Help—help—help! I am inclosing a sketch of my alleged "set", but the postal regulations won't permit me to fully describe it, so my style is badly cramped. However, the darn thing doesn't seem to function except in a very tired manner. I get local stations only—WJAZ I get fine (it is three blocks away); the stations downtown I get faintly—nothing else. It doesn't whistle or make any noise whatever, and the only way I can tell when I am tuning in is to hear voices and music faintly. All connections are tight or soldered—all parts used are supposed to be of good quality, so I am completely up a stump. Will you look over the inclosed sketch and tell me what the trouble is—or if you would advise my trading it off for a crystal set?

Your circuit is apparently O. K. except for the fact that you show no grid condenser. This is absolutely necessary to enable you to get the results you wish. We would not advise trading it for a crystal set, but we would advise checking the tuning unit for loose or broken connections.

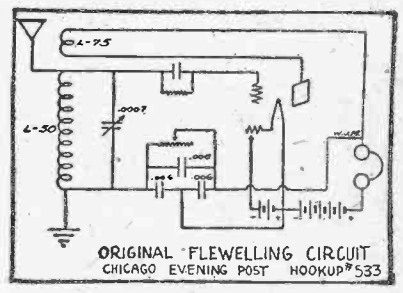
"INDUCTANCE VARIOMETER."

1256—CHICAGO: You most assuredly are entitled to congratulations on your Radio section. I doubt very much that any newspaper can boast of a more interesting section, and coupled with the fact that I have been a reader of The Post for a good many years, I now enjoy it all the more. Noting your kindness in answering questions, I am going to avail myself of the privilege. I have made up the circuit which will be found inclosed, obtained from an article by "Six Zee Jay" in Radio News Magazine for September, page 279, and is described as "Inductance Variometer a Utility Radio Unit." For local stations I believe that it is rather satisfactory with fair volume, but while I can hear long distance quite often I find it very hard to tune clearly or for long. Can you give me any suggestions? Note that the diagram does not show a grid leak. I find it works very much better with one. I am using two mgs. I find that the set will not work following other instructions given, but that it does work following the diagram. Can you offer any suggestions? I would be pleased if you would furnish me with a diagram of a Reinartz circuit or tell me where I could obtain one of the latest hook-ups. What is the difference in your opinion in the UV-199 and WD-12—is the UV-199 better for amplifying, will it stand more plate voltage?

The circuit you inclosed in your letter was the best you could make with the parts mentioned. We are showing a diagram of the Reinartz set. A WD-12 tube is a better detector, but is not a better amplifier than a UV-199.

HOOK-UP CORRECTIONS.

1267—BLUE ISLAND: I am taking advantage of your offer of free radio service and desire to make a few inquiries. Attached hereto you will find three diagrams numbered for reference. Diagram No. 1 is intended to represent the diagram shown on page 8 of the Chicago Evening Post Radio Magazine issued Dec. 6. This diagram calls for the same parts which I have at present made up as per diagram No. 2, excepting the transformers and tubes, also I am using a phone condenser as called for in diagram No. 2. I am using one 22½-volt B battery (for the detector unit) in series with one 45-volt B battery for the amplification. The method permits 22½ volts to be applied on the detector unit, while the total of 67½ volts is applied to the two steps of audio-frequency amplification. WD-11 tubes are used with 6 dry-cell A batteries connected in parallel. Other parts are identically the same as shown in diagram No. 1. You will note that



Q. & A.—1231: The original Flewelling, which is one of the best "super" sets known.

the variocoupler connections are described in different ways, which I do not understand. Diagram No. 3 will indicate how the connections are at present on my set. May I ask you to kindly enlighten me as to just how the coupler connections should be made as called for in diagrams 1 and 2? Also, kindly note the A battery connec-

Continued on Page 12.

Questions You Ask and Answers We Give

Continued from Page 11.

tions. On my set (diagram No. 2) the rheostats and F of the transformers are connected to A minus, which in turn goes to the G switch and ground. F plus of tubes being connected to A plus of the battery. Diagram No. 1 shows the rheostats only are connected to A minus of the battery, while F plus of the tubes, and F of the transformers are connected to A plus of the battery, which in turn is connected some place on the variocoupler. Kindly advise just how these connections should be made. I will say that my set worked very good prior to adding the two steps of audio-frequency amplification, and since this has been added, I am unable to tune in outside stations without making use of the amplification.

Your trouble lay in the fact that you had your negative B battery in diagram No. 2 connected to the wrong side of the A battery. The corrected drawing has been mailed.

CALIBRATING DIALS.

1262—AURORA: Could you tell me how I can use the meter numbers given in locating stations? All stations have a meter number, but until now they mean nothing to me, as I do not know how to use them. How must the dials be set to get these different meters? My radio is a Zenith and has an outside aerial about 150 feet in length, 100 feet from house to pole and 50 feet from pole to radio. I know where to pick up KYW (Chicago) and WTAS (Elgin), but do not know how to make a combination to pick out the more distant stations.

There is no method for using the regenerative set whereby the dials can be calibrated so as to determine the wave length of the stations received. Altho when a long-distance station is received the dial readings might be recorded and the same station tuned in again by resetting the dial at the same combination as it was received on before.

WANTS TOO MUCH.

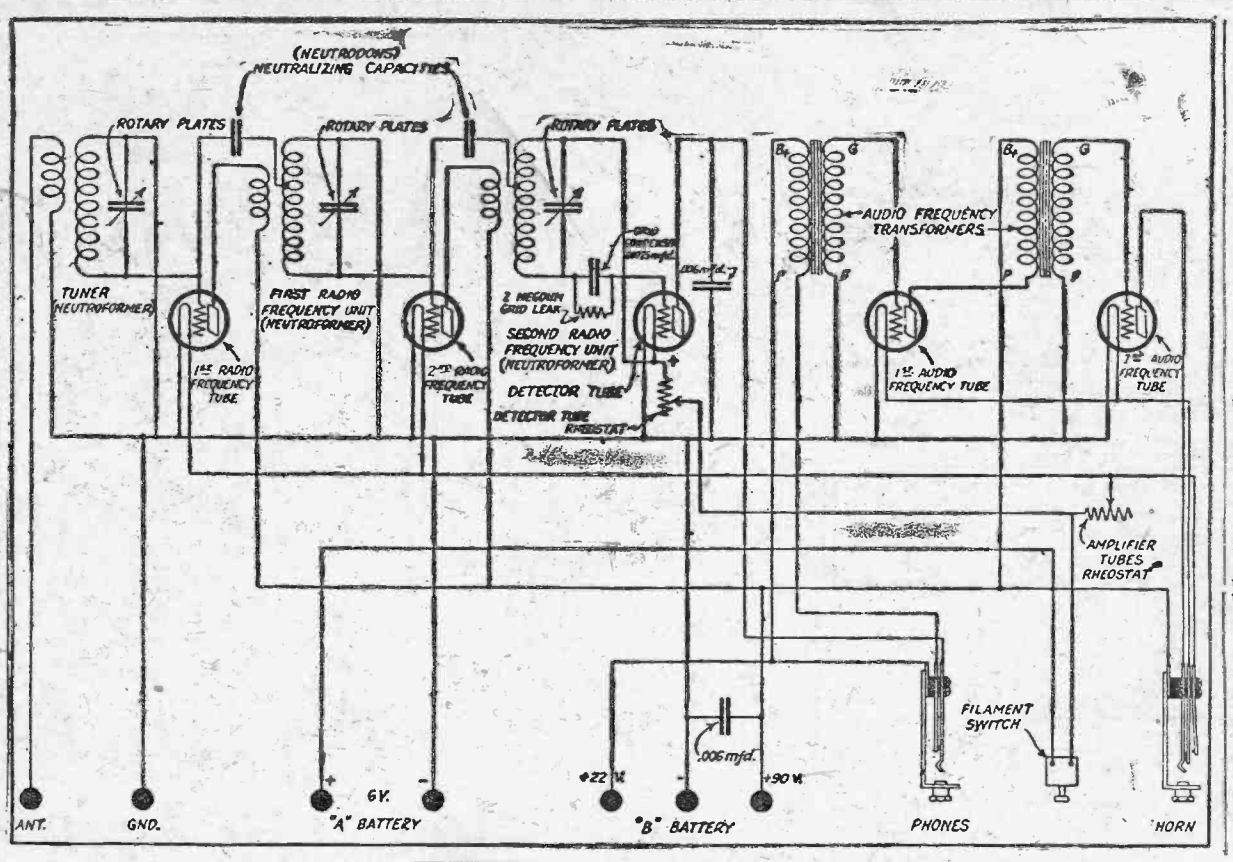
1261—EVANSTON: Recently purchased a single-circuit radio set, using a 23-plate variable condenser as tuner and a coil similar to the Reinartz. Believe it is the same as the Rothco set. On using a WD-12 tube, found the rheostat was about a 30 ohm, so changed to a Howard 6½ ohm. The reception is fine on certain parts of the dial, but cannot tune clear to 0 on the condenser dial without the tube oscillating as soon as it is turned on at all. Can you tell me how to remedy it? Am using 100 feet antenna, "L" type, with fifteen-foot lead-in. Also at times the set seems to go entirely dead for a minute or so, then works again. Can that be due to the battery? Have also a three circuit, two variometers and a coupler. As using a 23-plate variable-condenser shunted across antenna and ground posts. Is there anything I can do to make it tune finer? Receive Los Angeles stations quite often and Calgary, Canada, on silent night, so think I get good distance, as it only has a detector tube.

The results you have been obtaining with your set as to distance are very good. The oscillations of your tube which take place at a certain setting of the condenser are natural and should be present. Therefore, there is nothing you can do to remedy it. The dying out of the set at times is not due to the battery, but probably to a loose connection. A wave trap improves the tuning on your set.

NOISY SET.

1022—CHICAGO: Have experimented with three stages of audio-frequency and was successful for a while by connecting a .0001 fixed condenser from the grid of the second audio-transformer to the grid of the third audio-transformer. This proved very satisfactory in eliminating noise, and bringing great volume, but now the arrangement does not work at all. All it does is to howl and squeal. Can you tell me what's wrong? (2) Can you send me the Zenith hook-up, using three stages of audio-frequency? (3) Would you suggest a single circuit set to be used with an indoor aerial of thirty feet length? Don't you think it would be more efficient than a two or three circuit?

We give below the answers to your questions: (1) Check your "B" battery and .0001 fixed condenser to see if they are O. K. (2) This hook-up will have to be obtained from the Zenith people. (3) A single circuit set would be as efficient as a two or three circuit.



Q. & A.—1222: One of the most efficient methods of reception.

HAGERMAN CRYSTAL.

1031—CHICAGO: I am enjoying your radio section very much. It sure is a "dandy." Please send me a general hook-up or a diagram of the Hagerman crystal receiving set. Do you think you could send me also a list of the parts needed and the cost of this set if I wanted to make it myself, and please tell me if it is possible to use a wave trap? (2) Could you send me something plainer than answer No. 491?

The hook-up you request has been mailed. The parts used are: One variometer, one 43-plate condenser, one crystal detector, one 7-by-9 panel, four binding posts, wire, screws, etc. The cost may be anywhere from $6 to $20, depending on the quality of apparatus used. The hook-up mailed is the only one we can give you.

SIMPLE ULTRA-AUDION.

1025—CHICAGO: Please send a drawing of the ultra-audion circuit using a 75-turn spider-web coil, 23-plate condenser and WD-11 tube.

The ultra-audion hook-up you request is shown.

TYPE RECEIVER.

1014—CHICAGO: In your wonder Radio Magazine there was a list of the twelve most selective types of radio sets enumerated. Under or after what number is the "Old Reliable." Is it or would it be under No. 2? The above article mentioned is of remarks made by John V. L. Hogan, past president of the Institute of Radio Engineers.

The "Old Reliable" comes under type No. 5 in Hogan's article.

HAGERMAN CRYSTAL.

1018—CHICAGO: Have noticed considerable comment on the Hagerman long-distance crystal set, and would like to build one. Would it be convenient for you to send me a diagram or blue print? Would like a list of the parts needed, and the make, and could you give me the approximate cost?

The diagram your request has been mailed. Further information can be found in the Nov. 28 issue of the magazine, which can be obtained from our circulation department.

BROAD TUNING.

1029—CHICAGO: I have an "autoplex," using 225 volts on "B" circuit. Can you tell me how much "B" voltage to use? Am one-half mile from WJAZ, but cannot cut it out. In what way can I avoid using a wave trap?

Two Columbia variometers, one 1,500-turn coil, VT-2 tube.

In the autoplex set from three to six volts of "C" battery is generally used. There is nothing that can be added to your set to make it finer tuning but a wave trap.

PUSH-PULL DATA.

1050—CHICAGO: I am a reader of your magazine every Thursday and am taking liberty to obtain some information thru your service. I am using the Old Reliable hook-up with WD-11 tube with good results. I want to get enough volume to operate a loud speaker. I have been reading your articles on push-pull amplification and would like to ask a few questions. (1) Does one stage of push-pull amplification furnish as much volume as two stages of regular amplification? (2) Can push-pull transformers be used as regular A. F. transformers by the nonuse of the center tap? (3 Will WD-11 tubes be satisfactory? (4) What ratio should input and output transformers have? (5) If WD-11 tubes are used, can both tubes be controlled by one rheostat? If so, how many ohms resistance should it have? Please send me a diagram or hook-up of a regular two-stage amplifier with jack connections to plug in the detector, first and second stages.

Below are the answers to your questions: (1) One stage of push-pull amplification is more than equivalent to two stages of regular amplification. (2) Push-pull transformers can be used as regular transformers, but this is not advised, as they are not constructed correctly. (3) WD-11 tubes will work, but of course not as well as 201-A's. (4) two WD-11 tubes can be controlled with one rheostat. Use one of six ohms. (5) The hook-up you request has been mailed.

GRID LEAK POSITION.

1048—CHICAGO: I bought a diagram of a two-stage audio-amplifier, and in the list of parts is a variable grid leak. On one sheet it shows it in the diagram, but not connected. Will you please connect it in the diagram I am sending you?

A grid leak is not necessary in the two-stage amplifier, a diagram of which you sent us. Therefore, we do not advise its use.

HAGERMAN CRYSTAL DATA.

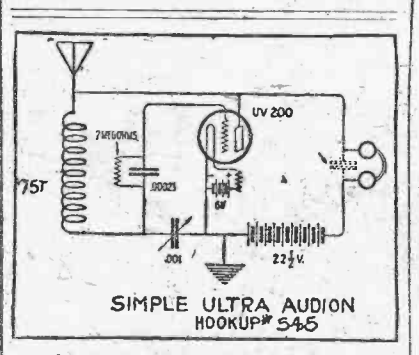
1031—CHICAGO: Please send me a diagram of the hook-up as well as a list of the parts needed to construct the Hagerman crystal receiving set. Also please advise in which issue of the Radio Magazine this set was described.

The diagram for the Hagerman crystal set is inclosed. The parts necessary are as follows: One variometer, one 43-plate condenser, one crystal detector, one 7-by-9 panel, four binding posts, baseboard, wire, screws, etc. Article appeared in Nov. 28 Radio Magazine.

LABELED DIAGRAM.

1204—DOWAGIAC, MICH.: In last Thursday's Radio section of your paper I noticed a hook-up for one stage of audio. It was hook-up No. 508. I would like to add such to my present set, but I am a bit hazy on the diagram. If you would send me the hook-up labeled, and explain how connection is made to my present set, I would appreciate it a great deal.

The hook-up you request with values specified has been mailed.



SIMPLE ULTRA AUDION HOOKUP # 545

Q. & A.—1025: The ultra-audion is the simplest method of producing regeneration.

OUR ERROR.

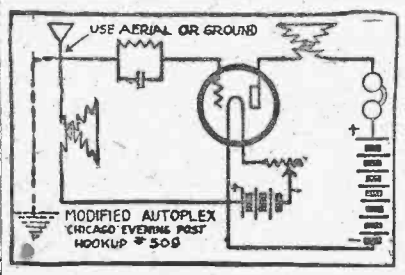
1219—CHICAGO: Inclosed is a description of a DX crystal hook-up that I cut out of the Radio section for Nov. 5, on page 10. I find that this gives the information on the construction of aerial and ground, but in the first sentence it says, "With the crystal hook-up shown." I do not find any crystal hook-up on page 10 or any other page of this Thursday's Radio section. Could you please inform me as to where I can find this hook-up, or I would appreciate it very much if you would send me a copy of it.

We have mailed hook-up you request. Kindly pardon our error in omitting diagram.

NOISY AUTOPLEX.

1235—CHICAGO: Using Columbia variometer and a good type honeycomb coil, with a 201A tube in the Autoplex circuit with poor results, noisy, faint local stations, etc. Would the circuit inclosed help, page 427 of the signal corps radio book, or can you suggest any other circuits in which two can utilize the instrument I have, or with a moderate purchase of additional devices?

We are showing a circuit which will be ideal to use with your set.



Q. & A.—1235: A Post laboratory hook-up which works like a "super" without a "super's" critical tuning.

TRANSCONTINENTAL RECEIVER.

1220—ELGIN: Please send me a plan for making a radio set that will receive messages from all parts of the United States.

The hook-up you request for transcontinental receiver is shown.

AUTOPLEX DATA.

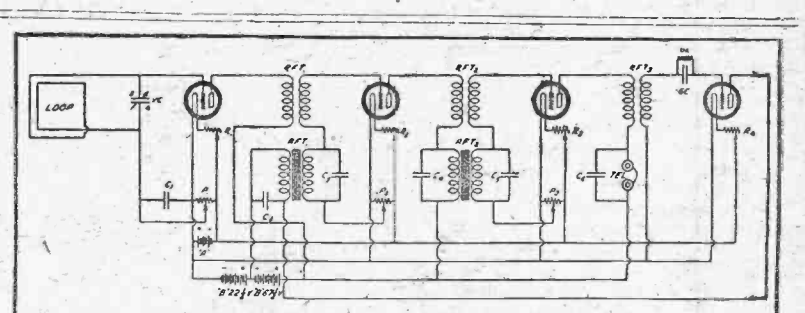
1231—CHICAGO: With reference to autoplex circuit, I note no rheostat is recommended. How many volts "A" battery would you recommend for the UV-201A tube without a rheostat? How can this work out if no rheostat is used? Will it not cause too much amperage to flow in the circuit for this tube? If no resistance is in the circuit and six volts are applied this will cause six amperes to flow and the tube only calls for one-fourth ampere. Will this not harm the tube in a short length of time? I note it is claimed the variometer to be used should have a low distributed capacity. Will you please advise how to determine if a varometer has a low distributed capacity? Also, how to determine if it has a high ratio of inductance. I have the standard wooden variometers on hand, 60 turns on static and 60 turns on rotor. Windings of stator are inside of the wooden frame. Winding of rotor and stator come very close. They are not over one-eighth of an inch apart. Will these variometers function efficiently in the autoplex circuit? Will these variometers tune in the present broadcasting wavelengths? Will this circuit tune in at stations while local stations five or six miles away are broadcasting? Does the broadcasting come in clear or is it full of distortion? I contemplate building this circuit after I hear from you in regard to these points that are not clear to me. Does the negative "A" wire connect with the negative "B" wire? Also both connect with the coil and ground?

We agree with you that a rheostat should be used on a VT-2 tube. A variometer, in order to have low distributed capacity, should be constructed of as little insulating material as possible. In order to determine whether a variometer has a high or low ratio of inductance, count the number of turns of wire on the rotor and on the stator. If they are the same and of practically the same size of wire they have a high ratio of inductance; if not, they have a low ratio. The variometers that you mention may or may not work efficiently on the autoplex set. This can be determined only by experimentation. The autoplex set was built to produce volume and is exceedingly fine tuning. Therefore, we do not believe you can cut out local stations when tuning in DX. The negative "A" wire, the negative "B" wire, the ground and the coil all connect together.

TRAP TROUBLE.

1258—CHICAGO: I am having a hard time to hear other stations than the Drake hotel. Before they start their evening work everything is fine, but when they start, it is listen to them or go to bed. I live one block west from the Drake, on Rush and Walton place, have an R. C. S. Jr. set with one stage, using 298-C lamps. Aerial wire is 100 feet long, due east and west, 34-foot lead-in wire at the east end. Does the painting of aerial wire have much to do with my getting the station so strong? I have used the many wave traps and their hook-ups without any results. I thought that coil was not large enough, so bought and made up, according to your article of Nov. 28, and tried that as with coil 12 and still no results. Tried the grid wire on the aerial post, tied the grid wire on the grid post, no aerial, took off both aerial and grid wire, still got the Drake strong, even with three head sets working. With no aerial or grid on my set I turned the 23-plate condenser one full turn and at no time could I get away from the Drake. What can I do without moving, so that I can get other local stations, if not out of town? Will a loop do any good?

It is practically impossible to cut out the Drake hotel in your locality without using radio-frequency. A loop aerial would be of no aid because of the fact that it would cut down your volume and would not allow you to receive long distance.



4 TUBE REFLEX SET WITH V.T AS DETECTOR HOOKUP # 550

Q. & A.—1220: The four-tube reflex works efficiently under any condition.

TWO-STAGE AMPLIFIER HOOK-UP.

1236—CHICAGO: If consistent please add two steps of amplification to circuit shown on other side of this page. Can it be done without moving "B" battery to other side of the phones?

A hook-up for a two-stage amplifier to suit your requirements has been mailed.

3-Honeycomb Coil Receiver in Universal Panel

Continued from Page 8.

the primary circuit it should be connected in shunt or parallel and a 35-turn coil should be used in place of the 50-turn coil. If a 43-plate coil is to be used it should be connected in series. The illustration shows how either a 23 or 43-plate condenser can be used and how it can be switched from series to parallel by the use of the inductance switches. When switches Nos. 1 and 2 are on switch points Nos. 2 and 1 respectively, the condenser is connected in series. When switches Nos. 1 and 2 are set on points Nos. 1 and 2 respectively the condenser is connected in parallel. When both switches are on No. 2 the condenser is entirely cut out.

Advises Close Coupling.

The other details necessary can be obtained from the illustrations. In tuning in a station the primary and secondary coils should be closely coupled and should be separated to increase sharpness and selectivity in case of interference from another station.

The tickler coil should be set away from the secondary coil and brought closer to the secondary to increase regeneration after the signal is obtained. It is sometimes necessary to reverse the connections of the tickler coil in order to get the proper regeneration. This is easily done by changing the leads on the binding post strip behind the panel at the rear of the mounting as shown in the illustration.

In the detector and two-step amplifier illustration a .00025 grid condenser should be connected across the grid leak. This connection is not shown but must be adhered to.

Gets All Wavelengths.

By using smaller or larger coils which are interchangeable at will all wavelengths from 150 to 20,000 meters can easily be tuned. This is a feature which can only be accomplished successfully and with equal efficiency at any of the wavelengths, with honeycomb coils. It has been adapted by relay men of this country and abroad and by commercial organizations as the "Universal Receiver."

What Detector Tubes Do in Radio Receiving Sets

The purpose of the vacuum tube, when used as a detector, is to rectify the incoming waves, converting them from one type, which are inaudible to the human ear, to another type which are audible.

Radio-frequency currents are those which bring in the signals from a broadcasting station or alternating currents whose frequencies are so high the ear cannot distinguish them. These frequencies are collected on an aerial of some sort and brought down into the receiver. The variable inductance coils are used to not only permit the signals of the various stations to enter the set, by being varied in wavelength to be in resonance with signal, but, also, at the time, to some extent, intensify the strength of these signals.

From the inductance the incoming signal is led to the vacuum tube (detector)—sometimes directly and sometimes by various means. Here it is said to be rectified—that is only one side of the alternating current is permitted to pass thru, which not only makes the current a direct current but one that is audible to the human ear. The vacuum tube, even when used as a detector, also amplifies or increases the signal strength considerably. Otherwise, the simple crystal, with its lack of battery expense, would continue to find favor as a rectifier. Its inability to amplify as it rectifies, makes it almost useless in present-day reception.

Use Only Distilled Water

Never use anything but distilled water in storage batteries. Ordinary water, no matter how pure it may seem to be, contains a certain amount of mineral substance. This substance, united with chemicals in the battery, do injury to the plates.

An Emergency Deal

An emergency vernier on the dials of your tuner can be obtained by wedging the eraser of a common lead pencil between the dial and the panel. By turning the pencil, a very fine adjustment can be obtained.

You will find the classified advertisement section interesting. See Page 15.

Today's Programs and Schedules

Continued from Page 3.

meters. Miss Judith C. Waller, station director.

Day—4:20 p. m., items of interest to women; 4:30 p. m., Illinois Federation of Women's Clubs.

Evening—7 p. m., Boy Scouts' band concert; financial talk by Roy Munger; talk by Rockwell R. Stephens, auto editor of the Daily News; second of a series of lessons in golf by B. A. Andrews; talk by Dr. R. A. Allen of the Y. M. C. A.; travelog by Miss Clara E. Laughlin; 8:30 p. m., WMAQ orchestra; 9 p. m., recreational talk under direction of the City Club of Chicago; 9:15 p. m., program by the Woodmen of the World.

WJAZ—Located on Edgewater Beach hotel; 447.5 meters; E. Warren Howe, program director.

Day—This station has no regular day schedule.

Evening—10 p. m. to 2 a. m., music.

WDAP—Chicago Board of Trade, located at Drake hotel; 390 meters.

Day—9:30 a. m., 10 a. m., 10:30 a. m., 11 a. m., 11:30 a. m., 12 noon, 12:30 a. m., 1 p. m., 1:30 p. m., quotations and market reports direct from the Chicago Board of Trade.

Evening—10 p. m., program furnished by Alexander Nakutin.

WSAH—Located at 4801 Woodlawn avenue; 248 meters.

FOREIGN STATIONS

CKAC—Montreal, Canada; 430 meters:
Day—3 p. m., news, weather and stock reports; musical tea.

CYL—Mexico City, D. F. "El Universal"; 500 meters: Reul Azcarraga, director; G. Obregon Jr., announcer (Spanish); Sendel Hodges, announcer (English).

Daily, 12:54 p. m., news and weather; 8:24 p. m., war bulletins from the war and navy departments; Tuesday and Friday, 8:24 to 8:54 p. m., music. Sunday, 7:24 p. m., war bulletins.

PWX—Havana, Cuba; 400 meters: Jose Isquierdo, chief operator; Urbano del Castila, program director; Rememberto O'Farril, announcer; regular broadcasting nights, Wednesday and Saturday, 7:30 to 10 p. m., central standard time.

TSF—Paris, France; French Post and Telegraph department, 106 Rue de Grenelle. Director, M. G. Valenst; assistant, M. Chanton; 400 meters; 500 watts.

Daily except Tuesday at 2:21 p. m., Tuesday at 1:51 p. m., music, classical theater and a course in English literature; Tuesdays, a course in the Morse code. Every ten days, scientific lectures.

SUBURBAN STATIONS

(Central Time Is Shown.)

WCBD—Zion, Ill.; 345 meters; J. H. Depew, station manager.
Silent all day.

WCAY—Milwaukee, Wis.; 261 meters: No silent nights.
Day—1 p. m., to 4:30 p. m., special concert; novelty and test programs as announced.
Evening—7:30 p. m., regular concert program.

WHAD—Marquette University, Milwaukee, Wis.; 280 meters:
Wednesdays—At 7:30 p. m. only.

WIAB—Rockford, Ill., 252 meters: Monday and Friday evenings; Monday evening, 9 p. m., MacDonald's Melody orchestra, in latest hits; Friday evening, 8 p. m., vocal and instrumental selections; Sunday, 12:30 p. m., religious services by the Rev. Toykmann and choir of the Mission Tabernacle church.

WJAN—Peoria, Ill.; 280 meters: Daily except Sunday.
Day—9 a. m., live stock market; 9:15 a. m., weather; 11:30 a. m., Chicago, Peoria and St. Louis live stock and grain markets; 1:30 p. m., Chicago and Peoria grain and produce markets; United States agriograms.
Evening—Tuesday and Thursday, special musical program to be announced by radiophone.

WRM—Urbana, Ill., University of Illinois; 360 meters: 8:50 to 9:30 p. m., lectures and news.

WTAS—Elgin, Ill., Charles E. Erbstein; 265 meters: Wednesday evening schedule, 8:30 p. m., musical program.

OUT-OF-TOWN STATIONS

(Central Time Is Shown.)

KDKA—East Pittsburg; 326 meters:
Day—8:45 a. m., markets; 10:35 a. m., weather; 11 a. m., markets and weather; 11:10 a. m., organ recital; 5:15 p. m., dinner concert.
Evening—6:30 p. m., weekly chat with farmers; 6:45 p. m., children's period; 7 p. m., stock and market reports; 7:15 p. m., farm features; 7:30 p. m., concert; 8:35 p. m., time; 10 p. m., late concert.

WBZ—Springfield, Mass.; 337 meters:
Day—10:55 a. m., Arlington time signals; weather reports, Boston and Springfield market reports; 5 p. m., dinner concert.
Evening—6 p. m., talk; 6:30 p. m., bedtime story, farmer's period; 7 p. m., concert; 8 p. m., story for grown-ups; 8:55 p. m., time.

WCAE—Pittsburg, Pa.; 462 meters:
Day—11:30 a. m., news and weather program; 2:30 p. m., news; 3:30 p. m. markets; 5:30 p. m., dinner concert.
Evening—6:30 p. m., Uncle "Kaybee"; 7 p. m., silent; 7:30 p. m., music.

WEAF—New York, city; 492 meters:
Day—10 a. m., talks; 8 to 4:30 p. m., music.
Evening—6 to 9 p. m., religious service.

WHN—New York city; Lowe's State broadcasting station; 360 meters:
Day—1:15 to 4:30 p. m., music.
Evening—8:30 to 11 p. m., music.

WGI—Medford Hillside, Mass.; 360 meters:
Day—11 a. m., selection on the Ampico; selections on the Brunswick console; 11:40 a. m., weather; 11:45 a. m., farmers produce market report; 4:30 p. m., closing stock market report, live stock markets, agriograms; 5:15 p. m., Boston police reports; 5:30 p. m., meeting of the Big Brother Amrad club; 6 p. m., concert.

WHAZ—Troy, N. Y.; 380 meters: This station broadcasts only on Monday evenings.

WGY—Schenectady, N. Y.; 380 meters: Silent night Wednesday.
Day—10:35 a. m., time; 11 a. m., markets; 11:45 a. m., weather; 1 p. m., music and address; 5 p. m., produce market; 5:30 p. m., dinner music.
Evening—8:45 p. m., musical program.

WGR—Buffalo; 319 meters:
Day—9:45 a. m., weather; 11 a. m., produce and live stock; 11:30 a. m., organ recital; 1:30 p. m., Chicago Board of Trade; 2:30 p. m., New York Stock exchange; 3 p. m., tea-time music; 5:30 p. m., dinner music.
Evening—6:30 p. m., news.

WJY—New York City; 405 meters; Tuesday, Thursday, Friday, 6:30 to 10:30 p. m., Sunday, 1:30 to 4:30 p. m., and 7 to 9:30 p. m.
Evening—6 p. m., "Golf," by Ennis Brown; 6:45 p. m., "The Yardmaster's Story"; 7 p. m., Mayor Hylan's people's concert; 8 p. m., "time"; 8:15 p. m., Department of Street Cleaning band.

WJZ—New York City; 455 meters: No silent night.
Day—2 p. m., music; 3 p. m., French lecture; 4:30 p. m., closing markets.
Evening—6 p. m., "Jack Rabbit" stories; 6:40 p. m., world's work; 7:15 p. m., organ recital; 8 p. m., Paraguayan program; 8:55 p. m., time signals; 9 p. m., "The Battle of Santiago"; 9:30 p. m., dance program.

WOO—Philadelphia; 509 meters: Silent Sunday, Tuesday, Thursday, Friday and Saturday evenings.
Day—10 a. m., grand organ; 10:30 a. m., United States weather forecast; 10:30 a. m., United States naval observatory time signals; 11 a. m., luncheon music by the Tea Room orchestra; 3:45 p. m., grand organ and trumpets; 4 p. m., sport results and police reports.

WOR—Newark, N. J.; 405 meters:
Day—1:30 p. m., Marguerite Zender, soprano; 1:45 p. m., Edward J. Hufnall, tenor; 2 p. m., Hilda Spong; 2:30 p. m., continuation of soprano solos; 2:45 p. m., Edward J. Hufnall, tenor; 5:15 p. m., "Romance of Time Telling"; 5:30 p. m., "Music While You Dine."

WRC—Washington, D. C.; 469 meters: Silent Tuesday, Thursday and Saturday evenings.
Day—3 p. m., fashions; 3:10 p. m., song recital; 3:25 p. m., current events; 3:35 p. m., piano recital; 4 p. m., report of the conference board; 4:15 p. m., international code; 5 p. m., children's stories.

WRW—Tarrytown, N. Y., 273 meters;
Evening—6:30 to 8:45 p. m., music and talks.

WDAR—Philadelphia, Pa.; 395 meters:
Day—10:45 a. m., daily almanac; 11:02 a. m., organ recital; 1 to 2 p. m., Arcadia concert; 3:30 p. m., recital from the studio, Sal Zaleb's orchestra, Mass cafe.
Evening—6:30 p. m., Dream Daddy with the boys and girls; 7 p. m., recital.

Midwest Programs.

WCAL—Northfield, Minn., St. Olaf college, P. Skifter, director; Riku Hjertaas, program director; 360 meters.

WCX—Detroit, Mich.; 517 meters:
Day—1 p. m., news bulletins; 1:15 p. m., stock quotations; 1:20 p. m., Rev. Gaius Glenn Atkins, D. D., speaker; a twenty-minute explanation of the international Sunday school lesson; 1:50 p. m., government weather forecast; 3:15 p. m., music; 5 p. m., dinner concert, broadcast from Hotel Tuller.
Evening—7 p. m., musical program.

WJAX—Cleveland; 390 meters: Silent every night except Tuesday and Thursday.
Evening—7:30 p. m., musical program.

WLAG—Minneapolis, Minn.; 417 meters: No silent nights.
Day—9:30-9:45 a. m., announcements; 10:45-11:15 a. m., household hints; 11:35 a. m. to 12 m., surprise program; 2 to 2:30 p. m., Woman's club; 2:40 to 4 p. m., daylight concert; 4 to 4:30 p. m., short story; 5:30 to 6 p. m., children's stories.
Evening—6 p. m., talk; 6:15 p. m., orchestra; 7:30 p. m., farm lecture.

WLW—Cincinnati; 309 meters: Silent Friday and Saturday.
Day—10:30 a. m., weather; 1:30 p. m., business reports; 3 p. m., markets; 4 p. m., piano solos.
Evening—10 p. m., music.

WOC—Davenport, Iowa; 484 meters: Silent Tuesdays.
Day—10 a. m., opening market quotations; 10:55 a. m., time signals; 11 a. m., weather and river forecast; 11:05 a. m., market quotations; 12 noon, chimes concert; 3 p. m., closing stocks and markets; 3:30 p. m., educational program and concert; 5:45 p. m., chimes concert; 6:30 p. m., Sandman's visit.

WSAI—Cincinnati, United States Playing Card Company; 309 meters. Tuesday, Thursday, Saturday evenings.
Evening—8 p. m., music; 9 p. m., address; 9:15 p. m., dance music.

Southwest Programs.

KSD—St. Louis; 546 meters: Silent Friday.

WBAP—Fort Worth, Texas; 476 meters:
Day—10 a. m. to 4 p. m., markets and financial review.
Evening—7:30 p. m., concert; 9:30 p. m., music.

WDAF—Kansas City, Mo.; 441 meters:
Day—3:30 to 4:30 p. m., musical matinee, Johnnie Campbell's Kansas City Club orchestra.
Evening—6 p. m., weather; 7 p. m., music and lectures.

WFAA—Dallas, Texas; 187 meters: Silent Wednesday.
Day—12 noon, address.
Evening—7 p. m., music.

WHAS—Louisville; 400 meters: Silent Mondays.
Day—4 to 5 p. m., selections by the Walnut theater orchestra; Walter Davison, conductor; selections by the Strand theater orchestra, Harry S. Currie, conductor.
Evening—9 to 10:30 p. m., music.

WHB—Kansas City, Mo.; 411 meters: Silent Monday, Wednesday and Friday.
Day—8:25 a. m., stock reports; 9:25 a. m., grain market; 12:35 p. m., music; 2 p. m., ladies' hour.
Evening—7 p. m., music.

WMC—Memphis; 500 meters: Silent Wednesday.
Day—Stock and news every half hour from 9 a. m. to 10 p. m.
Evening—8:30 p. m., lecture.

WSB—Atlanta, Ga., Atlanta Journal; 428 meters:
Day—5 p. m., talk; 5:30 p. m., kiddies' program.
Evening—8 p. m., music; 10:45 p. m., transcontinental recital.

Pacific Coast Concerts.

KPO—San Francisco; 425 meters; 50 watts: Crair F. Morrison, station director; Ada Morgan O'Brien, program director. Friday night silent.
Day—2 p. m., time signals from the navy observatory; 3 to 4 p. m., Rudy Sieger's Fairmount Hotel orchestra, by remote control.
Evening—7:30 p. m., children's program; 10 to 12 p. m., music.

Engineers Vote Beverage Honor for Wave Antenna

Harold H. Beverage, an engineer of the Radio Corporation of America, was tendered a vote of honor by the membership and board of officers of the Institute of Radio Engineers at a recent meeting, for the outstanding radio invention of the year which consisted of his so-called wave antenna.

Beverage also was presented with a cash prize of $500, the Liebmann memorial prize, this amount being the annual interest on an investment made by the late Col. Morris Liebmann, a well-known radio engineer. Each year this sum is given to the most deserving individual whose radio inventions or developments are of outstanding practical importance.

Phonograph as Speaker

The phonograph makes an ideal loud speaker by attaching a receiver unit to the tone arm with one of the standard adapters on the market today. Altho the volume is not as great as is obtained with a horn, the quality of tone is much richer and less distorted.

Radio Helps Canary

Mrs. George LaLonde of Vancouver, Wash., credits radio with the return of her pet canary's voice. The bird is 12 years old and had been silent for years before music broadcast to her started the bird singing again.

BOYS LEARN RADIO IN SCHOOL—Radio courses are being given to a certain extent in New York public schools, the manual training and science classes being co-ordinated in Public School No. 6 in this regard. Photo shows a group of New York schoolboys who have made enviable DX records with sets they have constructed themselves.

Broadcasting Stations and Schedule of Programs

Continued from Page 2.

WDAK—Hartford, Conn., the Courant, 261 meters.
WDAO—Dallas, Texas, Automotive Electric company, 360 meters.
WDAP—Chicago, Ill., Board of Trade, 300 meters.
WDAR—Philadelphia, Pa., Lit Brothers, 395 meters.
WDAS—Worcester, Mass., 692a Main street, Samuel A. Waite, 360 meters.
WDAU—New Bedford, Mass., Slocum Kilburn, 360 meters.
WDAX—Centerville, Iowa, First National bank, 360 meters
WDAY—Fargo, N. D., Radio Equipment Corporation, 244 meters; director, L. W. Hamm; daily, 9:30 a. m., weather; Tuesday, Thursday, Saturday, 7:30 to 8:30 p. m., music; Sunday, 4 to 5 p. m., orchestra.
WDBC—Lancaster, Pa., Kirk, Johnson & Co., 258 meters.
WDBF—Youngstown, Ohio, 254 West Federal street, Robert G. Phillips, 261 meters.
WDZ—Tuscola, Ill., Star Store building, James L. Bush, 278 meters.
WEAA—Flint, Mich, Fallain & Lathrop, 280 meters.
WEAB—Fort Dodge, Iowa, Standard Radio Equipment company, 360 meters.
WEAF—New York, N. Y., American Telephone and Telegraph company, 492 meters.
WEAG—Edgewood, R. I., Nicholas-Hineline-Bassett Laboratory, 231 meters.
WEAH—Wichita, Kan., Wichita Board of Trade, 244 meters.
WEAI—Ithaca, N. Y., Cornell university, 286 meters.
WEAJ—Vermillion, S. D., University of South Dakota, 360 meters.
WEAM—North Plainfield, N. J., Borough of North Plainfield (W. Gibson Buttfield), 250 meters.
WEAN—Providence, R. I., Shepard company, 273 meters.
WEAO—Columbus, Ohio, Ohio State university, 360 meters.
WEAP—Mobile, Ala., Mobile Radio company, 360 meters.
WEAR—Baltimore, Md., Baltimore American and News Publishing company, 360 meters.
WEAS—Washington, D. C., Hecht company, 360 meters.
WEAU—Sioux City, Iowa, Davidson Brothers company, 360 meters.
WEAY—Houston, Texas, Iris theater (Will Horowitz Jr.), 360 meters.
WEB—St. Louis, Mo., Benwood company, 360 meters.
WEV—Houston, Texas, Hurlburt-Still Electrical company, 360 meters.
WEW—St. Louis, Mo., St. Louis university, 261 meters: 9 a. m., estimated receipts of live stock at public stockyards; opening trend of hog market; opening futures, wheat for St. Louis and Kansas City; opening trend of market; Liverpool cables; 10 a. m., official weather reports, river stages; 2 p. m., closing market quotations, live stock, grain markets, fruits and vegetables, eggs and poultry; 5 p. m., special weather and river bulletins, agrigrams, etc.; other special musical program will be announced previously.
WFAA—Dallas, Texas, Dallas News and Dallas Journal, 476 meters.
WFAB—Syracuse, N. Y., 802 McBride street, Carl F. Woese, 234 meters.
WFAF—Poughkeepsie, N. Y., H. C. Spratley Radio company, 360 meters.
WFAH—Port Arthur, Texas, Electric Supply company, 360 meters.
WFAJ—Asherville, N. C., Hi-Grade Wireless Instrument company, 360 meters.
WFAM—St. Cloud, Minn., Times Publishing company, 360 meters.
WFAN—Hutchinson, Minn., Hutchinson Electric Service company, 360 meters, 100 watts; daily 12 noon to 12:05 p. m., Twin City radio programs; 12:05 to 12:20 p. m., long distance radio discussion; 12:20 to 12:25 p. m., markets; 12:25 to 12:30 p. m., news; Tuesdays, 8:10 p. m., entertainment.
WFAQ—Cameron, Mo., Missouri Wesleyan college, 360 meters.
WFAV—Lincoln, Neb., University of Nebraska, department of electrical engineering, 360 meters.
WFI—Philadelphia, Pa., Strawbridge & Clothier, 395 meters; 9:15 a. m., produce market and live stock reports; 12 m., Meyer Davis Bellevue Stratford hotel concert orchestra; 12:50 p. m., agricultural report; 1 p. m., concert by Louisa Knowlton, cellist; Strawbridge & Clothier male quartet; John Owens, tenor; Edayfed Lewis, tenor; Harold Simonds, barytone; John Vandersloot, bass; Loretta Kerk, pianist and accompanist; 5:30 p. m., Meyer Davis Bellevue Stratford Hotel concert orchestra; 6 p. m., "Snowball" talks to the children.
WGAL—Lancaster, Pa., Lancaster Electric Supply and Construction company, 248 meters.
WGAN—Pensacola, Fla., 216 West Romana street, Cecil E. Lloyd, 360 meters.
WGAQ—Shreveport, La., Glenwood Radio corporation (W. G. Patterson), 360 meters.
WGAR—Fort Smith, Ark., Southwest American, 360 meters.
WGAU—Wooster, Ohio, Radio Monufacturing and Service company (Marcus G. Limb), 226 meters.
WGAW—Altoona, Pa., 1918 West Chestnut street, Ernest C. Albright, 261 meters.
WGAY—Madison, Wis., Northwestern Radio company, 360 meters; daily, 1 to 4:30 p. m., concert and tests; 7:30 p. m. concert; Sunday, 7:30 p. m., radio chapel, sacred music.
WGAZ—South Bend, Ind., South Bend Tribune, 360 meters.
WGI—Medford Hillside, Mass., American Radio and Research corporation, 360 meters.
WGL—Philadelphia, Pa., 2303 North Broad street, Thomas F. Y. Howlett, 360 meters.
WGR—Buffalo, N. Y., Federal Telephone and Telegraph company, 319 meters.
WGV—New Orleans, La., Interstate Electric company, 360 meters.
WGY—Schenectady, N. Y., General Electric company, 380 meters
WHA—Madison, Wis., University of Wisconsin, 360 meters.
WHAA—Iowa City, Iowa, State University of Iowa, 283 meters.
WHAB—Galveston, Texas, Clark W. Thompson, 360 meters.
WHAD—Milwaukee, Wis., Marquette university, 280 meters; J. B. Kremer, program director; L. E. Coodes, H. P. Warring, Wednesday, 7:30 p. m.
WHAG—Cincinnati, Ohio, University of Cincinnati, 222 meters.
WHAH—Joplin, Mo., Hafer Supply company, 360 meters.
WHAK—Clarksburg, W. Va., Roberts Hardware company, 360 meters.
WHAL—Lansing, Mich., Lansing Capital News, 248 meters.
WHAM—Rochester, N. Y., University of Rochester (Eastman School of Music), 360 meters.
WHAP—Decature, Ill., Otta & Kahn, 360 meters.
WHAQ—Washington, D. C., Semmes Motor company, 360 meters.
WHAR—Atlantic City, N. J., Paramount Radio and Electric company (W. H. A. Paulus), 231 meters.
WHAS—Louisville, Ky., Courier-Journal and Louisville Times, 300 meters; silent Monday night; daily, 4 to 6 p. m., music; 5 p. m., news; 7:30 to 9 p. m., music, lectures.
WHAV—Wilmington, Del., Wilmington Electrical Special company, 360 meters.
WHAZ—Troy, N. Y., Rensselaer Polytechnic Institute, 380 meters.
WHB—Kansas City, Mo., Sweeney School company, 411 meters.
WHD—Morgantown, W. Va., West Virginia University, 360 meters.
WHK—Cleveland, Ohio, Radiovox company (Warren R. Cox), 360 meters.
WHN—Ridgewood, N. Y., George Schubel, 360 meters.
WIAB—Rockford, Ill., Joslyn Automobile company, 252 meters. Monday and Friday, 8 to 930 p. m. Sunday, 12:30 p. m.
WIAC—Galveston, Texas, Galveston Tribune, 360 meters.
WIAD—Ocean City, N. J., Ocean City Yacht club (Howard R. Miller), 254 meters.
WIAF—New Orleans, La., 139 North Alexander street, Gustav A. DeCortin, 234 meters.
WIAI—Springfield, Mo., Heer Stores company, 360 meters.
WIAJ—Neenah, Wis., Fox River Valley Radio Supply company (Quinn Brothers), 224 meters.
WIAK—Omaha, Neb., Journal-Stockman company, 278 meters.
WIAO—Milwaukee, Wis., School of Engineering of Milwaukee, 360 meters.
WIAQ—Marion, Ind., Chronicle Publishing company, 226 meters.
WIAR—Paducah, Ky., Paducah Evening Sun, 360 meters.
WIAS—Burlington, Iowa, Home Electric company, 360 meters.
WIAU—Le Mars, Iowa, American Trust and Savings bank, 360 meters.
WIK—McKeesport, Pa., K. & L. Electric company (Herbert F. Kelso and Hunter J. Lohman), 360 meters.
WIL—Washington, D. C., Continental Electric Supply company, 360 meters.
WIP—Philadelphia, Pa., Gimbel Brothers, 509 meters.
WJAB—Lincoln, Neb., American Electric company, 360 meters.
WJAD—Waco, Texas, Jackson's Radio Engineering laboratories, 360 meters.
WJAF—Muncie, Ind., Press Publishing company, 360 meters.
WJAG—Norfolk, Neb., Norfolk Daily News (Huse Publishing company), 283 meters.
WJAK—Greentown, Ind., Clifford L. White, 254 meters.
WJAM—Cedar Rapids, Iowa, 302 3d Avenue West, D. M. Perham, 268 meters.
WJAN—Peoria, Ill., Peoria Star, 280 meters.
WJAQ—Topeka, Kan., Capper Publications, 360 meters, 100 watts; director, J. A. Machel; weather, news, roads, etc.; daily, 9 to 9:45 a. m., bond gossip, financial news and grain markets; 10 to 10:45 a. m., quotations upon foreign exchange, live stock, grain, bonds and stocks, financial news bulletins and weather reports; 2 to 2:45 p. m., quotations upon grain, stock, butter, eggs, poultry, foreign exchange and bonds, financial news bulletins and weather reports; 3 to 3:45 p. m., quotations upon fruits and vegetables, butter, eggs and poultry, live stock, hay and grain, flour and feed, foreign exchange, bonds and stocks, weather reports.
WJAR—Providence, R. I., The Outlet company (J. Samuels and Brother), 360 meters.
WJAS—Pittsburg, Pa., Pittsburg Radio Supply House, 360 meters.
WJAT—Marshall, Mo., Kelly-Vawter Jewelry company, 360 meters.
WJAX—Cleveland, Ohio, Union Trust company, 360 meters.
WJAZ—Chicago, Ill., Chicago Radio laboratory, 448 meters.
WJD—Granville, Ohio, Richard H. Howe, 229 meters.
WJH—Washington, D. C., White & Boyer company, 273 meters.
WJX—New York, N. Y., Deforest Radio Telephone and Telegraph company, 360 meters.
WJY—New York, N. Y., R. C. A., 405 meters.
WJZ—New York, N. Y., R. C. A., 455 meters.
WKAA—Cedar Rapids, Iowa, 1444 2d avenue, East, H. F. Paar, 268 meters.
WKAD—East Providence, R. I., Charles Loof (Cresent park), 240 meters.
WKAF—Wichita Falls, Texas, W. S. Radio Supply company, 360 meters.
WKAN—Montgomery, Ala., United Battery Service company, 226 meters.
WKAP—Cranston, R. I., Dutee W. Flint, 360 meters.
WKAQ—San Juan, P. R., Radio Corporation of Porto Rico, 360 meters.
WKAR—East Lansing, Mich., Michigan Agricultural college, 280 meters.
WKAV—Laconia, N. H., Laconia Radio club, 254 meters.
WKAW—Beloit, Wis., Turner Cycle company, 242 meters.
WKAX—Bridgeport, Conn., 1789 Park avenue, William A. MacFarlane, 231 meters.
WKAY—Gainesville, Ga., Brenau college, 280 meters.
WKC—Baltimore, Md., Joseph M. Zamolski company, 360 meters.
WKY—Oklahoma City, Okla., WKY Radio shop, 360 meters.
WLAC—Raleigh, N. C., North Carolina State college, 360 meters.
WLAG—Minneapolis, Minn., Cutting and Washington Radio corporation, 417 meters.
WLAH—Syracuse, N. Y., 425 Brownell street, Samuel Woodworth, 234 meters.
WLAJ—Waco, Texas, Waco Electrical Supply company, 360 meters.
WLAK—Bellows Falls, Vt., Vermont Farm Machine corporation, 360 meters.
WLAL—Tulsa, Okla., Naylor Electric company, 360 meters.
WLAN—Houlton, Maine, Putnam Hardware company, 283 meters.
WLAP—Louisville, Ky., 306 West Breckenridge street, W. V. Jordan, 360 meters.
WLAQ—Kalamazoo, Mich., 108 Elm street, Arthur E. Schilling, 360 meters.
WLAT—Burlington, Iowa, Radio and Specialty company, 360 meters.
WLAV—Pensacola, Fla., Electric Shop, 254 meters.
WLAW—New York, N. Y., police department, City of New York, 360 meters.
WLAX—Greencastle, Ind., Putnam Electric company (Greencastle Community Broadcasting station), 231 meters.
WLB—Minneapolis, Minn., University of Minnesota, 360 meters.
WLW—Cincinnati, Ohio, Crosley Manufacturing company, 309 meters.
WMAB—Oklahoma City, Okla., Radio Supply company, 360 meters.
WMAC—Cazenova, N. Y., Fernwood street, J. Edw. Page (Olive B. Meredith), 261 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WMAH—Lincoln, Neb., General Supply company, 254 meters; H. C. Harvey, station director; Monday and Friday, 9 to 10:30 p. m., dance music.
WMAJ—Kansas City, Mo., Drovers Telegram company, 275 meters; J. E. Cook, operator; daily, 8:15 a. m. to 2:25 p. m., markets and news.
WMAK—Lockport, N. Y., Norton Laboratories, 360 meters.
WMAL—Trenton, N. J., Trenton Hardware company, 256 meters.
WMAM—Beaumont, Texas, Beaumont Radio Equipment company, 360 meters.
WMAP—Easton, Pa., Utility Battery service, 246 meters.
WMAQ—Chicago, Ill., Chicago Daily News, 448 meters; Miss Judith C. Waller, director; program announced daily.
WMAV—Auburn, Ala., Alabama Polytechnic institute, 250 meters; Sunday morning and afternoon church services; evening, lectures.
WMAY—St. Louis, Mo., Kingshighway Presbyterian church, 280 meters.
WMAZ—Macon, Ga., Mercer university, 268 meters.
WMC—Memphis, Tenn., "Commercial Appeal" (Commercial Publishing company), 500 meters, George D. Hay, announcer; F. Y. Root, operator.
WMU—Washington, D. C., Doubleday-Hill Electric company, 261 meters.
WNAC—Boston, Mass., Shepard stores, 278 meters.
WNAD—Norman, Okla., University of Oklahoma, 360 meters.
WNAL—Omaha, Neb., 5019 Capitol avenue, R. J. Rockwell, 242 meters.
WNAN—Syracuse, N. Y., Syracuse Radio Telephone company, 286 meters.
WNAP—Springfield, Ohio, Wittenberg college, 231 meters.
WNAQ—Charleston, S. C., Charleston Radio Electric company, 360 meters.
WNAR—Butler, Mo., C. C. Rhodes, 231 meters.
WNAS—Austin, Texas, Texas Radio Corporation and Austin Statesman, 360 meters.
WNAT—Philadelphia, Pa., Lemmig Brothers company (Frederick Lemmig), 360 meters.
WNAW—Fort Monroe, Va., Peninsular Radio club (Henry Kunzmann), 360 meters.
WNAX—Yankton, S. D., Dakota Radio Apparatus company, 244 meters.
WNJ—Albany, N. Y., Shotton Radio Manufacturing company, 360 meters.
WOAC—Lima, Ohio, Maus Radio company, 266 meters.
WOAD—Sigourney, Iowa, Friday Battery and Electric corporation, 360 meters.
WOAE—Fremont, Neb., Midland college, 360 meters.
WOAF—Tyler, Texas, Tyler Commercial college, 360 meters; Director, A. B. Chenier; a. m., markets, afternoon, music; evening service Sunday.
WOAG—Belvidere, Ill., Apollo theater (Belvidere Amusement company), 224 meters.
WOAH—Charleston, S. C., Palmetto Radio corporation, 360 meters.
WOAI—San Antonio, Texas, Southern Equipment company, 385 meters.
WOAJ—Parsons, Kan., Ervins Electrical company, 258 meters.
WOAK—Frankfort, Ky., Collins Hardware company, 240 meters.
WOAL—Webster Groves, Mo., 4 Jefferson road, William E. Woods, 229 meters.
WOAN—Lawrenceburg, Tenn., Vaughn Conservatory of Music (James D. Vaughn), 360 meters; 8 p. m., music.
WOAO—Mishawaka, Ind., Lyradion Manufacturing company, 360 meters.
WOAP—Kalamazoo, Mich., Kalamazoo college, 240 meters.
WOAR—Kenosha, Wis., Henry P. Lundskow, owner and operator, 360 meters.
WOAT—Wilmington, Del., 215 Market street, Boyd M. Hamp, 360 meters.
WOAV—Erie, Pa., Pennsylvania National Guard, 2d Battalion, 112th Infantry, 242 meters.
WOAW—Omaha, Neb., Woodmen of the World, 526 meters; evening entertainment every night.
WOAX—Trenton, N. J., 600 Ingham avenue, Franklyn J. Wolff, 240 meters.
WOAZ—Stamford, Texas, Penick Hughes company, 360 meters.
WOC—Davenport, Iowa, Palmer School of Chiropractic, 484 meters.
WOI—Amea, Iowa, Iowa State college, 360 meters.
WOK—Pine Bluff, Ark., Pine Bluff company, 360 meters.
WOO—Philadelphia, Pa., 13th and Market streets, John Wanamaker, 509 meters; director, Gordon H. Cullen.
WOQ—Kansas City, Mo., Western Radio company, 360 meters.
WOR—Newark, N. J., L. Bamberger & Co., 405 meters.
WOS—Jefferson City, Mo., Missouri State Marketing bureau, 441 meters.
WPAB—State College, Pa., Pennsylvania State college, 283 meters.
WPAC—Okmulgee, Okla., Donaldson Radio company, 360 meters.
WPAH—Waupaca, Wis., Wisconsin department of markets, 360 meters.
WPAJ—New Haven, Conn., Doolittle Radio corporation, 268 meters.
WPAK—Agricultural College, N. D., North Dakota Agricultural college, 360 meters.
WPAL—Columbus, Ohio, Superior Radio and Telegraph Equipment company, 286 meters.
WPAM—Topeka, Kan., Auerbach & Guettel, 360 meters, 100 watts; W. A. Beasley, director; markets; special programs 6:15 p. m.
WPAP—Winchester, Ky., 222 Lexington avenue, Theodore D. Phillips, 360 meters.
WPAQ—Frostburg, Md., General Sales and Engineering company, 360 meters.
WPAT—El Paso, Texas, St. Patrick's cathedral, 360 meters.
WPAU—Moorhead, Minn., Concordia college, 360 meters.
WPAZ—Charleston, W. Va., Dr. John R. Koch, 273 meters.
WPG—New Lebanon, Ohio, Nushawg Poultry farm, 243 meters.
WQAA—Parkesburg, Pa., Horace A. Beale Jr., 360 meters.
WQAB—Springfield, Mo., Southwest Missouri State Teachers' college, 236 meters.
WQAC—Amarillo, Texas, 108 East 8th street, E. B. Gish, 360 meters.
WQAD—Waterbury, Conn., Whitall Electric company, 242 meters; 6:30 to 7:45 p. m., Monday, Wednesday and Friday.
WQAE—Springfield, Vt., Moore Radio News station (Edmund B. Moore), 275 meters.
WQAF—Sandusky, Ohio, Sandusky Register, 240 meters.
WQAH—Lexington, Ky., Brock-Anderson Electrical Engineering company, 254 meters.
WQAL—Mattoon, Ill., Coles County Telephone and Telegraph company, 258 meters.
WQAM—Miami, Fla., Electrical Equipment company, 300 meters. Director, R. H. Horning. Tuesday, 7 to 8 a. m., 9 to 10 a. m., Sunday.
WQAN—Scranton, Pa., Scranton Times, 280 meters.
WQAO—New York, N. Y., Calvary Baptist church, 360 meters.
WQAQ—Abilene, Texas, West Texas Radio company, 360 meters.
WQAS—Lowell, Mass., Prince-Walter company, 266 meters.
WQAV—Greenville, S. C., Huntington and Guerry (Inc.), 258 meters.
WQAW—Washington, D. C., Catholic university, 236 meters.
WQAX—Peoria, Ill., Radio Equipment company, 360 meters.
WQAZ—Greensboro, N. C., Greensboro Daily News, 360 meters.
WHAA—Houston, Texas, Rice institute, 360 meters.
WRAD—Marion, Kan., Taylor Radio shop (G. L. Taylor), 360 meters.
WRAF—Laporte, Ind., The Radio club (Inc.), 224 meters.
WRAH—Providence, R. I., Stanley N. Read, 231 meters.
WRAL—St. Croix Falls, Wis., Northern States Power company, 248 meters.
WRAN—Waterloo, Iowa, Black Hawk Electrical company, 236 meters. Director, H. R. Plowman; 5 to 6 p. m. week days; 8:15 to 9:15 p. m. Monday, concert.
WRAO—St. Louis, Mo., Radio Service company, 360 meters.
WRAP—Winter Park, Fla., Winter Park Electrical Construction company, 360 meters.
WRAU—Amarillo, Texas, Amarillo Daily News, 360 meters.
WRAV—Yellow Springs, Ohio, Antioch college, 360 meters.
WRAW—Reading, Pa., Avenue Radio shop (Horace D. Good), 238 meters.
WRAX—Gloucester City, N. J., Flaxon's garage, 268 meters.
WRAY—Scranton, Pa., Radio Sales corporation, 280 meters.
WRAZ—Newark, N. J., Radio Shop of Newark (Herman Lubinsky), 233 meters.
WRC—Washington, D. C., Radio Corporation of America.
WRK—Hamilton, Ohio, Doron Bros. Electric company, 360 meters.
WRL—Schenectady, N. Y., Union college, 360 meters.
WRM—Urbana, Ill., University of Illinois, 360 meters.
WRR—Dallas, Texas, City of Dallas (police and fire signal department), 360 meters.
WRW—Tarrytown, N. Y., Tarrytown Radio Research laboratory, 273 meters.
WSAB—Cape Girardeau, Mo., Southeast Missouri State Teachers' college, 360 meters.
WSAC—Clemson College, S. C., Clemson Agricultural college, 360 meters.
WSAD—Providence, R. I., J. A. Foster company, 261 meters.
WSAG—St. Petersburg, Fla., City of St. Petersburg (Loren V. Davis), 244 meters.
WSAH—Chicago, Ill., 4801 Woodlawn avenue, A. J. Leonard, Jr., 248 meters.
WSAI—Cincinnati, Ohio, United States Playing Cards company, 309 meters.
WSAJ—Grove City, Pa., Grove City college, 360 meters.
ESAK—Middleport, Ohio, Foster Egner (Daily News, Pomeroy, Ohio), 258 meters.
WSAL—Brookville, Ind., Franklin Electric company, 360 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WSB—Atlanta, Ga., Atlanta Journal company, 429 meters. No silent night. Day schedule 12-1 p. m., musical program; 2:30 p. m., weather; 5-5:36 p. m., bedtime story. Evening—8-9 p. m., popular concert.
WSL—Utica, N. Y., J. & M. Electric company, 360 meters.
WSY—Birmingham, Ala., Alabama Power company, 360 meters.
WTAC—Johnstown, Pa., Pennsylvania Traffic company, 360 meters.
WTAS—Elgin, Ill., Charles E. Erbstein, 275 meters. Evening schedule—7:30 p. m., musical program.
WTAU—Tecumseh, Neb., Ruegy Battery and Electric company, 360 meters.
WTAW—College Station, Texas, Agricultural and Mechanical college, 360 meters.
WTG—Manhattan, Kan., Kansas State Agricultural college, 485 meters.
WWAD—Philadelphia, Pa., Wright & Wright, 360 meters.
WWAX—Laredo, Texas, Wormser Brothers, 360 meters.
WWB—Canton, Ohio, Daily News Printing company, 360 meters.
WWI—Dearborn, Mich., Ford Motor company, 360 meters.
WWJ—Detroit, Mich., Detroit News, 580 meters. Silent Saturday. Day schedule—8:30 a. m., household hints and talks for women; 9:25 a. m., weather; 10:55 a. m., time signals; 2 p. m., concert. Evening schedule—8:30 p. m., concert.
WWL—New Orleans, La., Loyalo university, 360 meters.
WWT—Buffalo, N. Y., McCarthy Brothers & Ford, 360 meters.
WWZ—New York city, Wannamaker's department store, 360 meters.

Limit of Detection

Regenerative sets employing only one tube will bring in stations from nearly the same distance as sets that have one or more stages of audio-amplifications. Amplification does not make a set more sensitive to distant signals. It merely increases the volume of signals received. If the detector tube can't detect certain signals, audio-amplification will not improve the situation. Two or more stages of radio-amplification before the detector tube is the only way to increase sensitiveness and range.

See Classified Ads. on page 15.

Long Aerials Best When Used in Proper Manner

Long aerials, as a rule, give greater range and volume, but less selectivity. Short aerials give less range and volume, but more selectivity.

The long aerial, with a sentitive receiver and the proper controls, can be made selective. However, a short aerial cannot be made to perform the services of a long aerial.

It is better to construct a single-wire aerial of 150 to 175 feet, with the usual lead-in of twenty-five feet, and use a forty-three plate variable condenser in the aerial circuit to cut its wave length when desired. This can be used with a series-parallel switch, and the condenser thrown in series with the antenna or placed in shunt at will.

This is the thirteenth issue of this magazine. The first was November 15th. If you have missed any of them, they can be obtained at our office at 3 cents per copy. By mail, 4 cents per copy.

THE CHICAGO EVENING POST
12 South Market St., Chicago

Records of DX Hounds

BRINGS THIRTY-TWO STATIONS.

RADIO EDITOR—Here is a list of thirty-two stations that I received on Monday: WOC, Davenport; KYW, Chicago; WDAP, Chicago; WAAF, Chicago; WSD, St. Louis; WMAQ, Chicago; WGY, Schenectady; WIAO, Milwaukee; WOR, Newark; WBZ, Springfield, Mass.; KDKA, East Pittsburg; KOP, Detroit; WGR, Buffalo; WDAF, Kansas City; WCAE, Pittsburg; WSX, Detroit; WOAW, Omaha; WRC, Washington; WOQ, Kansas City; WWJ, Detroit; WOO, Philadelphia; WBAP, Fort Worth; CFCA, Toronto; WHAZ, Troy, N. Y.; WCBD, Zion; WLW, Cincinnati; WTAS, Elgin; WSB, Atlanta; WOS, Jefferson City; WBAH, Minneapolis; KFKX, Hastings; KPO, San Francisco. I received the first fourteen stations listed before 6:30 p. m. I listened to KPO, San Francisco, from about 12:15 to 12:45 a. m., broadcasting from the Palace hotel. I have a 3 H. C. set with one step of audio-amplification. I was using only a 22½-volt B battery at the time.—ROBERT P. CROSS JR., 207 Hamilton Street, Evanston, Ill.

FIVE-TUBE NEUTRODYNE.

RADIO EDITOR—The following stations were tuned-in on my five-tube neutrodyne, all received on a Music Master loud speaker, all tuning done with the loud speaker direct (no head phones were used), same were received in the following order: WEAF, New York city; at 6:10 p. m., WRC, Washington, D. C.; at 6:40, WFAA, Dallas, Texas; at 6:55, WCAE, Pittsburg; 6:57, WGY, Schenectady, N. Y.; 7:05, WHB, Kansas City; 7:15, WDAR, Philadelphia, Pa.; 7:30, WCX, Detroit, Mich.; 7:35, CFCA, Toronto, Can.; 7:40, WOR, Newark, N. J.; 7:55, WOS, Jefferson City, Mo.; 8:10, WLAG, Minneapolis, Minn.; 8:15, KDKA, East Pittsburg, Pa.; 8:20, WBAP, Fort Worth, Texas; 8:25, WHAZ, Troy, N. Y.; 8:30, KSD, St. Louis, Mo.; 8:35, WOC, Davenport, Iowa; 8:40, WOAI, San Antonio, Texas; 8:45, WMC, Memphis, Tenn.; 8:55, WOO, Philadelphia, Pa.; 9, WOAW, Omaha, Neb.; 9:15, WCBD, Zion, Ill.; 9:30, WTAS, Elgin, Ill.; 9:35, KFKX, Hastings, Neb.; WLW, Cincinnati, Ohio; 9:50, WGR, Buffalo, N. Y.; 10, WBAH, Minneapolis, Minn.; 10:30, WSB, Atlanta, Ga.; 11, KGW, Portland, Ore.; 1130, KHJ, Los Angeles, Cal.; 11:40, KFI, Los Angeles, Cal.; 12, WDAF, Kansas City, Mo.; 12:15 and signing off at 12:30 a. m., with KYW, Chicago, the World Crier. This is a list of thirty-three stations listened to in a total of six hours and twenty minutes, which, to my way of thinking, is not bad for amateur tuning.—LESLIE W. OTTO, 7231 South Park Avenue.

112 STATIONS.

RADIO EDITOR—I have been reading your magazine and the records of the phans every week. I have only had my set two and one-half months, but I have brought in 112 stations, including stations in Canada and Cuba. On Jan. 28 I picked up the following stations: WGY, market reports; KOP, missing autos; WIAO, "Dream Daddy"; KDKA, organ selections from New theater; WOR, "Song of India"; WGR, signing off 11:28, "Papa Loves Mama"; WCAE, music from William Penn hotel; WDAF, market reports; WCX, musical program; WLAG, special program, wheat agriculture; WBAP, "Dream Daddy"; WCBD, cornet duet; WHAZ, "Roamin' in the Gloamin'"; WOS, Jefferson City prison band; WOC, "Ave Maria"; WWJ, "Blue Danube Waltz"; WHN, "There Is Nobody Else But You"; WTAS, "Does the Spearment Lose Its Flavor on the Bedpost at Night"; WMC, "Song of Love"; WLW, "Fable of Ant and Grasshopper"; KFI, "Runnin' Wild," "Last Night on the Back Porch," "Whispering"; WBAH, not distinct; WOAH, mandolin solo; KFKX, "The Heavenly Song"; WSB, "Somebody Stole My Gal." All these stations came in on the horn except WBAH. We are using a Garod Piaf receiver.—AL SOLOMON, 4746 Engleside Avenue.

ONE-TUBE REINARTZ GETS TO COAST.

RADIO EDITOR—How's this for a long-distance record? I received the following stations Saturday, Feb. 2: WOC, Davenport, Iowa; KYW, Chicago, Ill.; WDAP, Chicago, Ill.; WAAF, Chicago, Ill.; KDKA, East Pittsburg, Pa.; KOP, Detroit, Mich.; WTAM, Cleveland, Ohio; WHAS, Louisville, Ky.; WMAQ, Chicago, Ill.; 9ARF-9BPA, Chicago, Ill.; WCAP, Canton, N. Y.; WSAI, Cincinnati, Ohio; WNAC, Boston, Mass.; WTAS, Elgin, Ill.; WGY, Schnectady, N. Y.; WOQ, Kansas City, Mo.; WOAW, Omaha, Neb.; KSD, St. Louis, Mo.; WLAG, Minneapolis, Minn.; WMC, Memphis, Tenn.; WFAA, Dallas, Texas.; WABT, Washington, Pa.; KFKX, Hastings, Neb.; WDAF, Kansas City, Mo.; WJAZ, Chicago, Ill.; WABP, Dover, Ohio; KFNG, Coldwater, Miss; KFLZ, Atlantic, Iowa; 9MCT-KGO, Oakland, Cal. This is a record, as I have a one-tube Reinartz Circuit homemade.—RICHARD M. WEINBERGER, 5329 Calumet Avenue.

SUBMITTED TO THE PHANS.

RADIO EDITOR: I wonder if you can shed any light on a present problem in this city? Station KYW, I believe, is the finest one in this city, and as I understand it, they have an antenna output of 500 watts. Their tuning is fine; out-of-town stations come in clear and loud without interference due to this.

But, now somewhere else in Chicago are two more fine stations who do their prowling at a little later hour. They prowl all over, too, anywhere on the dials, and their output is the same as KYW, 500 watts.

Now, why it is that one station can be tuned fine to their wave length, while two others of the approximate same power are on many wave lengths? Does the one station have such experts in the engineering department or better equipment, or has the latter two such poor help?

I'm sure my set works, because while KYW was on the last few weeks, I've had WTAS, WTAM, WWJ, WOS, WDAF, WEAF thru on one night.

Now, I'm not saying I don't break thru one of these other stations. I do on one. While the one that broadcasts on 300 meters was on I often get KSD on 546 meters or WOAW on 526 meters, but look at the distances apart—over 226 meters!

While if both of these Chicago stations are on, one on 300 and the other on 448, well, you are all cooped up in Chicago, unless WTAS, the life-saver, Elgin, is on. Now, who can explain the reason? Any phans? I can't. Send me that petition spoken of in H. A. Wendell's letter, printed on page 13 of The Post Thursday, Jan. 10.—WARREN G. HENRY, 535 North Leamington, Chicago.

EQUAL TO TWO TUBE SET.

RADIO EDITOR: Decided to try out the Superduc and hooked up a temporary set. I received the following stations in less than a week, most of them coming in as clear as Zion and Elgin did on my old set: KDKA, East Pittsburg, Pa.; WABA, Lake Forest, Ill.; WBAP, Fort Worth, Texas; WCAE, Pittsburg, Pa.; WCAY, Milwaukee, Wis.; WCBD, Zion, Ill.; WEAF, New York City; WCX, Detroit, Mich.; WDAF, Kansas City, Mo.; WFAA, Dallas, Texas; WHAS, Louisville, Ky.; WHB, Kansas City, Mo.; WJAS, Pittsburg, Pa.; WJAX, Cleveland, Ohio; WLW, Cincinnati, Ohio; WMC, Memphis, Tenn.; WOC, Davenport, Iowa; WOS, Jefferson City, Mo.; WRC, Washington, D. C.; WSB, Atlanta, Ga.; WTAM, WTAS, Elgin, Ill.; WTAY, Oak Park, Ill.

These were received on only one tube. Chicago station came in louder on two tubes than on three with my old set. I had no difficulty in distinguishing music and announcements. I now have the set hooked up permanently and wouldn't change it for a four-tube outfit.—BERNARD A. ROLOFF, 100 South East avenue, Oak Park.

BULLY FOR YOU, ROBERT!

RADIO EDITOR: I have an Armstrong regenerative set, employing a WD-11 tube. I built this set myself. Since building it I have received thirty-four stations. They are: WCAP, Washington; CHCS, London, Ontario, Canada; WCAL, Northfield, Minn.; WWJ, Detroit; WHAZ, Troy, N. Y.; WHAS, Louisville WOR, Newark; WSAI, Cincinnati; WJAX, Cleveland; WEAF, New York; WOC, Davenport; WFAA, Dallas; WBZ, Springfield, Mass.; WMAJ, Kansas City; WHB and WDAF, Kansas City; WCBD, Zion City; WTAS, Elgin; WGR, Buffalo; WTAM, Cleveland; WGY, Schenectady; WCAE and KDKA, Pittsburg; WOS, Jefferson City; WLW, Cincinnati; KSD and WCK, St. Louis; KYW, WDAP, WMAQ, WPAD, WJAZ, WAAF, WSAH, Chicago. I am 14 years of age.—ROBERT E. LEE, 6108 Ellis Avenue.

$3.95 SET BRINGS 'EM IN.

RADIO EDITOR: I read that you wanted more "DX" records. Well, here's mine:

WCBD, Zion, Ill.
WTAS, Elgin, Ill.
WOC, Davenport, Iowa.
WOS, Jefferson City, Mo.
WTAM, Cleveland, Ohio.
KDKA, East Pittsburg, Pa.
WOAW, Omaha, Neb.
KFKX, Hastings, Neb.
WGY, Schenectady, N. Y.
WHAZ, Troy, N. Y.
WJAZ, WMAQ, KYW, WOAP, WAAF, WPAD, WBU in Chicago.

These stations were heard on a crystal set that cost $3.95 and a wooden variometer put in the aerial lead-in.

I am planning on making a "superduc," and am hoping for good rsults.

Your magazine is certainly a good one, and I have read every one. Sincerely yours.—VERNON WARD, 1044 Jackson Avenue, Evanston, Ill.

Letter Box

"STOP KICKING AND TUNE."

RADIO EDITOR: The writer has in the last few weeks noted in your weekly radio section letters from broadcast listeners complaining very vigorously against certain local broadcasting stations in regard to their interference, harmonics, etc. This is very amusing, but none the less annoying to one who is situated in a similar, and in some cases, even worse location with respect to interference, than these writers. I happen to be located within two and a half blocks of WJAZ, which, according to the abovementioned letters, is the most pernicious station causing disturbance.

While it is certainly not a wonderfully simple matter to eliminate any sound from this most powerful station, it can be done, and that consistently, and other broadcasting stations on a reasonably different wavelength and at a considerable distance from Chicago tuned in at the writer's residence. It can be readily seen that the writers of these derogatory statements are either the possessors of unselective receiving sets or unfamiliar with their operation, for it should not be hard to tune in such stations as Kansas City, Omaha, St. Louis and other representative broadcasting stations, even when a large and efficient antenna is in use. We hear many complaints such as one published several weeks ago when the writer said: "They tell us to shorten our aerial, but even with the aerial entirely disconnected from the set, he can be heard all over the scale—what to do?" Such statements are entirely ridiculous if the owner has an even moderately selective receiving set for any of half a dozen on the market may be taken directly under the antenna of the most powerful station, with no receiving aerial connected to the set, and utter silence experienced on slightly different waves. Witness the rebroadcasting of the opera, sent from KYW and picked up on a standard receiving set, connected to a receiving antenna directly from the studio of WJAZ some weeks ago. If this can be done within a few hundred feet of a station, why should a man several blocks away complain of interference?

Some people do not seem to recognize that broadcasting is national—not local—and that thousands of letters are no doubt received by Chicago stations telling them how their programs were enjoyed and at the same time damning their local stations for interfering with their reception of Chicago.

The second question of interference—that of harmonics—is no doubt justified. Almost all broadcasting stations, unless special precautions are taken, radiate on wave-lengths which are one-half, one-third, one-fourth, etc., of their real wave, sometimes with such persistence that reception over distances of a thousand miles or more may be effected on these multiple frequencies when, due to interference, their real wave cannot be heard. This is a matter for our broadcasting station engineers to take up since it is theoretically possible to radiate on one wave without impairing the efficiency of the station and a vastly more pleased local audience among both broadcast listeners and amateurs would result.

I sincerely hope you may be able to publish this communication alongside of some complaint you have received recently along this line, in order to show to the general body of listeners both sides of the question.—FRED MARCO.

HEARS MUSIC WITH TUBE OUT.

RADIO EDITOR—I had a peculiar experience last night when a neighbor lad for whom I built a one-tube Ultra-Audion set, came over and said that he was getting music without the tube in his set. I, of course, at first thought that he was imagining the fact, so the next time he heard it he called me over and I was surprised to hear WMAQ, but it was faintly, and I came to this conclusion, that inasmuch as his lead-in was only two feet from mine he was getting the music from another Ultra-Audion set which I was testing for another boy. But what gets me still is the fact that it worked without a tube, as the tube is the detector.—GEORGE HOPPE.

"FALLS" FOR DX CRYSTAL.

RADIO EDITOR—Further report on your L D Crystal: Tuesday evening, Jan. 29, KYW and WMAQ both on, was able to tune one from the other without trouble, KYW and WMAQ both on loud speakers. Had to stand within two to three feet to receive perfectly, but could be heard all over a 12 by 20 foot room. Could easily distinguish between speaking, singing or music anywhere in the room. With both phones and loud speaker attached to set, one did not reduce the volume from the other.

WDAP came in stronger than Monday; will still call that fair. WJAZ came in good; no trouble to tune one from the other, but could not get WDAP or WJAZ on loud speaker on account of not being the same volume as from KYW and WMAQ.

An amateur out this way, who is a pest, blowing everything off the air, came on, and I could not tune him out at all until I shunted a tuning coil (10 taps—from 1 turn to 10) across the aerial. (This coil has a .000025 fixed condenser). This got him partly off. I will have to find something better to do the work.

I will say this, even tho I never get out-of-town on this set, that I am more than satisfied with it for local reception. I like the crystal, have stuck to it and will continue, even in the face of all the ridicule from my friends, and being called a piker.—F. H. MacDONALD.

"BROADMINDED."

RADIO EDITOR—Your Radio Magazine is wonderful and I can hardly wait for it each week.

But it seems a shame we have these knockers that are always complaining of some station bothering their evening's entertainment. We have a great many of the same kind of chronic kickers always complaining about America, when America, like the broadcasting stations, is giving them something for nothing, that they never had before. Anybody can be a knocker, but it takes a man to be a real cheerful booster. I have a real radio set and I assure you that I can cut out any Chicago station I care to and bring in distant stations any night in the week. There are times when I do not like certain programs, but I happen to be broadminded enough to realize I'm not the only one to please. My slogan is quit singing the blues and send in more applause cards.—CARL BUEK, 6443 Dante Avenue.

NOTES ON UV-199 TUBES.

RADIO EDITOR: Looking over my radio notes and drawings I came across this article, which I thought you might be interested in. It is about the UV-199 tube used as an amplifier and detector. The article is as follows:

"The UV-199 tube should be mounted in a vertical position. Not more than 40 volts "B" battery should be used when the tube acts as a detector. Critical adjustment of the plate voltage is not required. When used as an amplifier it is important that the filament rheostat be connected in the negative filament lead and that the return lead from the grid circuit be connected to the negative side of the "A" battery and not to the negative side of the filament. A plate voltage from 40 to 80 volts can be used when the UV-119 serves as an amplifier.

The base of this tube is of the same general design as the standard four-prong base. It is of a smaller diameter and an adapter has been developed so it will fit all standard sockets.

In case of portable sets using three flashlight cells it is recommended that one set of three flashlight batteries be used for each tube in the set. It is immaterial whether it is wired separately to one of the batteries or whether they are placed in parallel, provided that a separate rheostat control is made for each tube. If separate rheostat control is not made for each tube and only one common rheostat is used, the batteries should be connected parallel. If a six-volt battery is used to light the filament the resistence should be 60 ohms."—EDWARD TOMASEK, 175 West Jackson Boulevard.

WHO WILL VOLUNTEER?

RADIO EDITOR: Is it not possible to have some broadcasting station or amateur transmit code slowly at some convenient hour in the evening—say, from 7:30 to 8 p. m.?—so that some of us B. C. L's can pick it up?

I think that from 200 to 250 meters would be quite suitable, as most, if not all, sets can tune that low.

If somebody connected with The Post has a transmitting set, why not go to it?

The message sent on the previous night could be published in The Post next day. This is merely a suggestion—J. ANDERSON.

(EDITOR'S NOTE—Your suggestion is a good one. Unfortunately, no one connected with The Post staff is qualified to transmit code. Perhaps some of the amateur clubs will volunteer. The Post will be glad to assist by publishing the lessons each day. If the broadcast listeners only would learn the code it would make a much better feeling between them and amateurs. Like Mr. Duffield (9ECB) says elsewhere in this department, much of the so-called amateur interference is from ships at sea and coast stations transmitting on the broadcasting bands.

The Chicago Evening Post Radio Magazine

RADIO EXCHANGE

5ca Word

Radio Classified Advertisements will be inserted in this section at 5c per word per insertion. Minimum 10 words. Two initials count as one word. No display type, cuts or borders allowed.

If box number is desired, allow four extra words. Box answers will be mailed to advertisers free of charge Address The Chicago Evening Post, Radio Department, 12 South Market-st

SETS FOR SALE.

BASS RECOMMENDS, GUARANTEES AND INSTALLS the latest five-tube Radiodyne Atwater-Kent Number 10, the EQUAL of any, the PEER of most; selectivity the highest; Chicago installations made in one hour from receipt of order.
BASS CAMERA COMPANY,
Graflex Headquarters of America,
109 N. Dearborn-st. State 7410

SUPER-SENSITIVE CRYSTAL SETS—Will pick up broadcasts up to 15 miles without aerial; with aerial and ground, longer distances; no tubes or batteries to bother with; guaranteed; $15 complete. ANDREW DEVORE, 637 Cass-st., Chicago. Phone Superior 7223.

3-TUBE, 3-CIRCUIT REGENERATIVE—Complete; 1-tube Reflex, suitable for loud speaker; 4-tube set, all perfect and guaranteed; very reasonable. CHARLES SCHNEIDER, 1811 Sedgwick, 2d floor (front).

PARAGON SUPER ARMSTRONG Regenerative 3-Tube Set—Cost $140; B batteries and tubes, all for $75; will demonstrate. F. GUIBARD, 5731 Aberdeen-st. Englewood 1024.

3 DE FOREST HONEYCOMB COIL RECEIVER—Detector and 2-stage; well built; 1,000 miles guaranteed; first $40 gets it. WEISS TAILORING CO., 17 South Clark.

5-TUBE NEUTRODYNE—Including tubes, batteries, speaker, aerial; ready to listen in; best parts used. CAVERLEY, 4742 Winthrop-av. Sunnyside 5992.

3-TUBE ARMSTRONG RECEIVER—Batteries, phones and loud speaker horn, $40. Rogers Park 4788. Call evenings.

3-TUBE RADIO SET—COMPLETE; $50; without accessories. $30. F. FAIRFIELD, 1205 W. Garfield-blvd.

GREBE C. R. 8 and 2-Step Amplifier—Very reasonable. GREENBAUM, 5036 Michigan-blvd. Kenwood 1615; evenings.

WESTINGHOUSE R. C. RADIO—3-TUBE, complete with loud speaker. 3817 S. Albany-av., 1st Ph. Laf. 7076.

ZENITH RECEIVER—Same MacMILLAN uses, $100. BEVERLY DUDLEY, 4909 Fletcher-st., Chicago.

DE FOREST INSIDE LOOP—Bargain; complete with tubes. Call Main 0774 before 5 o'clock.

SETS FOR SALE.

NEUTRODYNE RECEIVER—New, for $75, or complete with tubes, batteries, phones and loud speaker unit for $125; only best parts and equipment used; also make sets to order at low cost; for this bargain phone or call SCHMALZIGAN, 218 E. Garfield-blvd., Kenwood 1317.

REINARTZ RECEIVER—With 2 steps of audio; 3-honeycomb ARMSTRONG, with 3 steps; 2-variometer coupler ARMSTRONG with 2 steps; all in A-1 shape and distance-getters. Call Sunnyside 7132.

3-TUBE ERLA—With power amplifier; in cabinet; complete; coast to coast on loud speaker. JOHN JEPSON, Calumet 3538, 2031 Prairie-av. (rear).

6-TUBE NEUTRODYNE—Complete with loud speaker, batteries; coast to coast; sacrifice $135. 8234 Dorchester-av. Saginaw 2049.

4-TUBE ATWATER-KENT—With 100 ampere A battery, B batteries, Baldwin unit; complete, $90. Graceland 4179; evenings after 6.

FOR SALE—3-TUBE regenerative set; tubes and Atlas speaker batteries, $75. Wabash 6390.

PARTS FOR SALE.

FOR SALE—RADIO PARTS amounting to $25 sold reasonable; parts have never been used. Phone Wellington 3065, or call at 3430 N. Irving-av., 2d flat; evenings.

SETS MADE TO ORDER.

SETS MADE TO ORDER—Installed reasonably; trouble finders; call FRANK UNIDIL, Roosevelt 8045, 5:30-6:30 p. m.

RADIO SETS MADE and Adjusted—Evenings after 5 p. m. Tel. (RILEY) Ravenswood 6404.

SETS BUILT.

HERALD-EXAMINER SETS BUILT; REASONABLE. Call Graceland 5056. "WILLARD SERVICE."

AERIALS.

FIRST-CLASS AERIALS—Constructed reasonably. MR. SCHULZ. Hyde Park 0072.

SALES AND SERVICE.

NEUTRODYNE SETS
constructed, repaired—neutralized; expert in charge. 702 E. 63d-st., Suite 9. Phone Hyde Park 6416, Sundays after 1 p. m.

SEE OUR RADIO TABLES—PRACTICAL for every receiving set; write for circular or call. G. H. OTTO, 120 W. Lake-st., 2d floor.

BARGAINS IN RADIO SETS, PARTS AND CABINETS — Rewiring and repairing. SMITH, 3968 Drexel-blvd.

AERIAL WIRE.

COPPER RIBBON AERIAL—50 feet, $1.25; 100 feet, $2.25; ½-inch wide, .010 thick. STRAND LABORATORIES, 1512 N. Leamington-av. Tel. Mansfield 1067; write or phone.

BUILDING AND REPAIRS.

RADIO SETS MADE, repaired, rewired or rebuilt; all work guaranteed; moderate charges. WOODLAWN RADIO CO. Call Midway 4257 after 3 p. m.

EXCHANGE.

WILL EXCHANGE STANDARD RADIO parts, sets or service for drill press, workbench, ¼ horse-power motor, or what have you. Nevada 3146, evenings.

WILL EXCHANGE fine camera, 7-inch Verito lens, complete enlarging outfit, for radio. D-161 Chicago Evening Post.

SETS OR PARTS WANTED.

I WILL BUY ASSEMBLED ERLA TRIPLEX or other good set or complete parts—storage battery, etc., for $10 down and $10 each month. Buckingham 5573.

REPAIRS.

RADIO SETS REPAIRED—Rewired or rebuilt; satisfaction guaranteed; charges reasonable. SIDNEY H. STONE, 5233 Glenwood-av. Edgewater 0805.

POST CLASSIFIED RADIO ADS BRING RESULTS

Radio Is a Major Factor in the World March of Events

(From Chicago Evening Post)
November 28, 1923.

RADIO MAKING A NEW WORLD

The extraordinary response which a discerning public has made to THE POST'S Radio Magazine is not only a gratifying evidence of appreciation for newspaper enterprise, it is a remarkable demonstration of the grip which aerial communication has taken upon the popular interest.

No invention of modern times has brought to the great mass of the people the many-sided opportunities presented by radio. It is a unique development destined to contribute vastly more to the thought and progress of our age than is superficially obvious.

The delights of listening-in would be alone sufficient to justify it as a diversion. It would be a hopelessly dull imagination which could not find thrill in the possibility of establishing within the seclusion of a home an instrument, occupying less room than a sewing machine, which literally brings the world about one's ears. The man with books upon his shelves keeps touch with the living past; the man with a radio receiving set is in touch with the throbbing present. For him there is no distance. New York is as near as the loop; San Francisco as close as Edgewater Beach. He can hear the calls of ships all the way from the Mediterranean to the Caribbean. The lecture in Boston, the concert in Atlanta, the recital in Los Angeles are within his audience for the mere turning of a milled head on a dial. If business, rather than entertainment or instruction, be his momentary interest, the trade of all the great marts can be brought within his hearing as readily. The pulse of the fleeting hour, whether it beats to the clamor of the traffickers on the floor of the exchange, or to the tempo of the conductor's baton in symphony and opera, can be felt by the man who sits in the stillness of his room, be it on the Lake Shore drive, on South Halsted street or in Ten Sleep, Wyo. Radio has put an end to isolation.

Telegraph, telephone, phonograph, automobile and aeroplane—all these marvelously extended human possibilities; but what barriers still remained radio has broken down. Nothing has brought within the reach of so many so varied and far-sweeping a realm for adventure as opens to the magic of wireless.

Radio is thoroly democratic. It has joys for mass and class, for the youngster and the oldster, for the serious mind and the lover of frivolity. The ether is neither critical nor selective. It will carry jazz as readily as Brahms, or the open and close quotations as tolerantly as a lecture on art. You can go to the opera or to church; you can listen to Dr. Shannon or Voliva.

But a unique wonder of radio, as we see it, lies in the fact that the public has been in on its development as on the development of no other great invention. What discovery of the past has invited so curious and experimental an interest as this on the part of the multitude? The telegraph has remained in the hands of specialists; the telephone belongs to the public utility; the phonograph is sold to us ready built in its mahogany cabinet; the automobile and aeroplane are the products of great factories, but every man can be his own discoverer, inventor, artificer in radio. There is no end to the possible hook-ups, to the combinations of condensers, fixed and variable, variometers, variocouplers, crystals, tubes and all the rest of the marvels which make a radio shop window the most fascinating display in the world. Here is the real fun and one of the great values of radio. Who can say what may be the impetus forward which will come from the countless thousands of boys thruout America who are studying the theory of etheric communication and working it out, by trial and error, on their reception sets? They may add no new thing to radio, but they will add much to their own capacity for constructive thought—for thought in the terms and in the sphere of that new world which science is unfolding to our amazed understanding.

THE POST believes that in encouraging the active, curious, experimental interest in radio it is doing more than appealing to whim or fad; it believes it is stimulating those brain cells which more and more must be the world's dependence for the solving of many of its problems. The political mind needs the aid of the scientific mind. Democracy did much to develop the former; radio is doing more, perhaps, to develop the latter.

Without Radio, today, you are practically shut in from the world. Your home is in darkness. Contemporary history is broadcast over your head and leaves you behind.

With Radio you keep step with the day—you remain in the present, instead of slipping into the misty past. You stay in the race.

Resting in your easy chair, in the evening, after the usual day's grind, you can reach out to all sections of the country—near or far—and be entertained, advised of facts, informed in news.

All you need is a good Radio receiving set—and The Post.

The Chicago Evening Post Has Taken the Lead in Radio

Your Radio Magazine is very good. Keep it up.
CARL GREDIN, JR.,
2214 Ainslie Street, Chicago.

I like your Magazine, in fact, haven't enjoyed anything like it quite so much since the days when I used to revel in Dan Beard's American Boys Handy Book. Please continue to be specific, as many of us appreciate detail and like to know the exact number of turns in a coil and the position of every part.
FRANK F. SIPP,
3656 Pine Grove Ave., Chicago.

You most assuredly are entitled to congratulations on your Radio Section. I doubt very much that any newspaper can boast of a more interesting section. Coupled with the fact that I have been a reader of The Post for a good many years, I now enjoy it all the more.
FRED A TODD,
820 Oakwood Blvd., Chicago.

I get many helps from your Section.
J. CURTISS STOCK,
606 Oneida Street, Joliet, Ill.

Just a few words of praise for the Radio Magazine. I look forward to every Thursday and believe the Radio Magazine is equal to any magazine worth ten times the price.
EDWARD A. STONER,
527 N. Spalding Ave., Chicago.

I have just seen a copy of your wonderful Radio Magazine, and would be pleased to have you send me a subscription blank for your valued paper.
MENDELL SCHNEIDER,
112 Weld Street, Rochester, N. Y.

Picked up a copy of your Radio Magazine, December 8th, on train and am very well pleased with same, and expect to be a regular reader of your paper in the future.
JOHN I. RAPP,
303 Weston Ave., Valparaiso, Ind.

I have built your wave trap—in your issue of Nov. 28th—and must say it is a beauty. It shuts 'em dead as a doornail and is a whiz. May your Radio Section be as good a year from now as it is at present.
FRED HOUGHTBY,
654 Roscoe, Chicago.

I have not seen a Radio Magazine that could compare with yours. Keep it up.
CHARLES F. KROULIK,
2714 S. Kedvale Ave., Chicago.

I wish to tell you how much I appreciate your Radio Department. It is very complete and rounds out your splendid paper.
ROSCOE L. STOUT,
7423 Coles Ave., Chicago.

I have enjoyed the Post Magazine very much, and I find it very good and interesting. Wishing you success with the magazine.
F. H. HILL,
944-954 Washington Blvd., Chicago.

Several of your Radio Magazine Supplements have been forwarded to us and I wish to take this opportunity to express my thorough satisfaction with this Section. Please accept my congratulations upon bringing out such a good publication. It is my opinion that this is one of the best current magazines dealing with the subject that is now published. Many of my friends to whom I have shown it have the same opinion as I. In order to keep my file up to date, would kindly request that you forward me the issue of Nov. 22, as I am short this one. Enclosed find stamps to cover mailing.
A. B. WILLIAMS, Research Engineer,
Board of Education, Cleveland, Ohio.

Your Radio Magazine is GREAT. Keep it up.
ANTHONY SIRUS,
3830 Parnell Ave., Chicago.

I wish to congratulate you on your Radio Magazine. It sure is a dandy and worth more than the weekly magazine selling at 10c.
J. W. BEAZEKAMP,
2139 Armitage Ave., Chicago.

You sure have THE Radio Magazine of Chicago.
JOHN A. MONTGOMERY,
5255 N. Bernard St., Chicago.

I want to congratulate you on your wonderful Radio Section every evening, and especially the one on Thursday.
DAVID COUSTAN,
9437 Champlain Ave., Chicago.

Assuring you that I enjoy the Radio Department of The Post.
LYLE D. HAZEL,
Coal City, Illinois.

I think your Radio Magazine fills a want for an intelligent, reliable source of information.
E. B. NELSON,
372 Herrick Road, Riverside, Ill.

I'll say you've got some Radio Section in your paper, and appreciate it very much.
PHILIP BERTEMES, JR.,
10744 Drew St., Chicago.

We appreciate the up-to-date Radio Magazine that The Chicago Evening Post is now conducting.
JOHN S. REID, JR.,
7441 Yates Ave., Chicago.

Your Radio Section is great, especially the Thursday issue. I do not seek information at this time, but just a word of praise for your splendid magazine. I enclose a few stamps and wish you would kindly send a copy of next Thursday's magazine as a sample to the two following named parties who, after reading your paper, will undoubtedly subscribe.
H. R. ARNOLD,
4608 Malden St., Chicago.

By luck I got one of The Chicago Evening Post Radio Magazines and I think it is as good as I have seen yet. Inclosed you will find postage. Please send me editions of November 15th, 22d, 28th, as I am a Radiophan and would like to see the same. Also let me know the subscription fee of same yearly, and oblige.
SAMUEL FERGUSON,
2216 Bedford Ave., Pittsburgh, Pa.

Your paper surely is the berries. Your Thursday issue saves me from buying two papers.
JAMES INGHAM,
2423 Irving Park Blvd., Chicago.

I have been a reader of The Chicago Evening Post for some time. Before you started to publish the Radio Magazine I had to buy another to get good reading of Radio, but since you publish the magazine I only have to get one paper, and that is The Post.
CHARLES GILLMAN,
515 Denvir Ave., Chicago.

Just to let you know that the wave trap printed in your Radio Section is a "Bear." I am referring to the trap with 43 plate condenser and two coils. Your Radio Section sure is some help to the Radiophan.
HOWARD W. LEARN,
2126 Giddings St., Chicago.

Read THE POST Every Night for RADIO News

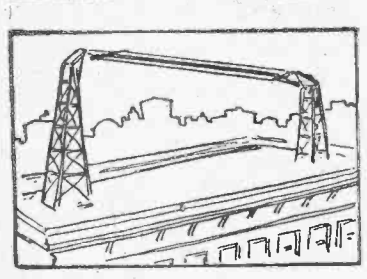
Real news and plenty of it—more than you will find in any other Chicago newspaper—all up-to-the-minute, correct, dependable. Of course, you never want to forget the big magazine on Thursday—there's nothing better anywhere in this country. If you have a Radio friend tell him about this big 16-page magazine—he will thank you because he never will miss a copy of it after he sees how valuable it is to him in information that he would not be without at any price. If your Radio friends and relatives reside in the country, or in some distant city, send them a copy of the magazine and call their attention to the yearly subscription price—or, send us their name and address and we will mail them a sample copy FREE. Think of it—52 issues of The Post with the RADIO MAGAZINE by mail, every Thursday, for only $1.35!

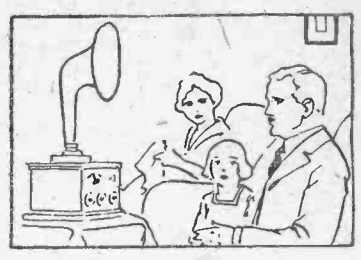
The Chicago Evening Post with the RADIO MAGAZINE Every Thursday for a year

BY MAIL—FOR ONLY $1.35

THE CHICAGO EVENING POST

RADIO MAGAZINE





Published Every Thursday

THURSDAY, FEBRUARY 14, 1924.

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The Chicago Evening Post

BROADCASTING

HOME RADIO

RADIO SETS

HOOK-UPS

AMATEUR RECEPTION

HOME-WORKSHOP

RADIO SCIENCE-

RADIO PROGRAMS

LOCAL NEWS

U.S. RADIO NEWS

HOME LABORATORY

AMATEUR TRANSMISSION

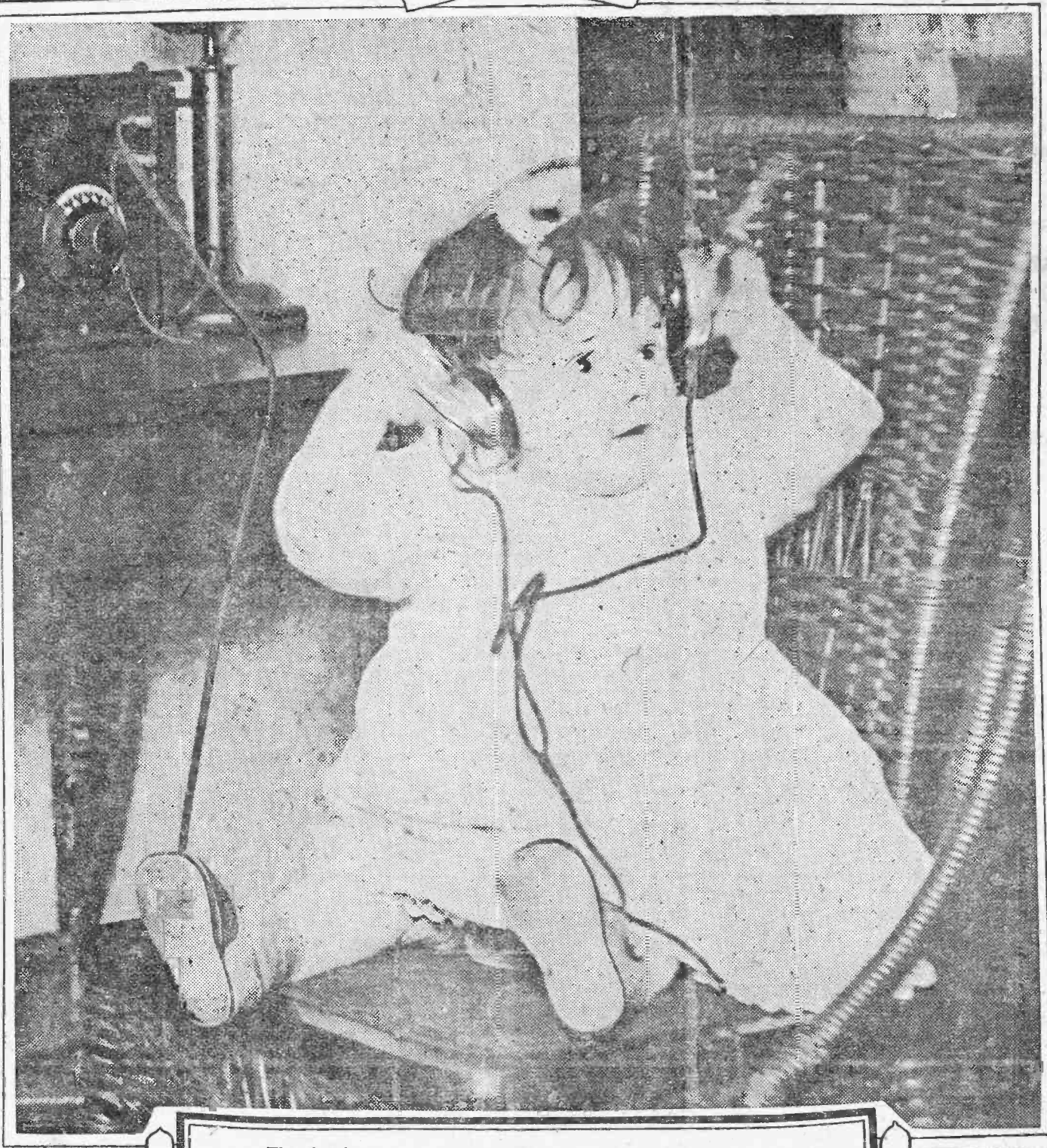
RADIO STATIONS

INVENTIONS

D.X. RECORDS

RADIO PRACTICE-

COMMERCIAL



The Sandman soon will get Mary Elizabeth, but before she is tucked into her crib she must hear the bedtime story and listen to "Dream Daddy." This photograph of Mary Elizabeth was furnished to the Radio Magazine by D. O. Smith, 750 Pierce street, Gary, Ind.

FOREIGN RADIO NEWS

MANUFACTURERS NEWS

NEW EQUIPMENT

DEALERS NEWS

JOBBER NEWS

IN THIS ISSUE

Hagerman Describes Five-Tube Radio Frequency Receiving Set—Freund Gives Data on Use of Two Honeycomb Coils with Ultra-Audion Set—Oak Park's New Broadcasting Station Described in Pictures and Story—Radio Work of Chicago Boys' Club Detailed.

Broadcasting Stations and Schedules

Central, or Chicago time, is shown on all stations. If necessary to ascertain local time on any station deduct two hours from time shown for Pacific coast stations, one hour from time shown for the Rocky mountain stations and add one hour to those stations using eastern time. Hawaiian island time is four hours and a half slower than Chicago time. In the list the call number of the station is first given, followed by the location, the owner's name, wave length used and broadcasting schedule in order named. THE POST is making a thoro canvass of all stations in order that this directory may be complete and accurate. Changes are so frequent in stations and schedules that no list can be satisfactory which is not corrected frequently. Corrections and additions to this list will be made from week to week. Stations are urged to co-operate by sending information of changes in schedule to Radio Editor, The Chicago Evening Post.

CFAC—Calgary Herald, Calgary, Canada; 430 meters; Fred Carleton, director and operator; silent Monday, Wednesday and Thursday; Tuesday, day, 1 to 1:30, night, 7:45 to 7:55; Friday, day, 1 to 1:30, night, 7:45 to 8:45 and 11 to 12.

CKAC—La Presse, Montreal, Canada; 430 meters; J. M. Carter, announcer and director; day, 4, music; 4:30, weather and stock reports; special Tuesday, Thursday and Saturday, night, 7, kiddies stories in French and English; 7:30 to 10 lectures in French and English, music; Sunday, day, 4, sacred music.

CKOC—Wentworth Radio Supply company, Hamilton, Ont.; 410 meters H. Slach, operator; silent nights, Tuesday, Thursday; Saturday, night, 7:30 to 9; special Sunday night church exercises, 7 to 8.

CJCA—Edmonton Journal, Edmonton, Alberta. 500 watts, 450 meters. Tuesday night silent.

CYL—Mexico City, D. F. "El Universal"; 500 meters; Reul Azcarraga, director; G. Obregon Jr., announcer (Spanish), Sendel Hodges, announcer (English); daily, 12:54 p. m., news and weather; 8:24 p. m., war bulletins from the war and navy departments; Tuesdays and Fridays, 8:24 to 8:54 p. m., music; Sunday, 7:24 p. m., war bulletins.

KDKA—East Pittsburg, Westinghouse Electric and Manufacturing company, 326 meters.

KDPM—Cleveland, Ohio, Westinghouse Electric and Manufacturing company, 270 meters.

KDPT—San Diego, Calif., Southern Electrical company, 244 meters.

KDYL—Salt Lake City, Utah, Telegram Publishing company, 244 meters.

KDYM—San Diego, Calif., Savoy theater, 280 meters.

KDYQ—Oregon Institute of Technology, Portland, Ore., 360 meters; program director, L. E. Simson.

KDYQ—Portland, Ore., Oregon Institute o. Technology, 360 meters.

KDYW—Phoenix, Ariz., Smith Hughes & Co., 360 meters.

KDYX—Honolulu, Hawaii, Star Bulletin, 360 meters.

KDZB—Bakersfield, Calif., 1402 20th street, Frank E. Seifert, 240 meters.

KDZE—Seattle, Wash., The Rhodes company, 455 meters.

KDZF—Los Angeles, Calif., Automobile Club of Southern California, 278 meters.

KDZI—Wenatchee, Wash., Electric Supply company, 360 meters.

KDZQ—Denver, Colo., Nichols Academy of Music, 360 meters.

KDZR—Bellingham Publishing company, Bellingham, Wash., 261 meters; 50 watts; operator and announcer, A. M. Brown; silent Thursday; night, 9 to 10, local talent, phonograph music.

KFAD—Phoenix, Ariz., McArthur Bros, Mercantile company, 360 meters.

KFAE—Pullman, Wash., State College of Washington, 360 meters; director, H. V. Carpenter; program manager, A. J. Kralowse; silent Tuesday, Thursday, Saturday, Sunday, night, 9:30 to 11; educational lectures.

KFAF—Western Radio corporation, Denver, Colo., 360 meters. Silent nights, Sunday and Wednesday. Nights, 9 to 10.

KFAJ—Boulder, Colo., University of Colorado, 360 meters.

KFAN—Moscow, Idaho, The Electric shop, 360 meters.

KFAR—Hollywood, Calif., Studio Lighting Service company (O. K. Olsen), 280 meters.

KFAU—Boise, Idaho, Independent School District of Boise City, Boise High school, 270 meters.

KFAV—Venice, Calif. Abbot Kinney company, 224 meters.

KFAW—Santa Ana Calif., The Radio Den (W. B. Ashford and H. T. White), 280 meters.

KFAY—Medford, Ore., Virgin's Radio service, 283 meters.

KFBB—Havre, Mont., F. A. Buttrey & Co., 360 meters.

KFBC—San Diego, Calif., W. K. Azbill, 278 meters.

KFBE—San Luis Obispo, Calif., Reuben H. Horn, 360 meters.

KFBG—Tacoma, Wash., First Presbyterian church, 360 meters.

KFBK—Sacramento, Calif., Kimball-Upson company, 283 meters.

KFBL—Everett, Wash., Leese Bros., 224 meters.

KFBS—Trinidad, Colo., Trinidad Gas and Electric Supply company and the Chronicle News, 360 meters.

KFBU—Laramie, Wyo., The Cathedral (Bishop N. S. Thomas), 283 meters.

KFCB—Phoenix, Ariz., Nielson Radio Supply company, 238 meters.

KFCD—Salem, Ore., Salem Electric company, 360 meters.

KFCF—Walla Walla, Wash., 707 Baker building, Frank A. Moore, 360 meters.

KFCH—Billings, Mont., Electric Service station (Inc.), 360 meters.

KFCK—Colorado Springs, Colo., Colorado Springs Radio company, 258 meters.

KFCL—San Antonio, Calif., Los Angeles Union Stock yards, 360 meters.

KFCM—Richmond, Calif., Richmond Radio shop (Frank T. Doeing), 360 meters.

KFCP—Ogden, Utah, 2421 Jefferson avenue, Ralph W. Flygare, 360 meters.

KFCY—Houston, Texas, Fred Mahaffey, Jr., 360 meters.

KFCY—Le Mars, Iowa, Western Union college, 252 meters.

KFCZ—Omaha, Neb., Omaha Central High school, 258 meters.

KFDA—Baker, Ore., Adler's Music store, 360 meters.

KFDD—Boise, Idaho, St. Michael's cathedral, 252 meters.

KFDH—Tuscon, Ariz., University of Arizona, 360 meters.

KFDJ—Corvallis, Ore., Oregon Agricultural college, 360 meters.

KFDL—Denver, Colo., Knight-Campbell Music company, 360 meters, 50 watts.

KFDO—Bozeman, Mont., 420 West Koch street, H. Everett Cutting, 248 meters.

KFDP—Des Moines, Iowa, Hawkeye Radio and Supply company, 278 meters.

KFDR—York, Neb., Bullock's Hardware and Sporting Goods (Robert G. Bullock), 360 meters.

KFDU—Lincoln, Neb., Nebraska Radio Electric company, 240 meters.

KFDV—Fayetteville, Ark., Gilbrech & Stinson, 360 meters.

KFDX—Shreveport, La., First Baptist church, 360 meters.

KFDY—Brookings, S. D., South Dakota State College of Agriculture and Mechanic Arts, 360 meters.

KFDZ—Minneapolis, Minn., 2510 South Thomas avenue, Harry O. Iverson, 231 meters.

KFEC—Portland, Ore., Meier & Frank company, 360 meters.

KFEJ—Tacoma, Wash., 1724 South Jay street, Guy Greason, 360 meters.

KFEL—Denver, Colo., Winner Radio corporation, 360 meters.

KFEQ—Oak, Neb., J. L. Scroggin, 360 meters.

KFER—Fort Dodge, Iowa, Auto Electric Service company, 231 meters.

KFEV—Casper, Wyo., Radio Electric Shop, 263 meters.

KFEX—Minneapolis, Minn., Augsburg Seminary, 261 meters.

KFEY—Kellogg, Idaho, Bunker Hill and Sullivan Mining and Concentrating company, 360 meters.

KFEZ—St. Louis, Mo., American Society of Mechanical Engineers (F. H. Schubert), 360 meters.

KFFB—Boise, Idaho, Jenkins Furniture company, 240 meters.

KFFE—Pendleton, Ore., Eastern Oregon Radio company, 360 meters.

KFFO—Hillsboro, Ore., Dr. E. S. Smith, 229 meters.

KFFP—Moberly, Mo., First Baptist church, 275 meters.

KFFQ—Colorado Springs, Colo., Marksheffel Motor company, 360 meters.

KFFR—Sparks, Nev., Nevada State Journal (Jim Kirk), 226 meters.

KFFV—Lamoni, Iowa, Graceland college, 360 meters.

KFFX—Omaha, Neb., McGraw company, 278 meters.

KFFY—Alexandria, La., Pincus & Murphy, 275 meters.

KFFZ—Dallas, Texas (portable), Al. G. Barnes Amusement company, 226 meters.

KFG—Baton Rouge, La., Louisiana State university, 254 meters.

KFGD—Chickasha, Okla., Chickasha Radio and Electric company, 248 meters.

KFGH—Standard University, Cal., Leland Stanford university, 360 meters.

KFGJ—St. Louis, Mo., Missouri National guard 138th infantry, 266 meters.

KFGL—Arlington, Ore., Arlington garage, 234 meters.

KFGP—Cheney, Kan., Cheney Radio company, 239 meters.

KFGQ—Boone, Iowa, Crary Hardware company, 226 meters.

KFGV—Utica, Neb., Heidbreder Radio Supply company, 224 meters.

KFGX—Orange, Texas, First Presbyterian church, 250 meters.

KFH—Berrien Springs, Mich., Emmanuel Missionary college, 268 meters.

KFHA—Gunnison, Colo., Colorado State Normal school, 252 meters.

KFHB—Hood River, Ore., Rialto theater (P. L. Beardwell), 280 meters.

KFHD—St. Joseph, Mo., Utz Electric Shop company, 226 meters.

KFJQ—Grand Forks, N. D., Electric Construction company (portable), 252 meters.

KFJR—Stevensville, Mont., Ashley C. Dixon and Son, 258 meters.

KFJV—Dexter, Iowa, Thomas H. Warren, 224 meters.

KFJW—Towanda, Kan., Le Grand Radio company, 22½ meters.

KFJX—Cedar Falls, Iowa, State Teachers' college, 229 meters.

KFJY—Fort Dodge, Iowa, Tunwall Radio company, 246 meters.

KFJZ—Fort Worth, Texas, Texas National Guard, 112th Cavalry, 254 meters.

KFKA—Greeley, Colo., Colorado State Teachers' college, 248 meters.

KFKB—Milford, Kan., Brinkley-Jones Hospital association, 286 meters.

KFKH—Lakeside, Colo., Denver Park and Amusement company, 248 meters.

KFKQ—Conway, Ark., Conway Radio laboratories, 224 meters.

KFKV—Butte, Mont., F. F. Gray, 283 meters.

KFKX—Hastings, Neb., Westinghouse Electric and Manufacturing company, 286 meters.

KFKZ—Colorado Springs, Colo., Nassour Bros. Radio company, 234 meters.

KFLA—Butte, Mont., Abner R. Wilson, 283 meters.

KFLB—Menominee, Mich., Signal Electric Manufacturing company, 248 meters.

KFLD—Franklinton, La., Paul E. Greenlaw, 234 meters.

KFLE—Denver, Colo., National Educational Service, 268 meters.

KFLH—Salt Lake City, Utah, Erickson Radio company, 261 meters.

KFLP—Cedar Rapids, Ohio, Everette M, Foster, 240 meters.

KFLQ—Little Rock, Ark., Bizzell Radio shop, 261 meters.

evenings, 9, news bulletins; 9:30, weather; 10, studio programs, lectures, entertainment.

KLZ—Denver, Colo., Reynolds Radio company, 360 meters.

KMJ—Fresno, Calif., San Joaquin Light and Power corporation, 273 meters, 50 watts; R. C. Denny, operator and director; Wayne Freund, announcer; Tuesday, Friday and Sunday night, 10 to 11.

KMO—Tacoma, Wash., Love Electric company, 360 meters.

KNJ—Roswell, New Mexico, Roswell Public Service company, 250 meters.

KNT—Aberdeen, Wash., Grays Harbor Radio company (Walter Heinrich), 263 meters.

KNV—Los Angeles, Cal., Radio Supply company, 360 meters.

KNX—Los Angeles, Cal., Electric Lighting Supply company, 360 meters.

KOB—State College, New Mexico, New Mexico College of Agriculture and Mechanic Arts, 360 meters. Daily, time signals, weather, news, crop reports; Monday, Wednesday, Friday night, 8:30 to 9:30, concerts.

KOP—Detroit Police department, Detroit, Mich., 286 meters; daily except Sunday; 1 p. m., to 6:30 p. m.

KPO—San Francisco, Cal., Hale Brothers 423 meters; silent Friday; Sunday night, 10:30 to 12, concert; Monday, 10 to 11, organ, 11 to 12, dance music; Tuesday, Wednesday, Thursday nights, 10 to 11, studio program, 11 to 12, dance music; Saturday night, 10 to 2 a. m., dance music.

KQP—Hood River, Ore., Apple City Radio club, 360 meters.

KQV—Pittsburg, Pa., Doubleday-Hill Electric company, 360 meters.

KQW—San Jose, Cal., Berkeley Daily Gazette, 278 meters.

WAAN—Columbia, Mo., University of Missouri, 254 meters.

WAAW—Omaha, Neb., Omaha Grain Exchange, 360 meters, 500 watts; Daily except Sunday, 9:45, 10:45, 11:45, 12:45, 1:15 and 8, world markets; final report Saturday at 12:45 p. m.

WAAZ—Emporia, Kan., Hollister-Miller Motor company, 360 meters.

WAAB—Harrisburg, Pa., Dr. John B. Lawrence, 266 meters.

WABA—Lake Forest college, 266 meters Wednesday evening, 8 to 9, talks and music.

WABC—Anderson, Ind., Fulwider-Grimes Battery company, 229 meters.

WABD—Dayton, Ohio, Parker high school, 283 meters.

WABE—Washington, D. C., Young Men's Christian association, 283 meters.

WABG—Jacksonville, Fla., Arnold Edwards Piano company, 248 meters.

WABH—Sandusky, Ohio, Lake Shore Tire company, 240 meters.

WABI—Bangor, Me., Bangor Railway and Electric company, 240 meters.

WABJ—South Bend, Ind., The Radio Laboratories, 240 meters.

WABK—Worcester, Mass., First Baptist church, 252 meters.

WABL—Storrs, Conn., Connecticut Agricultural college, 283 meters.

WABM—Saginaw, Mich., F. E. Doherty Automotive and Radio Supply company, 254 meters.

WABN—La Crosse, Wis., Waldo C. Grover, 234 meters.

WABO—Rochester, N. Y., Lake Avenue Baptist church, 252 meters.

WABT—252 meters; Washington, Pa.; owner, Halliday Hall.

WABW—Wooster, Ohio; 234 meters; 20 watts.

WABX—Mount Clemens, Mich.; 270 meters; 150 watts.

WBAA—West Lafayette, Ind., Purdue university, 360 meters.

WBAD—Minneapolis, Minn., Sterling Electric company, 360 meters.

WBAH—Minneapolis, Minn., The Dayton company, 360 meters.

WBAN—Paterson, N. J., Wireless Phone corporation, 244 meters

WBAO—Decatur, Ill., James Millikin university, 360 meters.

WBAP—Fort Worth, Texas, Wortham-Carter Publishing company (Star-Telegram), 476 meters, 750 watts; Silent Saturday and Sunday nights. Operator, E. L. Olds; supervisor, H. W. Hough; announcer, "The Hired Hand." Daily program, 11 a. m., markets, aviation, weather; 12 noon, 1, 2, 4 p. m., markets and information; 5 p. m., financial news; 8:30 to 11:45 p. m., concert.

WBAV—Columbus, Ohio, Einer and Huphins company, 390 meters, 500 watts. Director, R. S. Bohannan; program director Miss Helen Mears; announcer, H. E. Day. Daily except Sunday, 12:30 to 1, markets and news. Monday evening, 8 to 10, music.

WBAW—Marietta, Ohio, Marietta college, 246 meters.

WBAX—Wilkesbarre, Pa., 66 Gildersleeve street, John H. Stenger, Jr., 360 meters.

WBAY—New York, N. Y., Western Electric company, 492 meters.

WBBA—Newark, Ohio, Newark Radio Laboratories, 240 meters.

WBBC—Sterling, Ill., Sterling Radio Equipment company, 229 meters.

WBBD—Reading, Pa., Barbey Battery Service, 234 meters.

WBL—Anthony, Kan., T. & H. Radio company, 261 meters.

WBS—Newark, N. J., D. W. May, Inc., 360 meters.

WBT—Charlotte, N. C., Southern Radio corporation, 360 meters.

WBU—Chicago, Ill., City of Chicago, 286 meters.

WBZ—Springfield, Mass., Westinghouse Electric and Manufacturing company, 337 meters.

WCAD—Canton, N. Y., St. Lawrence university, 280 meters.

WCAE—Pittsburg, Pa., Kaufmann & Baer company, 462 meters; daily, 11:30, weather; 2:30, news; 3:30, stocks; 5:30, dinner music; 6:30, children's stories; 7:30, music; Sunday, 2 p. m., people's radio church service, Rev. Dr. George W. Shelton; 6:30, music.

WCAG—New Orleans, La., 2813 Calhoun street, Clyde R. Randall, 268 meters.

WCAR—Columbus, Ohio, Entrekin Electric company, 286 meters.

WCAJ—University Place, Neb., Nebraska Wesleyan university, 360 meters; station director and announcer, J. C. Jensen; daily, 10:30 a. m., weather; Tuesday, 6 p. m., children's stories; Thursday, 8 p. m., lectures and music.

WCAK—Houston, Texas, 2504 Bagby street, Alfred P. Daniel, 360 meters.

WCAL—Northfield, Minn., St. Olaf college, 360 meters.

WCAM—Villanova, Pa., Villanova college, 360 meters.

WCAO—Baltimore, Md., Sanders & Stayman company, 360 meters; daily, 10:55, time signals; 11 a. m., weather; 11:05, music; Monday and Wednesday, 7 p. m., music.

WCAP—Washington, D. C., Chesapeake & Potomac Telephone company, 469 meters.

WCAR—San Antonio, Texas, Alamo Radio Electric company, 360 meters.

WCAS—Minneapolis, Minn., William Hood Dunwoodie Industrial institute, 246 meters; director, M. R. Bass; operator and announcer, F. P. Upton; Monday, 7 to 7:30 p. m., music; Tuesday, 8:15 to 9:30 p. m., music and educational programs (9:30 to 10:45 on alternate weeks); Wednesday, 6:30 to 7, music and technical lectures; Thursday, 7 to 7:30 p. m., notes on radio and code practice.

WCAT—Rapid City, S. D., South Dakota State School of Mines, 240 meters.

WCAU—Philadelphia, Pa., Durham & Co., 286 meters.

WCAV—Little Rock, Ark., J. C. Dice Electric company, 360 meters.

WCAX—Burlington, Vt., University of Belmont, 360 meters.

WCAY—Milwaukee, Wis., Kesselman O'Driscoll company, 261 meters.

WCAZ—Carthage, Ill., Carthage college, 246 meters.

WCBA—Allentown, Pa., 1015 Allen street, Charles W. Heimbach, 280 meters.

WCBB—Greenville, Ohio, K. & K. Radio Supply company (Charles H. Katzenberger), 240 meters.

WCBD—Zion, Ill., Wilbur G. Voliva, 345 meters.

WCK—St. Louis, Mo., Stix, Baer & Fuller Dry Goods company, 360 meters.

WCM—Austin, Texas, University of Texas, 360 meters.

WCX—Detroit, Mich., Detroit Free Press, 517 meters.

WDAD—Lindsborg, Kans., Central Kansas Radio Supply company (Wm. L. Harrison), 360 meters.

WDAE—Tampa, Fla., Tampa Daily Times, 360 meters.

WDAF—Kansas City, Mo., Kansas City Star, 411 meters.

WDAG—Amarillo, Texas, J. Laurance Martin, 360 meters; J. L. Martin, director and operator; broadcast Tuesday and Thursday at 8 p. m.

WDAH—El Paso, Texas, Trinity Methodist church (South), 268 meters; station director, A. C. Arnold; announcer, John Burke; Sunday, 8:30 a. m., and 12 midnight; Thursday, 8:30 p. m., concert.

WDAI—Syracuse, N. Y., Hughes Radio corporation, 246 meters.

THE CHICAGO EVENING POST TABLOID RADIO SCHEDULES

These stations are those most commonly tuned in evenings by the Chicago broadcast listeners. The time given is central standard. Pacific coast time is two hours earlier than that shown here. Mountain time is one hour earlier, and eastern time one hour later. Evening program schedules only are given. This list was compiled by The Chicago Evening Post Radio Department and is protected by copyright.

STATION	Miles	Met	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Chicago—									
KYW, Comm. Edison Bldg.		536		6:30- 9:30	6:30-12:00	6:30- 9:30	6:30- 9:30	6:30-12 m.	6:30- 9:30
WAAF, Union Stock Yards		286	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00	4:30- 5:00		
WMAQ, Hotel La Salle		536		7:00- 9:55	7:00- 9:55	7:00- 9:55	7:00- 9:55	8:00-10:00	
WDAP, Drake Hotel		360		7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	7:00-1 a.m.	9:15-10:30
WJAZ, Edgewater Beach Hotel		448		10:00-12:30	10:00-12:30	10:00-12:30	10:00-12:30	10:00- 2:00	6:00- 9:00
Suburban—									
WCBD, Zion, Ill.	39	345	8:00- 9:00				8:00- 9:00		
WIAB, Rockford, Ill.	77	252	9:00-				8:00-		12:00-
WRM, Urbana, Ill.	120	360			8:50- 9:30				
WTAS, Elgin, Ill.	37	275			7:30-10:00				
Eastern—									
KDKA, East Pittsburg	430	326	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WBZ, Springfield, Mass.	802	337	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	6:30- 9:00	
WEAF, New York City	912	495	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00	6:30-10:00
WGI, Medford Hillside, Mass.	875	360	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	6:30- 8:00	7:30- 9:00
WHAZ, Troy, N. Y.	748	380	8:00- 9:30						
WGY, Schenectady, N. Y.	698	280	6:45-11:30	6:45- 9:00	6:45- 9:00	6:45- 9:00	6:45-11:30	6:45- 9:00	
WGR, Buffalo	472	319	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	6:00-10:45	6:00- 7:30	
WHN, New York City	912	360	1:15-11:00	1:15-11:00	1:15-11:00	1:15-11:00	1:15-11:00	1:15-11:00	
WJY, New York City	912	405							2:30- 6:60
WJZ, New York City	912	455	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	6:30-10:30	
WOO, Philadelphia	677	509	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	7:15-10:00	
WRC, Washington, D. C.	612	469	8:00-10:00		8:00-10:00		8:00-10:00		
Midwest—									
WCX, Detroit	245	517	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00		
WJAX, Cleveland	323	390		7:30- 9:30		8:00-10:30			
WLAG, Minneapolis	358	417	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	10:30-1 a.m.	
WLW, Cincinnati	262	309	8:00-10:00	10:00-12:00	8:00-10:00	10:00-12:00			
WOC, Davenport	105	481	7:00-11:00		7:00-11:00	7:00-11:00	7:00-11:00	7:00-11:00	
WTAM, Cleveland	323	300	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30	7:00- 7:30
WWJ, Detroit	245	517	8:30-10:00	8:30-10:00	8:30-10:00	8:30-12 m.	8:30-10:00		
Southern—									
KSD, St. Louis	270	546	8:00-11:00	8:00-11:00	8:00-11:00		8:00-11:00	8:00-11:00	
WBAP, Fort Worth, Texas	855	476	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00	7:15-11:00		
WDAF, Kansas City, Mo.	430	411	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	11:45-1 a.m.	
WFAA, Dallas, Texas	853	476	6:45- 9:30	6:45- 9:30	6:45- 9:30	6:45- 7:30	6:45- 9:30	6:45- 9:30	9:30-11:00
WGV, New Orleans	858	350	7:00- 8:00		7:00- 8:00			7:00- 8:00	
WHAS, Louisville	271	400			7:30- 9:00				4:00- 5:00
WHB, Kansas City, Mo.	430	411		7:00- 9:00		7:00- 9:00	7:00- 9:00		8:00-10:00
WMC, Memphis	480	500	8:30- :	11:00-12:00		8:30-	11:20-12:00	8:00-10:00	8:00-10:00
WOAI, San Antonio, Texas	1,080	385		9:30-10:30				9:30-10:30	
WOS, Jefferson City, Mo.	337	441	8:00- 9:30		8:00- 9:30		8:00- 9:30		
WSB, Atlanta, Ga.	605	428	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	8:00-12 m.	7:30- 9:00
Pacific Coast—									
KFDB, San Francisco	1,910	509	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30	12 m.- 1:30
KGW, Portland, Ore.	1,895	492	1:00-1 a.m.	10:00-11:00	10:00-11:00	10:00-11:00	1:00-2 a.m.	10:00-11:00	9:00-10:00
KHJ, Los Angeles	1,795	395	8:45-10:00	8:45-10:00	8:45-10:00	8:45 10:00	8:45-10:00	8:45-10:00	10:00-12:00
KPO, San Francisco	1,910	423	6:30-12 m.	6:30-12 m.	7:30-12:00	6:30-12 m.		6:30-12 m.	10:30-12 m.

KFHF—Shreveport, La., Central Christian church, 266 meters.

KFHH—Neah Bay, Wis., Ambrose A. McCue, 261 meters.

KFHJ—Santa Barbara, Cal., Fallon & Co., 360 meters. Manager, S. Haskings. Evening—8 to 8:40 p. m., news bulletins, bed-time story; 11 to 12, music.

KHR—Seattle, Wash., Star Electric and Radio company, 283 meters.

KFHS—Lihue, Hawaii, Clifford J. Dow, 275 meters.

KFHX—Hutchinson, Kan., 407 East 1st street, Robert W. Nelson, 220 meters.

KFI—Los Angeles, Cal., Earle C. Anthony (Inc.), 469 meters.

KFIB—St. Louis, Mo., 5666 Vernon avenue, Franklin W. Jenkins, 244 meters.

KFID—Iola, Kan., Ross Arbuckle's garage, 246 meters.

KFIF—Portland, Ore., Benson Polytechnic institute, 360 meters.

KFIK—Gladbrook, Iowa, Gladbrook Electric company, 234 meters.

KFIL—Louisburg, Kan., Windisch Electric Farm Equipment company, 234 meters.

KFIO—Spokane, Wash., North Central high school, 252 meters.

KFIQ—Yakima, Wash., Yakima Valley Radio Broadcasting association, 242 meters.

KFIU—Juneau, Alaska, Alaska Electric Light and Power company, 226 meters.

KFIX — Independence, Mo., Reorganized Church of Jesus Christ of Latter Day Saints, 240 meters.

KFIY—Seattle, Wash., Brott laboratories, 236 meters.

KFIZ—Fond du Lac, Wis., Daily Commonwealth, 237 meters.

KFJB—Marshalltown, Iowa, Marshalltown Electrical company, 248 meters.

KFJC—Seattle, Wash., Post Intelligencer, 233 meters.

KFJD—Greeley, Colo., Weld County Printing and Publishing company, 236 meters.

KFJF—Oklahoma City, Okla., National Radio Manufacturing company, 252 meters.

KFJI—Astoria, Ore., Liberty theater (E. E. 236 meters.

KFJK—Bristow, Okla., Delano Radio and Electric company, 233 meters.

KFJI—Ottumwa, Iowa, Hadsacg Manufacturing company, 242 meters.

KFJM—Grand Forks, N. D., University of North Dakota, 229 meters.

KFLR—Albuquerque, N. M., University of New Mexico, 254 meters.

KFMQ—Fayetteville, Ark., 263 meters, 100 watts.

KFMR—Sioux City, Iowa; 261 meters; 10 watts.

KFMS—Duluth, Minn.; 275 meters; 100 watts.

KFMT—Minneapolis, Minn.; 231 meters; 5 watts.

KFMU—San Marcos, Texas; 240 meters; 20 watts.

KFMW—Houghton, Mich.; 266 meters; 50 watts.

KFMX—Northfield, Minn.; 283 meters; 500 watts.

KGB—Tacoma, Wash., Wm. A. Mullins Electric company, 360 meters.

KGG—Hallack & Watson Radio Service, Portland, Ore., 460 meters, 50 watts. Day—2:45 to 3, news. Evening—7:30 to 8, phonograph and sporting news; 9:30 to 10, press and police reports; special Wednesday and Sunday, 11 to 12 midnight, singing concert.

KGN—Portland, Ore., Northwestern Radio Manufacturing company, 360 meters.

KGU—Honolulu, Hawaii, Waiwiwi Beach, Marion A. Mulrony, 360 meters.

KGW—Portland, Ore., Portland Oregonian; 492 meters: Day—1:30, weather; 5:30, lectures and children's hour. Evening—10, music; 11, lecture; 12, music.

KGY—Lacy, Wash., St. Martin's college 258 meters; 10 watts; evening, 10 to 11:30.

KHQ—Seattle, Wash., 419 13th avenue, Louis Wasmer, 360 meters.

KJQ—Stockton, Cal., 615 East Main street, C. O. Gould, 360 meters.

KJR—Seattle, Wash., Northwest Radio Service company; 283 meters; 7:30 to 8:15 p. m. daily except Sunday, 9:30 to 10:30 p. m., Monday, Wednesday and Friday.

KJS—Los Angeles, Cal., Bible Institute of Los Angeles, 360 meters.

KLS—Oakland, Cal., 2201 Telegraph avenue, Warner Brothers, 360 meters; director, Miss A. Warner; announcer, S. Warner. Week days, 1:30 to 3; Friday evening, 10 to 11; Sunday afternoon, 2 to 3.

KLX—Oakland, Calif., The Oakland Tribune, 509 meters; 500 watts; silent Sunday;

KSD—St. Louis, Mo., Post Dispatch (Pulitzer Publishing company), 546 meters.

KSS—Long Beach, Cal., Prest & Dean Radio company and Radio Research Society of Long Beach, Cal., 229 meters; 10 watt; Boy Scout news.

KTW—Seattle, Wash., First Presbyterian church, 360 meters.

KUO—San Francisco, Cal., Examiner Printing company, 360 meters.

KUS—Los Angeles, Cal., City Dye Works and Laundry company, 360 meters.

KUY—El Monte, Cal., Coast Radio company, 360 meters.

KWG—Stockton, Cal., Portable Wireless Telephone company, 360 meters.

KWH—Los Angeles, Cal., Los Angeles Examiner, 360 meters.

KXD—Modesto, Cal., Modesto Herald Publishing company, 360 meters.

KYQ—Honolulu, Hawaii, Electric Shop, 360 meters.

KYW—Chicago, Ill., Westinghouse Electric and Manufacturing company, 536 meters.

KZM—Oakland, Cal., 13th and Harrison streets, Preston D. Allen, 360 meters.

KZN—Salt Lake City, Utah, The Deseret News, 360 meters; daily except Sunday 9 to 10:30 p. m., music, addresses, stories, news.

KZV—Wenatchee, Wash., Wenatchee Battery and Motor company, 360 meters.

NAA—Arlington, Va., U. S. Navy dept., 435 meters; daily except Sunday, 8:45 to 9:40 a. m., markets; 11:25 to 11:40, markets; 12:45 to 1:20 p. m., markets; 2:25 to 3:40 p. m., markets; 9:05 to 9:20 p. m., weather.

WAAB—New Orleans, La., 137 South St. Patrick street, Valdemar Jensen, 268 meters.

WAAC—New Orleans, La., Tulane university, 360 meters.

WAAD—Cincinnati, Ohio, Ohio Mechanics institute, 360 meters, 25 watts, range, 50 miles.

WAAF—Chicago, Ill., Chicago Daily Drovers Journal, 286 meters; Daily except Sundays and holidays, 8:10, 10:45, 12:40, 3, 4:30 p. m., markets; 10:30, 12:30 p. m., weather.

WAAH—St. Paul, Minn., Commonwealth Electric company, 360 meters.

WAAM—Newark, N. J., I. R. Nelson company; 263 meters.

Continued on Page 14.

Edited by
D. D. RICHARDS

The RADIO MAGAZINE Section is edited with the view of giving authentic news of the radio broadcasting field and authoritative information on the subjects of home construction of receiving and transmission sets, of the operation and maintenance of apparatus, and as an exchange of opinion for its readers.

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Pa's Got It; Ma'sGotIt; Everyone Getting It

By John A. Menaugh.

HE'S got it!

Good Heavens!

Picture the scene. Picture, gentle reader, the kinfolk gathered in, and the neighbors. See them circled round. "He's got it," Ma whispers hoarsely. There sits Pa in his ear muffs, a strange new light in his eyes. He seems to be gloating. A jubilant smile cracks his face. The neighbors wag their heads.

Thus it strikes, swiftly and surely, but with the touch of a light leaf in a dainty wind. It really hits before one knows. At times there may be symptoms of its approach, such as the formation of crystals, but usually it descends like night in the tropics.

It follows divers courses and takes queer twists and turns. It may appear in the form of soldering of the joints, it may come so violently as to split a variometer, it often causes grid leaks or body capacity, and draining by vacuum tubes never seems to give relief. It advances by steps, often as high as five or ten, until the stage of complete neutrodyne is reached.

When Pa is taken down he finds he is no longer able to sleep. He sits up late into the night. Perhaps, at midnight he tears thru the house crying something like this:

"I've got Fort Worth." (Fancy, Pa getting Fort Worth.)

At other times he goes wild and in a frenzy attacks Ma's phonograph, tearing it apart with hammer and saw and filling its hull with strange new ballast. Tragedies may occur. Pa, in his excitement, may brand Ma with a red hot soldering iron. It has been known to happen. Sometimes Pa goes hunting trouble with a long 45.

It spreads in the family and from one family to another. Ma takes down. It appears in another form with her, however. At night she is strangely silent as Pa listens and listens for a far-off voice. But by day she roams the ether. She copies recipes, she harks to the speeches and the songs, and she scolds the static like she scolds her naughty offspring.

Children of a tender age usually are immune, but, oh, boy, let it once get in its grip a boy of 13 or 14. Oh, gee!

IT IS everywhere. It is epidemic. It is pandemic. It appears to spare no one. They whisper it in the alley ways and talk it shamelessly in the public places.

Your nearest and dearest friend has it. Your banker riding down in his eight-cylinder car may have superducs. Your favorite bootlegger, riding down in his nine-cylinder car, may have superdynes. The old man in the street car has either ultra-audion or is regenerative. The artificer at his work is thinking of his antenna, while the tradesman talks frequency as he weighs out your sugar.

It dots the world with Eiffel towers and makes of the house tops veritable networks of wires, as tho some giant spider had woven traps for giant houseflies.

IS THERE a cure? Nay, brother. It is here to stay. It can't be stopped in any way. It is growing with a roar. Bigger and greater will it be. There is no end. Each and everyone must come within its tolls sooner or later.

RHUMMY, my friend's parrot, like Long John Silver's, frets and fumes in the middle watch of the night. It dreams and in the dream it shrieks: "Stand by a moment, please." My friend turns over in his sleep and his phones clatter to the floor.

Los Angeles is speaking—speaking to the empty air.

YOU might have seen him down in Madison street last week. The elbows of his shirt showed thru remains of a coat. His cap showed signs of once having had a visor. He stood in the center of a crowd gazing at a five-tube neutrodyne on display in a show window.

He was oblivious of those about him. A boy at his side nudged him.

"Some set, hey? Gee, I'd like to have one."

The old man turned, an indulgent smile on his face. "Sonny," he said, "I've got one at home that would make this look like 2 cents."

ON PROGRAMS OF LOCAL STATIONS

On the programs at local broadcasting stations: No. 1—Dr. J. Paul Fernel at KYW Feb. 19 (photo by De Gueldre). No. 2—Evelyn and Elizabeth Gekler, pianists, WDAP Feb. 14 (photo by Drake photo studio). No. 3—B. Amber Andrews, golf talks every Thursday, WMAQ. No. 4—George G. Smith, announcer and studio director, WJAZ.

Radio Programs

The sixteenth anniversary of the founding of the Rotary club will be celebrated this week. At midnight Feb. 20 Charles A. Newton, president of the club, will broadcast over WJAZ a message to Donald MacMillan in the Arctic regions. "The North Pole Rotary club" will be discussed.

Tonight WDAP is broadcasting an unusual piano duo—Evelyn and Elizabeth Gekler. KYW jumps into the limelight tomorrow night with Taylor Holmes of "The Nervous Wreck" and the "Seattle Harmony Kings."

WJY (New York) sends the good news that it will broadcast the first concert of the New York Symphony, conducted by Bruno Walters. Mr. Walters formerly was conductor of the Berlin Symphony. Much interest has attended his tour of the United States. The concert will begin at 7:15 (Chicago time) Friday night.

Below are given the complete schedules of all the Chicago and suburban broadcasting stations and those of the out-of-town stations which are most commonly tuned by local radiophans.

These schedules are a regular daily feature in The Chicago Evening Post.

On Thursday of each week a complete list and schedule of every broadcasting station in the United States is published in The Chicago Evening Post's sixteen-page Radio Magazine section.

CHICAGO STATIONS

(Central Time Is Used.)

KYW—Located in Commonwealth Edison building, 536 meters; Wilson J. Wetherbee, director.

Day—9:30 a. m., news and markets; 10 a. m., market reports; 10:30 a. m., financial news and comment; 10:58 a. m., naval observatory time signals; 11 a. m., market reports; 11:05 a. m., weather report; 11:30 a. m., news and comment of the financial and commercial market; 11:30 a. m., table talk by Mrs. Anna J. Peterson; 2:35 to 3:20 p. m., studio program.

Evening—6:30 p. m., news, financial and final market and sport summary furnished by the Union Trust company, Chicago Journal of Commerce, and United States department of agriculture; 6:50 p. m., children's bedtime story; 7 to 7:30 p. m., dinner concert broadcast from the Congress hotel; 7 to 7:10 p. m., Joska DeBabary and his orchestra playing in the Louis XVI. room; 7:10 to 7:20 p. m., Clyde Doerr and his orchestra playing in the Pompeiian room; 7:20 to 7:30 p. m., Joska DeBabary and his orchestra playing in the Louis XVI. room; 8 to 8:20 p. m., "Twenty Minutes of Good Reading," by Rev. C. J. Pernin, S. J., head of department of English, Loyola university, Chicago; 8:30 to 9 p. m., musical program. Frances Scalford, contralto; John Minnema, barytone; Sallie Menkes, accompanist; Samovar orchestra, Jack Johnstone director; 9:15 p. m., program furnished by the National Live Stock and Meat Board; J. L. Tormey will be the speaker of the evening and his subject, "Live Stock Improvement and Its Relation to Agriculture."

WAAF—Located at Union stock yards; 286 meters.

Day—Live stock reports at 8:40, 10:30, 10:45 a. m., 12:30, 12:45, 4:30 p. m.

Evening—No schedule.

WMAQ—Located on Hotel LaSalle; 447.5 meters. Miss Judith C. Waller, station director.

Day—2:35 p. m., concert from Lyon & Healy recital hall; 4:20 p. m., items of interest to women; 4:30 p. m., Illinois Federation of Women's clubs.

Evening—7:30 p. m., Boy Scouts weekly talk; financial talk by Roy Munger; talk by Rockwell B. Stephens, auto editor of The Daily News; third of a series of lessons in golf, by B. A. Andrews; Edward Price Bell, "The Handwriting on the Political Wall"; 8:30 p. m., La Salle hotel dance orchestra; 9 p. m., recreational talk under direction of the City club of Chicago; 9:15 p. m., Aeolian male quartet.

WJAZ—Located on Edgewater Beach hotel; 447.5 meters; E. Warren Howe, program director.

Day—This station has no regular day schedule.

Evening—10 p. m. to 1 a. m. Artists: Laura K. Eiberg, pianist; Esther Whitington, soprano; Jerry Cummings, tenor; Oriole orchestra. Program: "Jog Along" and "Mean Blues," by Oriole orchestra; tenor solos by Jerry Cummings: "Caprice" (Huerter), "Schrom Rosemarin (Kreisler) and "Pickaninny Dance" (Guion), by Laura K. Eiberg, soprano solos by Esther Whitington; "Honolulu Moon" and "Chimes Blues," by Oriole orchestra; tenor solo by Jerry Cummings; "Staccato Etude" (Friml), "Mazurka Caprice" (Quigley) and "Dance in F" (Brahms), by Laura K. Eiberg; soprano solos by Esther Whitington; "There's Nobody Else but You" and "Teach Me to Love," by Oriole orchestra; tenor solos by Jerry Cummings; "Valse, F Minor" (Chopin) and "Maiden's Wish" (Chopin-Liszt), by Laura K. Eiberg; "Tiger Waltz" and "Sobbing Blues," by Oriole orchestra; "Interlude" (from Holiday Sketches) and "Mazurka Fantasie" (Berge), by Laura K. Eiberg.

WDAP—Chicago Board of Trade, located at Drake hotel; 390 meters.

Day—9:30 a. m., 10 a. m., 10:30 a. m., 11 a. m., 11:30 a. m., 12 noon, 12:30 p. m., 1 p. m., 1:30 p. m., quotations and market reports direct from the Chicago Board of Trade.

Evening—10 p. m., Celestia Ankeney, soprano; Evelyn and Elizabeth Gekler, pianists; John Stamford, tenor; Rose Benson, soprano; Goldie Gordon, violinist; Jack Chapman's orchestra.

WTAY—Oak Leaves station, Oak Park Arms hotel; 447.4 meters.

Evening—6:15 to 8:15 p. m., music.

WSAH—Located at 4801 Woodlawn avenue; 248 meters.

FOREIGN STATIONS

(Central Time Is Shown.)

CKAC—Montreal, Canada; 430 meters;

Day—3 p. m., weather, news, stock reports, music.

Evening—6 p. m., kiddies' stories in French and English; 6:30 p. m., Rex Battle and his Mount Royal Concert orchestra; 7:30 p. m., Canadian Pacific Railway orchestra; talk; 9:30 p. m., Joseph C. Smith and his Mount Royal Hotel Dance orchestra; 10:30 p. m., latest news.

CYL—Mexico City, D. F. "El Universal"; 500 meters: Reul Azcarraga, director; G. Obregon Jr., announcer (Spanish); Sendel Hodges, announcer (English).

Daily, 12:54 p. m., news and weather; 8:24 p. m., war bulletins from the war and navy departments; Tuesday and Friday, 8:24 to 8:54 p. m., music. Sunday, 7:24 p. m., war bulletins.

PWX—Havana, Cuba; 400 meters; Jose Isquierdo, chief operator; Mariano del Castilla, program director; Rememberto O'Farril, announcer; regular broadcasting nights, Wednesday and Saturday, 7:30 to 10 p. m.

TSF—Paris, France; French Post and Telegraph department, 106 Rue de Grenelle. Director, M. G. Valenst; assistant, M. Chanton; 400 meters; 500 watts.

Daily except Tuesday at 2:21 p. m., Tuesday at 1:51 p. m., music, classical theater and a course in English literature; Tuesdays, a course in the Morse code. Every ten days, scientific lectures.

SUBURBAN STATIONS

(Central Time Is Shown.)

WCBD—Zion, Ill.; 345 meters; J. H. Depew, station manager.

WCAY—Milwaukee, Wis.; 261 meters: No silent nights.

Day—1 p. m. to 4:30 p. m., special concert; novelty and test programs as announced.

Evening—7:30 p. m., regular concert program.

WHAD—Marquette University, Milwaukee, Wis.; 280 meters;

Continued on Page 13.

Hagerman Describes Sensitive 5-Tube Set

By Lewis B. Hagerman.
(Technical Editor.)

RADIO receivers in most common use today can be classified in three types—regenerative, or those employing a feedback action to produce increased volume; reflex, in which the parts are so arranged that a tube acts as a radio-frequency and audio-frequency amplifier at the same time, and nonregenerative with radio-frequency, such as the neutrodyne, tuned and transformer coupled.

Much has been said in recent months about the first two—that is, regenerative and reflex, and one of the latter, the neutrodyne. But the transformer coupled radio-frequency, in spite of the fact that this type of set is highly efficient and comparatively easy to tune, has had little consideration.

The set I am describing today is one employing five tubes, two radio-frequency amplifiers, a detector and two audio-frequency amplifiers. This set operates a loud speaker on stations from five to seven hundred miles distant, using a loop inside aerial or antenna plug. No antenna is necessary for local, excellent reception being obtained by using just the wiring of the set as an energy collector.

Reports Are Favorable.

The hook-up has been given in the Questions and Answers department of the Radio Magazine several times and the reports from persons using it have been very favorable. The only difference between this set and the ordinary transformer coupled radio-frequency set is that the radio-frequency transformers have a wave length variation control. These transformers, altho slightly more efficient on high wavelengths than the common fixed type, are not absolutely necessary and no great effort need be made to obtain them. With the exception of the rheostat, potentiometer, sockets, etc., Dayton parts were used thruout.

List of Parts.

The necessary contents are as follows:

One variocoupler.

One 23 or 43 plate vernier condenser—if a 23 condenser is used, place it across the secondary of the variocoupler; if a 43, use in series with the antenna.

One potentiometer—400 ohms.

Three 6-ohm rheostats, one for the two radio-frequency tubes, one for the detector, and one for the audio-frequency tubes. One rheostat for every tube may be used, if so desired, as shown in the schematic diagram, but this is not necessary.

Two radio-frequency transformers.

Five vacuum tube sockets.

Two audio-frequency transformers about 5 to 1 and 3 to 1.

Two switch levers.

Switch points and stops, according to the number of taps on variocoupler used.

Two 3-inch dials.

One filament control switch—this can be inserted in either the negative or positive lead of the "A" battery.

Two double circuits and one single circuit phone jacks.

Seven binding posts.

One grid leak and condenser.

One 7 by 28 by 3-16 inch panel.

Wires, screws, spaghetti, etc.

The parts are mounted in the fol-

Continued on Page 4.

Five-Tube Radio-Frequency Receiving Set Gives Splendid Results

Continued from Page 3.

lowing order, looking at the panel from the front and reading from left to right: Aerial and ground binding posts, variocoupler, switch points and levers, variable condenser, potentiometer, transformer control, six ohm rheostat, transformer control, six ohm rheostat, double circuit jack, six ohm rheostat, double circuit jack, filament control switch, single circuit jack and battery binding posts arranged as follows from top to bottom: "A," negative, "A" positive, "B" negative, "B" positive, 22½ volts "B" positive, 67½ volts "B" positive. Arrange the parts in the rear panel as shown in the photograph.

Place at Right Angles.

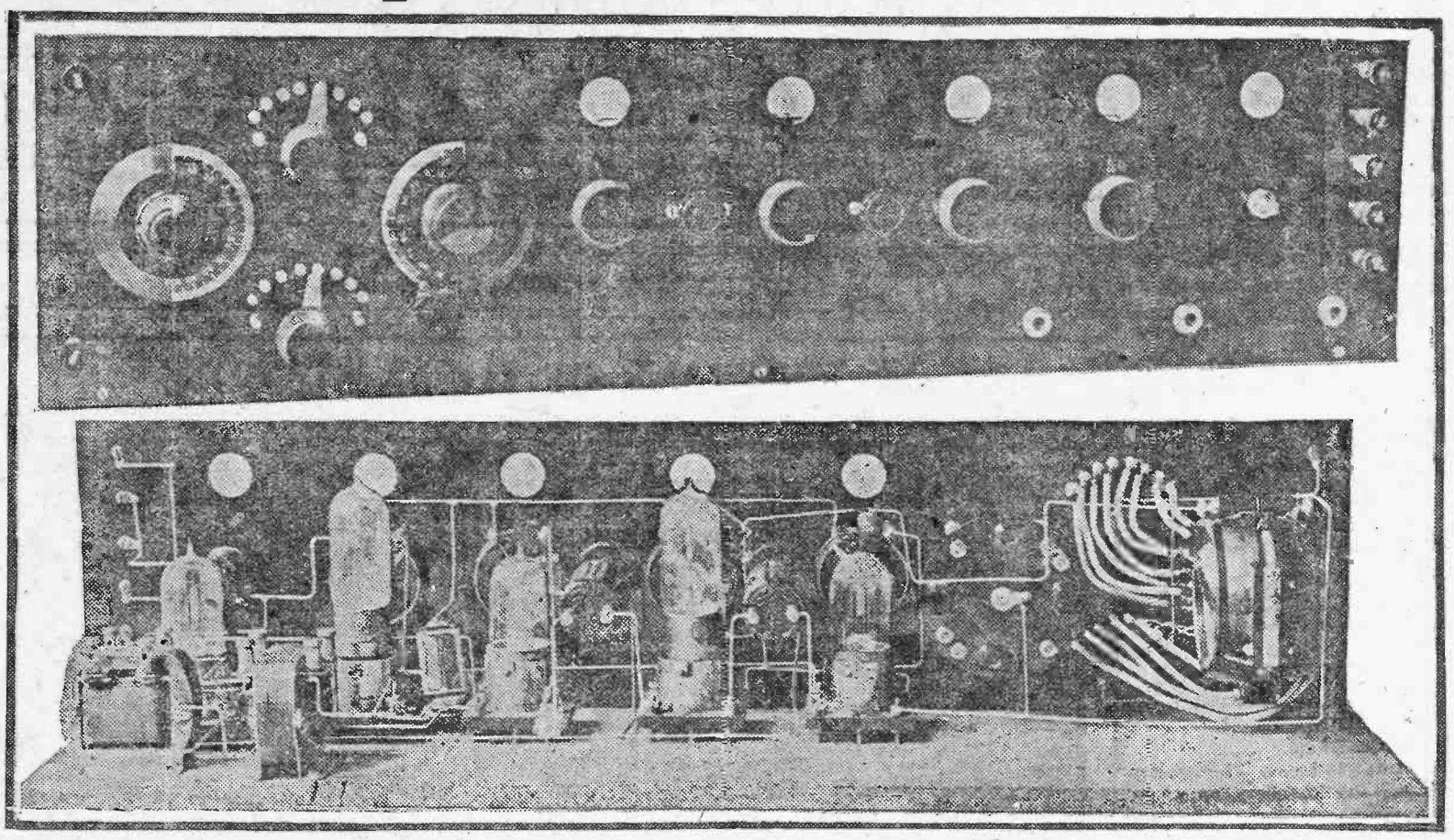
Be sure to place the audio-frequency transformers at right angles to each other. This is very important.

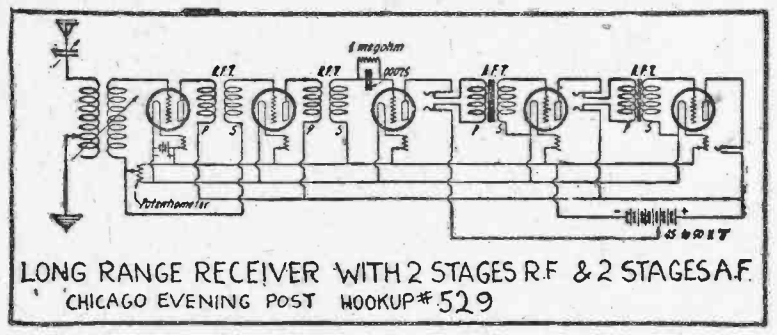
To wire the set start from the battery binding posts and wire rheostat, jacks and transformer, taking care to keep the wiring as near the baseboard as possible. This is essential if a neat set is desired.

No. 14 square tinned wire is advisable to use in wiring. This is neat appearing and easily bent.

For those who cannot read the schematic diagram, a pictorial layout will be given next week. The tubes used may be either dry cell or storage battery. Good results were obtained with WD-11s and WD-12s as shown. The combination was used after experimentation proved that they worked best in that particular position.

To operate the set, connect batteries, energy collectors, phones and insert tubes. Locate station with variocoupler rotor and taps, tune fine with the variable condenser and adjust volume with potentiometer. If wave length control radio-frequency transformers are used, set them at or near the wave length of the station wished to be received. The set may show symptoms of oscillations. If this occurs, place a .001 condenser across the primary of the first audio-frequency transformer.





Panel layout and arrangement of parts of five-tube radio-frequency receiving set (at top). Schematic drawing of hook-up (lower).

Radio Experts Give Talks at Electric Club

THE session of the radio section of the Electric club held in the club's rooms in the Morrison hotel on Tuesday evening was attended by 250 dyed-in-the-wool radiophans who listened to instructive talks by men recognized as experts in the field of radio. Fully seventy-five phans were turned away, as the clubroom was filled before 7 o'clock, the scheduled hour of the meeting.

The feature of the evening was a talk by David Grimes, radio engineer of nation-wide prominence, who told the club section of the history of radio, tracing the various steps of its development from 1877, when Alexander Graham Bell discovered the principle of induction as applied to the telephone. From that discovery of Mr. Bell came the radio, declared Mr. Grimes, and the radio we know today is but a refinement of the induction principle of electricity.

The other speakers each dealt with a special topic pertaining to radio and gave technical facts in a way that made it possible for the most inexperienced fan to understand what it was all about.

Club Section's Anniversary.

Incidentally, the radio section of the Electric club Tuesday evening celebrated its first anniversary. The report of President William P. Bear was presented by Secretary H. H. Engle, as illness prevented Mr. Bear from attending the meeting. The report shows a steady growth and interest in the radio section of the club.

The talk of Dr. Edward W. Engle, metallurgist of the Fansteel Products company, dealt with chemical electro-electric rectifiers.

Harry Marx demonstrated to the meeting some new devices recently put on the market to aid in the reception of radio waves; John H. Miller conducted a questions-and-answers discussion which was instructive.

Vibrating rectifiers were discussed by O. P. Smith, who explained the devices on the market for charging the battery at home.

L. N. E. Clausing, chief engineer of the Zenith-Edgewater Beach broadcasting station, WJAZ, addressed the club on the fundamentals of the superheterodyne receiving set. Mr. Clausing explained the set's workings in detail, and a lively questions and answer discussion followed this talk.

Call Them "Radio Lighthouses."

Mr. Grimes, in telling of the history of radio, went into some detail in the discussion of ether waves, which carry the impulses set up by a broadcasting station. He declared that all broadcasting stations should be known as "radio lighthouses" because, he said, the impulses are carried away from the broadcasting stations on light waves, traveling at a speed of 186,000 miles a second. These waves, he declared, are those which cannot be detected on the spectrum by the human eye, but are known to exist. He explained the difference in the speed of sound traveling as these light waves from the speed which would be attained were the air to carry the impulses.

The next meeting of the club will be held on Feb. 26, in the Electric club rooms.

Mr. Grimes will deliver his talk on Alexander Graham Bell thru the WDAP broadcasting station this evening.

Milwaukee Amateurs Honored in Wisconsin

The Milwaukee Radio Amateurs' Club, Inc., has been honored by having two of its members selected by the American Radio Relay league to fill positions in the league's operating department for Wisconsin. Clarence N. Crapo, 9VD, was appointed assistant division manager in charge of the state, and Mark H. Doll, 9ALR, was selected as district superintendent for Milwaukee county.

Ribbon Aerial Popular, Say Radio Dealers

Radio dealers thruout the city report an ever-increasing demand for the ribbon aerial which appeared on the market within the last year. Both loop and outside dealers say sales have been mounting steadily in this product.

The ribbon aerial is manufactured by the Acorn Radio Manufacturing company, 1806 South Racine avenue, Chicago. The manufacturers sell it with a money-back guarantee if the results are not improved 200 per cent. It is featured under the name of "Trancontinental ribbon."

This is what the manufacturers say:

"Not a 'strip of flat copper,' but a laboratory product—the result of long experiment. Capacity, resistance, weight, wind strains all calculated and standardized. Must give you bigger volume, clearer tone, greater distance and improved selectivity or money refunded. Thousands now in use all over the world. Recommended and used by leading radio engineers, great broadcasting stations, etc."

The Post Radio Magazine's technical expert has not had an opportunity as yet to give the ribbon aerial a thoro test, but what experiments have been made for the Radio Magazine show that the ribbon gives considerably more volume in reception.

Exchange the Radio material you have and do not need for the material you can use that some one else has. Advertise in the Classified Section of this magazine. 5 cents per word. See page 15.

Good Announcer Is a Real Asset to Any Station

Nothing adds so much to a station as the announcer. No matter how good a program the station puts on, the man at the microphone who tells you all about what you are going to hear and all about the happenings, both local and international, is the one who can make the program a success or otherwise.

The announcer who has his heart in his work and has proved the greatest success is the one who is able to deliver his personality to his listeners, and enter into the spirit of the entertainment being sent out.

Do not think for a moment that Mr. Announcer has an easy job. A visit to any of our broadcasting stations will demonstrate this to any who may doubt it.

He has to be a man of great resources, even temper and pleasing personality.

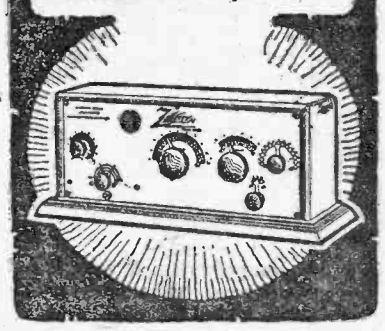
It is not always the case that things go according to schedule. An artist may be late or unable to come at the last moment. A tube may be blown. These are only a few of the many things that may happen.

You who listen in seldom know of these troubles; the program seems to go along with the same precision that you are so used to. Yet it is only by the resourcefulness of the announcer that this result is obtained. He may have to "stall" a bit at times, but you will never know it.

We believe we do not have to back down to any country when it comes to the gentlemen who announce from our stations. Some have a national reputation, and we have come to feel that we know them even tho we never met them.

Loud Speakers and Amplification

Loud speakers do not amplify. They merely take the amplified signals and, by concentrating the sound waves, throw them into a given direction. To operate loud speakers amplification must be resorted to first.



You will find the classified advertisement section interesting. See Page 15.

Fourteen headphones have been installed at the Hotel Cecil in London, where listening-in parties are a prominent feature of the guests' entertainment, and the demand has been so great that the number is to be increased to twenty. A transmitter is to be installed for the purpose of transmitting the hotel's own band to various recreation rooms.

De Forest Reflex, Type D 10, Simple Tuning and Efficient Receiver

By Fred E. Baer.

THE Reflex Radiophone Type D-10, developed by the DeForest Radio Telephone and Telegraph company, is a set which combines the qualities of excellent sensitivity, good distance covering power, and the ability to produce large volumes of sound with those other highly desirable qualities of simple stately beauty, ease of tuning, compact sizes, light weight and, as a result, portability.

This remarkable set of characteristics does not represent a balancing out of one against the other. There is no compromise of distance getting ability to achieve portability. The complete set with batteries and phones may be picked up by the carrier strap and taken along on a camping trip. This compactness is achieved without any sacrifice of circuit efficiency.

Tuning Is Simple.

The tuning is extremely simple. Instead of having circuits each of which must be tuned to exact resonance with the incoming signal there is only one tuned circuit. The receiving loop forms the fixed inductance for this circuit. The variable capacity which tunes the loop is controlled by two dials on the front of the set. One of these controls a 23-plate condenser and the other a vernier three-plate condenser which makes it extremely easy to set for exact tuning adjustments. The other two dials on the panel, a rheostat and a potentiometer, control the amplifying action of the tubes and offer no tuning difficulties to the uninitiated.

In order to understand how thousands of these sets are able to reproduce the program from a single broadcasting station it is necessary to think for a few moments about how the power sent out from the sending antenna is able to reach the receiver, is picked up and fed into the loud speaker.

The broadcasting station radiates its power in the form of ether waves between 200 and 600 meters long,—that is, the distance from crest to crest of these waves is approximately from one-eighth to three-eighths of a mile. The waves travel so rapidly that between one-half million and over one million are sent out in one second. It is necessary to send out these waves so very rapidly because each one carries only a very small amount of energy. It takes a great many of them to carry enough power to operate a receiving set a great distance away. In order to transmit the program these waves are sent out in groups, the length and power of each group corresponding to the pulsation in the sound being transmitted. For example, one sound wave may be sent out as a group of 1,000 ether waves.

Has Great Volume.

Now that the program is on the air the next problem is to find out how the D-10 is able to pick up the signals. If the loop is pointed toward the sending station, that is, if one corner is pointed toward it, the waves will induce a small voltage between the ends of the loop. This small voltage, however, would not be enough to operate the set if the loop were not tuned to the particular frequency of the sending station. The tuning is accomplished by the condenser in the set. When the condenser is set so that the loop is in resonance with the incoming waves the voltage induced will be hundreds of times what it was before and so will be enough to operate the set. This tuning is extremely sharp. If the condenser is set at just the right value the loud speaker will reproduce the program with enough volume to fill a large room. If the condenser setting is changed a small amount it will be impossible to hear the program even with the headphones. For example, there is enough room between the correct tuning positions for WEAF and WJZ to put in from three to five other stations and still separate their grams without any trouble.

The power which reaches the loop and is picked up is extremely minute. The power sent out by the average broadcasting station is no greater than that used by an electric iron and it is thrown out in every direction. The amount which happens to fall on the loop is so small that it must be amplified a million times or more before there will be enough of it to operate a loud speaker. This amplification is accomplished by the audions or vacuum tubes, the invention of Dr. Lee DeForest. The minute voltage generated in the tuned circuit of the loop and condenser is fed to the first audion where it is amplified, passed thru a transformer and thence thru two more steps, each consisting of an audion and a transformer. The signals are still in the form of pulsations of radio-frequency currents which would not move the diaphragm of a phone and which the ear could not detect even if they did.

Sent Thru a Crystal.

The signals are then set thru a crystal which has the strange property of detection, allowing current to pass in one direction but not in the other. This cuts off the tops of these groups of high-frequency currents, leaving only the pulsations of audio-current which are the ones desired for use in the phones.

Instead of putting the signals thru a step of audio-amplification and then sending it to the phones, they are brought back to the second tube which was already used once in amplifying them in the radio-frequency form. Since there is such an enormous difference in the frequencies, the two can be put thru the same tube and then separated by the proper transformers and fixed condensers such as are used in this set. This is the famous reflex principle by which one tube is made to do the work of two so that the resulting amplification is as great as would be obtained with two steps, one radio and one audio. The signals are reflexed thru two tubes and then go to the first phone jack for use with head phones or, by inserting the plug in the other jack, they are switched thru the last transformer and tube, which make a straight audio-frequency step, and then go to the loud speaker.

With improper construction of a reflex set it is possible to get some extremely weird results. For example, the catswhisker may be lifted off the crystal and the signals will still be received with very little change of volume. This shows that the set is not working as it should due to detection in the amplifier tubes and reactions between the audio-frequency and radio-frequency circuits. In the DeForest set these have all been carefully avoided in the design. When the circuit is opened at the crystal no signals will come thru at all.

Simple to Set Up.

When the set, batteries, audions and phones are purchased it is only a matter of a few minutes between the unpacking and tuning-in on the first program. If the dry cell audions—the DV-3s—are to be used, three of them should be placed in the bottom of the cabinet connected in series and joined to the A terminals with the proper polarity as shown on the diagram furnished with the set. There is room in the compartment for three small block B batteries which must also be connected up according to the diagram. If this is not done correctly the tubes will promptly burn out or if the polarity is reversed, the set will refuse to operate.

The next operation is to open up the loop and fasten it together with screws. It may then be lowered into the jack in the shelf of the set, which immediately makes the necessary connections. Transformers 1, 2 and 3 should then be placed in the corresponding positions. (Transformers 4 and 5 are used for other wavelength ranges.) The audions are then placed in their sockets, the switch on the front of the panel thrown and the rheostat turned up slowly. The tubes will then light up and the set is ready for tuning. The loop should then be pointed in the direction of a broadcasting station, the phone plug inserted and the condenser dial turned until the station is picked up. A slight adjustment of the right hand knob, the rheostat knob and the vernier condenser will then clear up the signal. The filaments should be burned at as low a temperature as is consistent with good results in order to prolong their life.

If the set is to be used with the storage battery tubes, DV-2s, the leads are brought in thru the back of the set and connected to the A batteries as before. The rheostat should be set so that not more than five volts is applied to the filaments when the set is operating.

Among the remarkable features of the D-10 receiving set are the absence of any necessity for an aerial or ground.

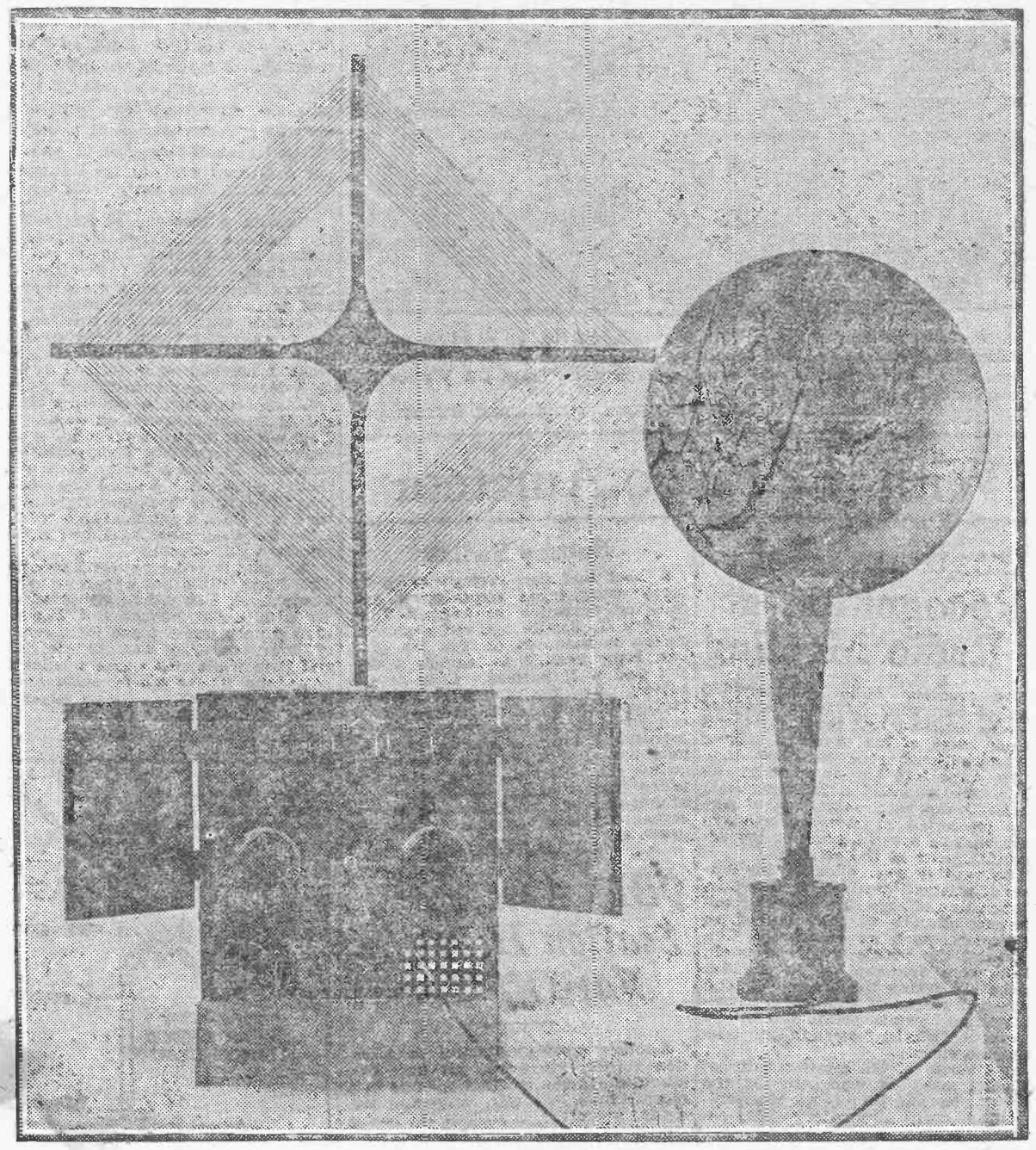
Need Loop for Tuning.

This does not mean, however, that the D-10 cannot employ these features. They can be used. If they are, the loop should be left in place at all times, as it is needed for tuning.

The long-distance possibilitise of the D-10 have helped make it famous, no less than its remarkable audibility and selectivity. DX hounds in New York have reported Pacific coast reception night after night, and it is no exaggeration to say that coast to coast reception averages three nights a week with the D-10.

"Bill" Priess, famous DeForest engineer, tells with some amusement of one kick registered against the set because its owner could not get San Francisco every night in the week. The DeForest company offered to take back his set, but he would not let it go.

The mechanical features of the D-10 are such as to make it unique among broadcast receivers. All the joints are made tight mechanically before they are soldered so that it is impossible to pick up the set by one of the wires. The only limitation on the ruggedness of the set is the filaments in the audions. These should be protected from jarring.



De Forest Reflex Radiophone, Type D 10, set up and ready for operation.

They Need a Few Yankee Schoolboys in Spain

United States Consul H. M. Wolcott, at Bilbao, Spain, says in a recent issue of Commerce Reports: "Altho no broadcasting stations have as yet been established in Spain, there is considerable interest of late in this district in radio receiving sets of sufficient range to receive broadcasts from Paris, The Hague, Berlin and London. The principal drawback to a more extended sale of radio receiving apparatus here is the apparent lack of technical knowledge on the part of those who have undertaken the sale of radio materials in Bilbao. In an investigation of the market this office has found five dealers who carry radio receiving sets in stock, mainly of British and French manufacture, but only one of the dealers interviewed seemed to have much knowledge of the subject. One set of American origin was found in the stock of a local dealer, which he states he has been unable to set up."

Federation to Broadcast Labor News by Radio

The Illinois State Federation of labor is planning the transmission of labor news thru the use of the radio. The officials of the central labor body of the state feel they will be able to keep in touch with the members of the various unions of the state in this way and the public will be made more familiar with the plans and aims of the state federation thru the radio talks. The matter was discussed this week at a meeting of the executive committee of the state federation and a committee appointed to investigate the advisability of installing a radio station.

Be sure to read the Classified Advertisements on page 15.

Radio Better Than Pills, Is Doctor's View

Radio is a valuable adjunct to the treatment to tuberculosis and is "of great thereapeutic value in treatment of other hospital cases," says Dr. Walter K. Foley, chief of the medical service of the United States vereterans' bureau hospital No. 68 at Minneapolis.

Dr. Foley has been "perscribing" radio for two years. He revealed recently that more than 250 radio sets were being used in the hospital and that when a patient enters he was given the option of receiving a set as part of his hospital equipment.

Discusses His Method.

"A radio set will do more to cure tuberculosis than any other apparatus yet devised," says Dr. Foley. "Our method is this:

"A worried, unsettled state of mind is the biggest obstacle we have to fight in treatment of tuberculosis. The only way a patient may be cured is to be put to bed and given absolute rest in mind and body. He may be in bed from several months to a year or two, and, naturally, when told this is discouraged. When newness of hospital routine wears off he begins to worry about himself, the folks at home, or his children. Even if he has no family the sick man can always find something to worry about. One of our patients spent hours in mental agony wondering whether the United States would join the league of nations.

"Two years ago we had a patient who worked himself into a mental frenzy with imaginary grievances. He claimed his sheets were being starched and that the food, no matter how tasty, was not good. His condition was rapidly growing worse. One day I installed a radio set at his bedside. He became interested at once and before long his mind was entirely at rest under the radio's soothing effect. He quit complaining and started to recover. He was recently discharged as cured.

Forget Their Troubles.

"This was the beginning of 'radio perscriptions' at hospital 68, which resulted in the installation of the 250 or more sets we now use. The boys now 'forget their troubles' with radio, and often call me to their rooms to check on a hook-up. I think these radio calls do as much good as professional calls.

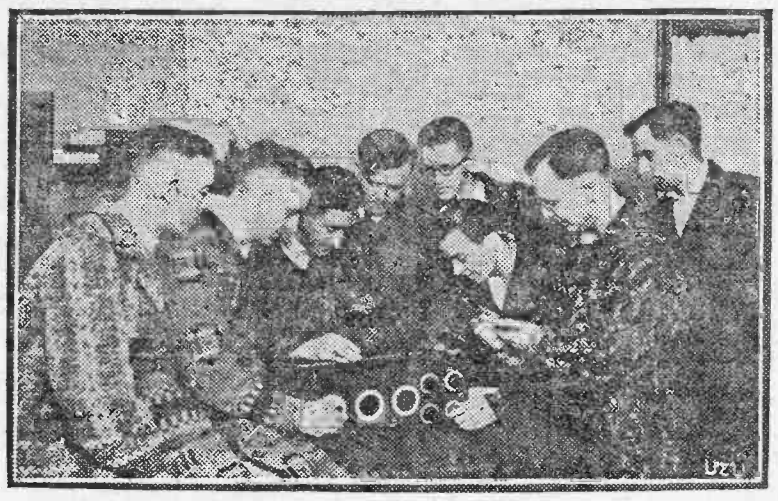
"I would rather give a patient suffering from tuberculosis and other diseases as well, a radio set than a whole handful of pills. It does him more good."

Radio "Concession" Acquired in Chile

A "concession" to erect and operate a wireless station, and corresponding receiving stations, for a period of thirty years, to Messrs. Errazuris Simpson and Jose De La Taille, and Seimens Schubert, Ltd., has been announced by the Chilean government. A novel feature of the contract, so far as Chile is concerned, is the provision that "any difficulty or claim arising from the concession shall be definitely settled by the Chilean authorities or courts without the intervention of foreign diplomats or officials."

Be sure to read the Classified Advertisements on page 15.

RADIO INSTEAD OF PILLS



Patients at United States veterans' hospital No. 68 at Minneapolis looking over one of the 250 receiving sets given to them to help cure them of tuberculosis. "Radio is better than pills," says Dr. Walter K. Foley, chief of the hospital.

With the Radio Amateur

Amateurs Get Recognition at Radio Meeting

The amateur radio operator—the man or boy who, for relaxation has a radio receiving and sending set and spends most of his evenings talking in international code to other amateurs, came into his own today as those who attended a meeting, held at the Drake hotel yesterday, of persons interested in radio reported to their various organizations of the accomplishments of the session.

The meeting was called for the purpose of attempting to agree on a plan of operation of radio broadcasting and amateur stations in the case of an emergency, such as confronted Chicago and the middle west last week. Plans were discussed as to the use of the air during the emergency and ways and means of establishing communication between points cutt off by prostration of the telegraph and telephone services.

As a result of the meeting railroad officials, many of who attended the meeting, learned that there is a well-organized corps of amateur radio operators available, men who know their business, to aid them when the railroad wires are out of commission. It was tentatively agreed that the amateurs should handle the commercial and the point-to-point communication, such as railroad requests and orders, should an emergency arise again. It was also agreed that the broadcasting stations should be used to get out the information of the emergency, should co-operate with the amateurs and should broadcast news for the various press associations, should it become necessary. The spirit of the session was one of co-operation by all persons who operate radio stations.

Government Official Presides.

E. A. Beane, government supervisor of radio stations for the ninth district of which Chicago is the headquarters, presided at the meeting and explained the necessity of avoiding again a chaotic condition in the air such as prevailed for a time during the last emergency.

R. H. J. Mathews, representative of the American Radio Relay league, connected with Edgewater Beach broadcasting station, WJAZ, and a member of the radio committee of the American Railway association, proposed a plan which was rather generally favored at the meeting as the one offering the best solution for handling radio stations in an emergency. He proposed turning over to the amateur operators the railroad and personal message for point-to-point communication and the using of the big broadcasting stations for the transmission of news. He explained that there are 3,600 amateur operators in his district and 600 of them are called official stations in that they are recognized by the government as being good stations with competent operators. He urged the railroads to get in touch with the amateur men in the various towns along their lines and have them ready for use in an emergency. The status of the radio amateur was news to most of the railroad men present.

Those Who Attended.

Those present at the meeting, many of whom spoke, follow: L. M. E. Clausing, Edgewater Beach station, WJAZ; E. T. Walford of the Associated Press; J. E. Jenkins, Drake hotel station, WDAP; Wilson J. Wetherbee and H. O. Fall of the Westinghouse station, KYW; W. E. Schweitzer, amateur operator; Donald O. Weller, William Hedges, Miss Judith Waller of the Daily News station, WMAQ; P. G. Neal of WDAP; B. B. Forbes, L. S. Bennett, Western Union Telegraph company; Ralph O. Shugart, WDAP; R. U. Norris, W. S. Cooper, Charles C. Dimmock, P. S. Westcott, Chicago, Milwaukee and St. Paul railway; William Bennett, Chicago Great Western railway; George D. Hood, Rock Island railway; F. F. Wilbur, Illinois Central railway; C. A. Worst, L. A. Wood, Chicago, Burlington and Quincy railway; A. F. Parkhurst, assistant supervisor of radio, ninth district; P. G. Shepard, Michigan Radio corporation.

Sagging Socket Contacts

Quite often tube socket spring contacts sag. The filament may light but the plate or grid contacts are poor. Take out tube and lift up springs.

Battery Switch

A neat and time-saving device for those using tubes requiring a dry-cell for operation is suggested by Charles R. Kuglin. A series parallel switch is mounted on the top of a box, large enough to contain a dry-cell and a B battery. Connect the battery terminals to four of the contact points. From the other points run wires to the binding posts which correspond with the binding posts on your panel. With this, a turn of the switch completely disconnects the batteries from the set. If short pieces of bus-wire are obtained and slipped across the binding posts it will improve the appearance.

9BP Amateur Station Heard in Far-Off Lands

Another amateur station in operation several years and rivaling 9RC (discussed in the Radio Magazine in a recent issue), in power, range and consistent operation, is 9BP, at 725 Noyes street, Evanston.

This station, owned and operated by Esther Lee Page, first, and Walter Watts, apprentice operator, has been in communication consistently with a great portion of the western hemisphere. Its signals have been reported in the Society islands, in the Pacific, Hawaii, New Zealand, Alaska, England, and recently heard by a French government station in Africa.

Such feats have been made possible only by constant application of the laws of radio. These two young persons have worked steadily since 1914 to bring the station to its present high state of perfection.

Details of Station.

Let us look into the details of the station. The transmitter consists of four fifty watt tubes used in giving a total rated power of 200 watts. However, it is known that tubes can be safely worked at a great deal over their rated power. This is done at 9BP by using a plate voltage of 4,639 volts pure filtered motor generator direct current.

The actual power of this station then is 1,031 watts. Usually in overloading tubes the plates become red and even white hot. At 9BP the plates do not change their color in the least. This is accomplished by a circuit developed by the boys using a combination of a Hartly, Colpits and Mine transmitting circuits.

Another advantage of the circuit is that it affords absolutely no interference to the broadcast listener. Of all the problems that Esther and Walter worked on the development of no interference to the broadcast listeners took the most time.

Unique Antenna System.

The antenna system at 9BP is most peculiar and efficient. The best transmitting aerial was found to be a one-wire aerial run in any direction but straight. The swooping down of the antenna to within thirty feet of the ground seems to help keep the tube cool. The circuit works best without a counterpoise. This counterpoise is used as the aerial for the Weagent receiver.

The aerial seems to be a main factor in the large amount of amateur traffic handled—the peak load being ninety-eight messages in twenty-four hours.

This station is in operation between 12 midnight and 4 a. m., and its operators announce they will gladly relay, free of charge, to any address in the United States, Canada, Alaska or Hawaii, any messages delivered to the above address or phoned to Evanston 1419.

The operators of this station belong to the A. R. R. L., North Shore Radio club and The Post's Junior club.—AMATEUR BOOSTERS' CLUB.

The Smallest Wire

The smallest wire in the world has been produced for radio work. It is made of copper-nickel alloy and has a diameter less than one-thousandth of an inch. It is invisible except under a microscope. It is used for measuring radio-frequency currents.

See Classified Ads, on Page 15.

HOME WORKSHOP

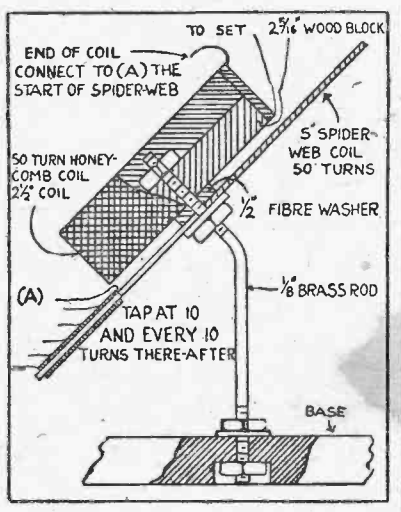
Finger "Clicked"

Joseph Hois has this solace which may help phans in trouble:

"A few months ago I constructed a set with one of these new circuits (which I do not now recall, as I build them all). I mounted the gridleak on the bakelite panel, and what I found was that wherever a hole was drilled, and the polished surface of panel was off and around the edge of panel, I got a distinct click in my headphone by touching those parts with my finger.

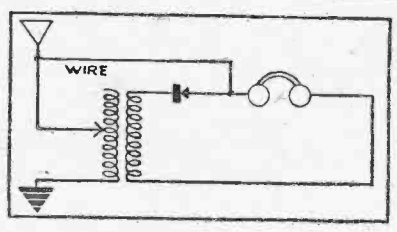
"Within a fraction of an inch of the gridleak I touched the polished surface of the panel, but did not get any click, therefore I suppose the core of the panel being more spongy and probably not being properly impregnated with bakelite solution, in the process of making, absorbed quite a bit of moisture from the air, and when I touched same formed a path or a leak for currents to my finger, and also I suppose, to any other terminal of circuit mounted on panel. As I did not get any click from holes very near other terminals, I suppose those terminals formed a better drain path than my finger. I used the same panel for other hook-ups right after that, but did not get the same results. altho the first may have had a very sensitive grid circuit.

"So now in order to avoid any possible leaks, altho not apparent in the headphones, I first drill my panel and lay it on a flat surface and then put it in a very warm place for a couple of hours to drive out all moisture, and then while still warm I paint all holes and places where surface polish is peeled off, and also edges of panel with a celluloid varnish."



Coil Helps Volume

Phil L. Ofenlock sends this drawing to Post phans. The coil was used on a Reinartz Ultra-Audion, but is found helpful in any set. The coil, set at this angle, makes soldering easier and neater. But above all, the arrangement increases volume.

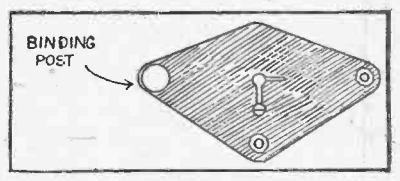


Increased Sound

A special wire from the aerial binding post to one of the phones increases the volume of signals, according to Robert Smith.

To Hitch Condenser

Edward Cope suggests that a binding post, minus the screw, may be screwed onto one of shafts of the stationary plates. As many condensers lack binding posts, this may be helpful.



Solders Neatly with New Outfit

H. E. Bedict, 3009 West 40th place, finds that a jeweler's blow pipe and wood alcohol lamp, which he purchased at a wholesale jewelry house for 47 cents, is a great improvement over the old soldering iron in making a neat and accurate connection.

"The tiniest wires may be soldered at exactly the right spot by this method without any trouble," he writes.

"The wire should first be placed at exactly the spot to be soldered and held in place by tying with another wire or laying some thing on it to hold in place, so that it will not be moved when soldering.

"The work to be soldered should first be cleared with a rough file or scraped with a knife. It should be raised to about even with the flame in the lamp and the lamp placed about one inch from it.

"With the blow pipe blow a tiny flame on the spot to be soldered until it is warm. Then with the flame still on it, touch with a piece of resin core. A small drop of solder will stick to the work. The flame should be kept on the work—not too hot—until the solder flows down on the work. As soon as it flows, stop blowing, and a neat job will result. Allow to cool for about one minute before moving. Care must be taken not to have the wire too hot or the solder will drop off. Neither will it stick if it is not warm enough.

"After a little practice you will learn the right temperature to make a neat job. On ordinary bus wire he usually blows a "slow" flame on the work for about ten seconds, touch with the resin core until a drop melts off, remove the solder from the work, and continue the 'slow' flame just until the drop of solder flows around the wire.

"This makes a very neat job."

Go to Radio Doctor

When you're sick and do not know what ails yourself or cannot prescribe the proper remedy, you to to a physician. Why not do the same thing with your radio receiving set? If your set refuses to function properly and you do not know what ails it or cannot prescribe the remedy, go to a radio "doctor." Several are advertised in The Post.

Little Chaps of Chicago Boys' Club to Be Radio Experts of Future

Literally hundreds of thousands of the youth of our country now are interested and at work on radio problems. We have then the future inventive genius of the world already preparing to add to its great contributions. Many of the present great inventions have been made by such young men lured on by the unique and romantic characteristics of their subject.—FROM A TALK BY OWEN D. YOUNG, CHAIRMAN OF THE BOARD OF THE GENERAL ELECTRIC COMPANY AND CHAIRMAN OF THE BOARD OF THE RADIO CORPORATION OF AMERICA.

BOYS of today are going to be the radio engineers and experts of the future. The Chicago Boys' club knows that the little chaps have keen minds, and is doing all it can to encourage the min the study of radio.

Out at the radio department of the Chicago Boys' club, at Club No. 2, 1725 Orchard street, there is a complete radio laboratory and workshop, where little fellows are given an opportunity to build and test receiving sets and experiment with various parts.

Get Good Results.

Remarkable results have been obtained in this workshop. Quite a number of the boys have developed unusual ability in their new craft.

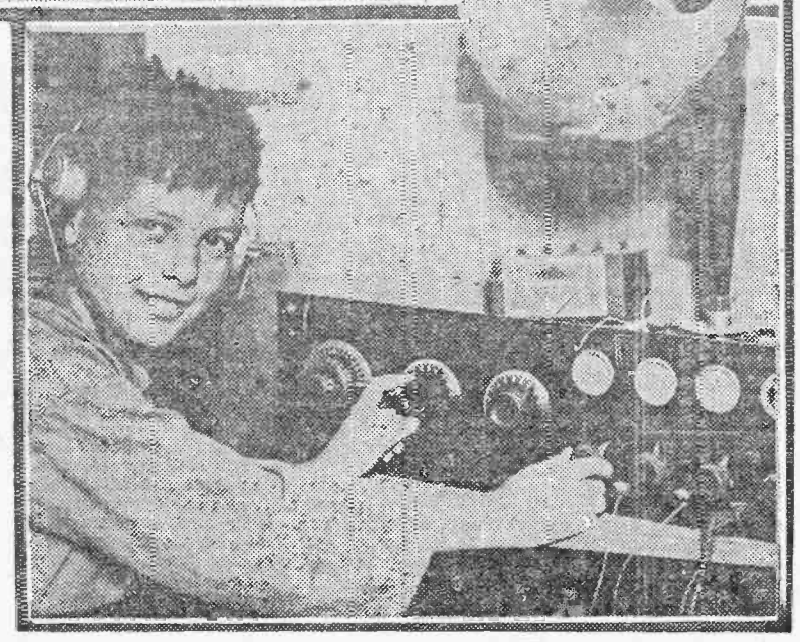
Be it a crystal set, four-circuit tuner or neutrodyne, you will find anywhere from one to dozens of them being constructed in the radio department of the club.

The club has now fostered the radio department for two years and has not only turned out hundreds of radiophans, but the sets made would make a real radio show all by themselves if they could be got together. All the way from crystal sets, which cost less than $1 (complete sets for phones), to massive outfits costing larger sums are being made.

Expert on Job.

An experimental department is conducted for testing hook-ups. This part of the work is under the direction of A. E. Haase, the club's radio expert. Classes in wireless telegraphy are being given so that radiophans turned out by this department can read code as well as listen to the voice over the radio phone.

The club is hoping to have an amateur station in the near future thru which it can transmit news items to the 4,000 boys who are members of the five branches of the Chicago Boys' club.



Boys from the Chicago Boys' club busy in the radio department of the club. Photograph at the top shows little chaps from Club No. 5 building and testing receiving sets. The center picture shows a few of the sets at the radio department at Club No. 2. Lower photo is that of Emil Roeder tuning in at Club No. 2. The boys in the top picture, from left to right, are: Joe Hadraber, Charles Lindquist, Edward Shaver, George Sklenicky, Adolph Barvansky and Clarence Hedstrom. (Photo by J. F. Maly.)

Radio Makes Strong Appeal to Chinese

The urge to broadcast and listen-in has reached Hongkong, China, where a few foreigners interested in radio got together about eight months ago and formed the Hongkong Radio society, membership in which now numbers more than a hundred. Today there are over 500 listeners-in, but it is estimated that this number will be doubled within a year's time.

So far there are only two broadcasting stations in Hongkong, one, a 100-watt American set, operated by the local telephone company which transmits phonograph music for an hour each evening; the other, a ten-watt Canadian made set is operated by the Radio Communication Co., Ltd.

The Chinese love anything mysterious, it is said, and consequently, radio telephony has a strong appeal to the natives.

Maybe you'd like to sell your set—and that's exactly the set some one else wishes to buy. Advertise it in the Classified Section of this magazine. 5 cents per word. See page 15.

Radio Full of Surprises for the Listeners

FAIRMONT, West Va., Feb. 14.—The element of surprise is generally conceded to be on of the major fascinations of radio. When one puts a record on a phonograph he knows exactly what he will hear. He may have listened to the same tune many times. On the other hand the radio receiver is full of mystery. When one turns the dials on his set he opens the door to the unexpected. Reception of programs is being standardized but that point is not yet reached.

This phase or philosophy of radio was emphasized here recently when Edward C. Jones Jr., district superintendent of the American Radio Relay league, the national association of radio amateurs, picked up his phones and heard a Canadian amateur station calling. Jones replied with his code transmitter. The surprise came when the Canadian, located in northern Ontario, suddenly shifted from code to phone and a voice from the air called: "Hello United States 8SP, this is Canadian 3GG calling you."

In a few minutes Jones, who is a clothing merchant in this place, learned that he had communicated with a radiophan in the gold mining area so far north that the Canuck, instead of giving his town and street address, called out his latitude and longitude. Not every clothier can get a thrill like that, out of the air anyway.

While the average phan would have been overcome with astonishment, Jones had an added advantage. He could talk back! He has one of the finest transmitting stations in this section and has been copied repeatedly in England and France as well as many times by ships in the North sea, Pacific ocean and South American waters. Amateurs in Holland Hawaii and Mexico have reported 8SP's signals.

The station, which is also operated by Albert G. Kisner, has many unique features in its construction and layout. The transmitter has a power of 150 watts, three 50-watt UV203's in parallel, with about 1,200 volts rectified A. C. on the plates. The sockets are arranged on the circumference of a circle, with grid and plate leads bunched and exactly the same length, and as short as possible.

Employes of Sweitzer Give Him a Radio Set

Employes of County Clerk Sweitzer have presented him with a radio receiving set. There was much ceremony in connection with the presentation of the set, and it was hooked up and messages received immediately. However, despite the ceremony and the receiving of messages, Mr. Sweitzer was pleased with the gift.

Gotham Board of Education Adopts Radio

For the first time in the history of education active use of radio broadcasting on an extensive and permanent basis as an educational aid will be inaugurated on Feb. 18, when the board of education of the city of New York, acting with the co-operation of the Radio Corporation of America, broadcasts thru station WJZ the first of the daily educational radio programs which have just been scheduled.

These programs, arranged by the newly created radio committee of the board of education, will be broadcast from 2 till 2:30 o'clock on every school day. A special and permanent broadcasting apparatus is to be installed in the office of Dr. William L. Ettinger, superintendent of schools, and the programs on every Tuesday afternoon will be broadcast by WJZ directly from there. On all other school days the programs will be given at the studio of station WJZ at Broadcast Central, Aeolian building.

The programs are designed primarily to acquaint the people with the work of the schools, to educate the public as to education. Superintendents of each department of the board of education will in turn explain exactly what is done in his department, and to what purpose. In addition, the pupils of each school will take part in the later programs with regular recitations, music lessons, glee club and school orchestra concerts, spelling bees, and special exercises for holidays.

New York city, it is said, is thus the first city in the world to recognize and utilize the extreme value of radiophone broadcasting in education, and the arrangements already consummated call for the largest municipal broadcasting program which has ever been scheduled.

You will find the classified advertisement section interesting. See Page 15.

WEAF Explains Power Increase in Broadcasting

The announcement of increased power by WEAF, New York, bears special interest to Chicago phans who are having trouble tuning out local stations. Here is what WEAF says:

"It has long been realized by radio engineers who have studied the situation here that there can be no further improvement in broadcasting conditions, particularly as regards spark telegraph interference, unless it is possible to increase the power of New York broadcasting stations. Increased power results in greater volume; it reduces the ratio of telegraph and static interference as compared with the broadcast program. This improvement applies not only to expensive receiving sets, but to the most modest equipment in operation.

"The owner of a crystal receiving set receives WEAF's program with much greater volume, and is consequently much better able to enjoy the program. Those possessing vacuum tube sets with many stages of amplification are able to operate successfully with reduced amplification, avoiding overloading of tubes and securing in consequence a much higher quality of reproduction. Sensitive receiving sets must, of course, be adapted by correct adjustments to receive properly under the new conditions. Audio-frequency amplifiers, if overloaded by signals of too great volume, do not reproduce as faithfully as they do when amplifying a current of normal volume.

Separate Wave Lengths.

"Receiving sets located within a short distance of WEAF's transmitter or those not adapted to selective tuning may at first interfere with satisfactory reception of other local broadcasting stations. However, this is a condition which certainly can be corrected by simple adjustments of the receiving sets. It may be recalled that when two-channel broadcasting operation was first inaugurated last year on 360 and 400 meters, listeners were troubled by interference, but by improvement of their sets now separate these two wave lengths without any difficulty. Similar difficulty was experienced when four-channel operation was undertaken in the metropolitan area.

"An indication of the selectivity obtainable with suitable receiving apparatus is given by the fact that 600 meter watch is maintained within a few feet of WEAF's antenna. A short receiving antenna is employed which successfully eliminates WEAF so that reception of ship wave lengths is possible. If this can be done within fifty feet of the broadcasting station, the feat can be duplicated at greater distances.

"One of the causes of difficulty which has frequently been noted is the use of antenna of too great lengths for local reception. A hundred-foot outdoor antenna may be suitable for long-distance reception while the local stations are not operating, but it may be unsuitable for interference-free local reception.

"The mail received so far at WEAF as a result of the increased power tests shows clearly that a great majority of the audience is served by increased power. Many who have been unable to hear WEAF in the past are for the first time enjoying satisfactory reception, and the small percentage of listeners who are suffering from interference will, it is anticipated, solve the interference difficulty by readjustment of their receiving apparatus."

Expert's View on 2 Kinds of Amplification

By M. C. Batsel.

(Radio Engineer, Westinghouse Electric and Manufacturing Company.)

CONSIDERABLE confusion exists regarding the functions of radio-frequency and audio-frequency amplifiers. The following paragraphs give the distinguishing differences between these two methods of amplification, and to point out the advantages of each.

If music or speech is received by means of a detector tube only, without regeneration or other amplification, the music is not very loud, even when received from a nearby, powerful station. Distant stations, tho received distinctly, may be so weak that they are heard with difficulty. When weak stations are heard distinctly, they may be made as loud as desired by using audio-frequency amplification. If head phones are to be used, there is little or no advantage in using more than one stage of audio-frequency amplification, as experience has shown that if the music or speech cannot be heard distinctly with one efficient stage of amplification and good head phones, they cannot be heard with any amount of audio-frequency.

If an efficient loud speaker is used two stages of audio-frequency amplification will give about the same strength as an ordinary phonograph, provided the music can be heard distinctly on the detector tube alone, and if sufficient power can be delivered by the last amplifying tube. It is often advisable to use two tubes in parallel in the last stage of amplification unless a much higher plate voltage is provided for this stage than is used for the first stage. Additional stages of audio-frequency amplification can be added to make the music or speech as loud as may be desired.

Insulate All Parts.

In order to preserve the quality of music and speech, the audio-frequency amplifier must be capable of amplifying practically all audible frequencies. All noises due to batteries and tubes are therefore amplified to the same extent as the music. For this reason it is necessary to use plate circuit batteries especially designed for use with vacuum tube amplifiers and to have all parts of the circuit well insulated.

Audio-frequency amplification is absolutely necessary for satisfactory operation of a loud-speaking receiver. Since the advent of radio broadcasting, much development work has been done to improve the audio-frequency amplifier, and, as a result, amplifiers have been developed which produce practically no distortion of music or speech and loud-speaking receivers are now available that reproduce music so accurately that it meets with the approval of the most exacting critic.

All radio detectors that can be used for the reception of music are least efficient when the received currents are weakest. For this reason radio-frequency amplification is desirable.

Radio-frequency amplification strengthens the received currents before they are changed to audio-frequency by the detector. Thus by using radio-frequency amplification, stations can be heard distinctly which cannot be heard on a simple detector with any amount of audio-frequency amplification.

Favors Armstrong Plan.

The most widely used and simplest form of the radio-frequency amplifier is the form represented by the Armstrong regenerative circuit. This is also the most efficient means of obtaining radio-frequency amplification. No additional tubes are required, the same tube being used as a radio-frequency amplifier and a detector. Most all efficient radio-frequency amplifiers that operate on the wave-length used for broadcasting, function because of regeneration.

The regenerative detector tube produces about the same amount of amplification as can be obtained by using two stages of radio-frequency with transformers. If more amplification is desired than can be had with a regenerative tube it is necessary to use at least three stages.

The benefits accruing from the use of a great amount of radio-frequency amplification are: It gives greater sensitivity; smaller antennae or coil antenna may be used; and, because of the greater sensitivity, very loosely coupled antenna and secondary circuits may be used, resulting in a great selectivity.

Expense Is Increased.

The greatest use for multistage radio-frequency amplifiers is where receivers are located in apartment houses or in other locations where an efficient antenna cannot be erected or when extremely weak stations are to be received. The loud-speaking receiver with three stages of radio-frequency amplification usually has at least six vacuum tubes. The expense of maintaining the tubes and batteries is, of course, greater in proportion to the number of tubes used.

During the summer months there is a greater freedom from atmosphereic disturbances when small antenna or coils are used with the radio-frequency amplification. This is due to the fact that the small antenna is less effected by atmospheric disturbances, than is the large antenna, in proportion to the energy received from the transmitting station.

The development of tubes requiring a small amount of filament energy and operating on dry cells should give a considerable impetus to the development of multistage radio-frequency amplifiers.

The elimination of the storage battery as a necessary part of the receiving equipment makes it possible for those who desire to operate a radio receiver in a well furnished room, to do so without danger of injuring the floor coverings and woodwork. The entire equipment using dry cells may be inclosed in an attractive cabinet and requires no attention except an occasional renewal of dry cells.

Radio Proves Big Aid to Farmers at Laredo, Texas

LAREDO, Texas, Feb. 14. — The farmer, regardless of his location, no longer is required to play a lone hand in the gamble with the changing seasons and big business. The co-operative marketing organizations came first and now radio has entered the fight in his defense and is tending to remove him still further from his isolation. Irrigation farmers in this vicinity get daily radio reports from the markets.

The prices of products raised in this section of the state are stabilized and the raisers given the advantage of knowing just what they should charge the consumer thru a radio service connecting them constantly with the state bureau of warehouses and markets. Not a day goes by but the grower knows exactly where he stands.

To make the service successful it was necessary to secure the assistance of WCM, the University of Texas station, and the sation of the signal corps at Fort McIntosh. With the help of these two radio units, the reports come in and are sent out from this city thru S. T. Phelps, operator of amateur station 5MT, one of the official relay stations of the American Radio Relay league.

The value of the service was emphasized by the market bureau as follows:

"We have not failed a single time to file the material with Austin 'fob' on the wire here to the thirty-one stations from Boston to San Francisco that are listed on the circuit, and we notice that the spinach reports as issued by Washington carry the information daily just as it is filed here. It looks as tho we were in a position to put across something big in radio. Already we have received considerable recognition for the consistent service we have been able to render thru amateur co-operation and that of WFO-WEAY, Houston."

Discussed 5-Day World Tour in Radio Speech

Touring the world by airplane in five days, at the rate of 200 miles an hour, covering 30,000 miles and passing over twenty-three countries, was a plan discussed in a radio talk by Maj. Gen. Patrick from Washington, D. C., this week. Maj. Gen. Patrick seemed to think the plan entirely feasible, and predicted that at no great distant date the feat will be accomplished. In connction with this plan, Maj. Gen. Patrick also described the plans for the army's around-the-world flight to be undertaken this summer.

New Marvel of Radio Makes Its Bow; Receiving Set Complete in Vanity Case

Compact Little Device Is Practical; Brings In Stations Without Antenna.

NOW comes radio in a vanity case.

Various designers and radio experts have built receiving sets in cigar boxes, suitcases, match boxes and what not, but here comes something new, something practical. It is a complete radio receiving set built like a watch and all installed in camera-size case.

Imagine for yourself the possibilities of a radio receiver in a case of this kind. There are a hundred and one ways it can be put to good use.

The society matron making a call, for instance, can take her own entertainment with her. If her hostess is dull, the caller can plug in on an ordinary electric light plug and cheer up the hostess.

A saleswoman calling on prospective customers from house to house can carry her own orchestra, brass band and lecturer right along in her little vanity case. She can get her prospect in good humor by tuning in on what happens to be in the air at that particular moment.

The actress or leading lady, sitting in her dressing-room waiting for her call, can plug in and hear what is agitating the ether. The shopgirl at her lunch hour or at her home in the evening can get some of the enjoyment furnished by radio. It is a boon to the schoolteacher. When the children are tired or unruly, five minutes of radio thru the little vanity set puts them in a happy mood again.

No Outside Wires Used.

This cunning little set has one control with which an amazing degree of selectivity is obtained. No outside wires of any kind are used. The set can be put into operation in any location, any place, any time, in five minutes.

The complete parts, including phone, aerial, ground, etc., are in one case 7 by 4 by 4 inches, covered with genuine leather. The set is very beautiful in its construction details, being lined with velvet.

The parts are arranged so as to secure the utmost compactness. The set may be operated at home, in the office, in a hotel, in an automobile, in fact anywhere one happens to be.

Successful in Tests.

One of the first sets was purchased by Miss Lenore Ulric, the stage and movie star, appearing in "Kiki" at the Powers theater. Miss Ulric's enthusiasm at the wonderful results obtained was unbounded. Her only statement was "Marvelous!" The volume was so great that the announcer's voice from WDAP was clearly distinguishable ten feet away from the phone, even tho the set was in the middle of the loop, in and surrounded by tall steel buildings.

Several other tests were made, several of which were from one to two floors below the level of the street. All of these were entirely satisfactory. The set has also been used in moving automobiles. It is called by the inventor, Lewis B. Hagerman, technical editor of the Radio Magazine, the "De Luxe Porta-Ceiver."

Radio Amateurs of Present Are Future Experts

"The assurance of the success and further development of radio largely depends upon the continued world-wide interest of the amateur," said Owen D. Young, chairman of the board of the General Electric company and chairman of the board of the Radio Corporation of America, in a recent talk from WGY in Schenectady, N. Y.

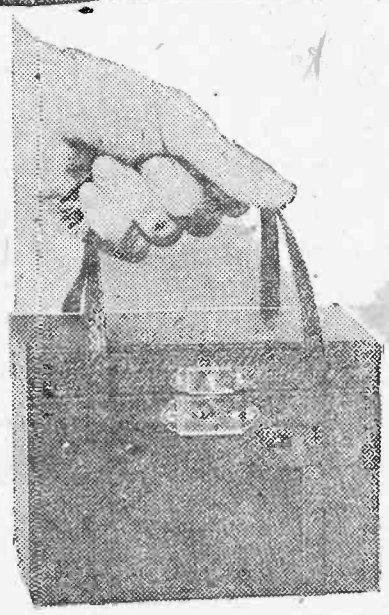
"I consider that one of the greatest assets of any new art is to have the youth of the world confident in its future. And what an immense resource this promises to be. This fact alone gives us assurance that radio is here to stay.

"History records clearly that the greatest inventions have been made by men under 30 years of age. Literally hundreds of thousands of the youth of our country now are interested and at work on radio problems. We have then the future inventive genius of the world already preparing to add to its great contributions. Many of the present great inventions have been made by such young men lured on by the unique and romantic characteristics of their subject.

"Mature scientists are seeing the latent possibilities of radio and are making great progress. The amateurs of today will be the scientists and radio engineers of tomorrow. Not only from the great research laboratory, but from that little spare room in the attic and that old workbench in the cellar will come great new discoveries."

Heard in Samoas.

Islands of the Southern Pacific ocean have been brought within range of American radio broadcasting. KGO, the new 1,000-watt station of the General Electric company at Oakland, Cal., was heard two evenings out of five at Apia, British Samoa, a distance of 4,750 miles from Oakland.



Improves "Jack"

James O. Reed submits the following solution for trouble with jacks in sets of more than one circuit:

"Considerable trouble is sometimes given by two-circuit jacks so that quite a few home builders are recommending the use of the single-circuit type, due to the fact that the leaves of the jacks sometimes fail to give sufficient pressure to make a good contact when the plug is pulled out.

"By doubling a small rubber band a few times and slipping over the outer jack springs, sufficient pressure will be aded to insure good contact."

Head Sets in Series

When using two head sets on a receiver, connect them in series. That is, with one tip of each set connected to one tip of the other, and the two free ends, or tips, inserted in the receiving set phone binding posts.

Jesse Crawford, organist, who plays in the Chicago theater's Saturday night radio revue broadcast over WMAQ, bought a portable radio for his office and listens in on the rest of the show after he has done his bit.

Two Honeycomb Coils Increase the Ultra Audion Circuit's Efficiency

By BENJAMIN E. FREUND.
(Chief Engineer Crossland-Pfaff Engineering Laboratories.)

TODAY I am to revive interest in the everfaithful ultra-audion circuit, the pioneer of circuits developed for adaptation to three-element vacuum tubes. Tho it appeared shortly after the discovery of the three-element tube by Dr. Lee de Forest, it has ranked high among the popular circuits, and up to the present day has been used as the nuceles of some of our most efficient circuits.

B. E. Freund.

Among some of the popular circuits built around the ultra-audion are the Superduc, Cockaday's four-circuit receiver, which was described a few weeks ago in the Radio Magazine.

As will be seen by referring to the tuning unit, the honeycomb or duo-lateral coil is used as the inductance. In place of using just one coil as customarily used for the ultra-audion circuit I have illustrated how two coils can be connected so that by varying the coupling between the two their mutual wavelength is increased or decreased as in the two windings of a variometer.

A variometer can be used with equally good results if desired in place of the two coils. The use of a variometer or two coils in place of a fixed inductance greatly increases the efficiency of the set.

The set is more flexible in evading and selecting one station from another; in fact, the selectivity of the set is increased about 30 per cent.

By observing the illustration it will also be noticed that a variable condenser is shown in the antenna circuit. This also allows a greater wavelength range with any one combination of coils.

Of course, the possibilities in wavelength range of this style of receiver are unlimited inasmuch as any desired wavelength can be obtained by inserting suitable coils. It is this flexibility in the covering of all wavelengths that makes honeycomb coils so popular.

In last week's article I explained the merits of the honeycomb and duo-lateral wound coils.

It was with this type of coil that the first consistent transatlantic reception was made possible.

The parts necessary to construct this receiver can be procured at a very moderate price.

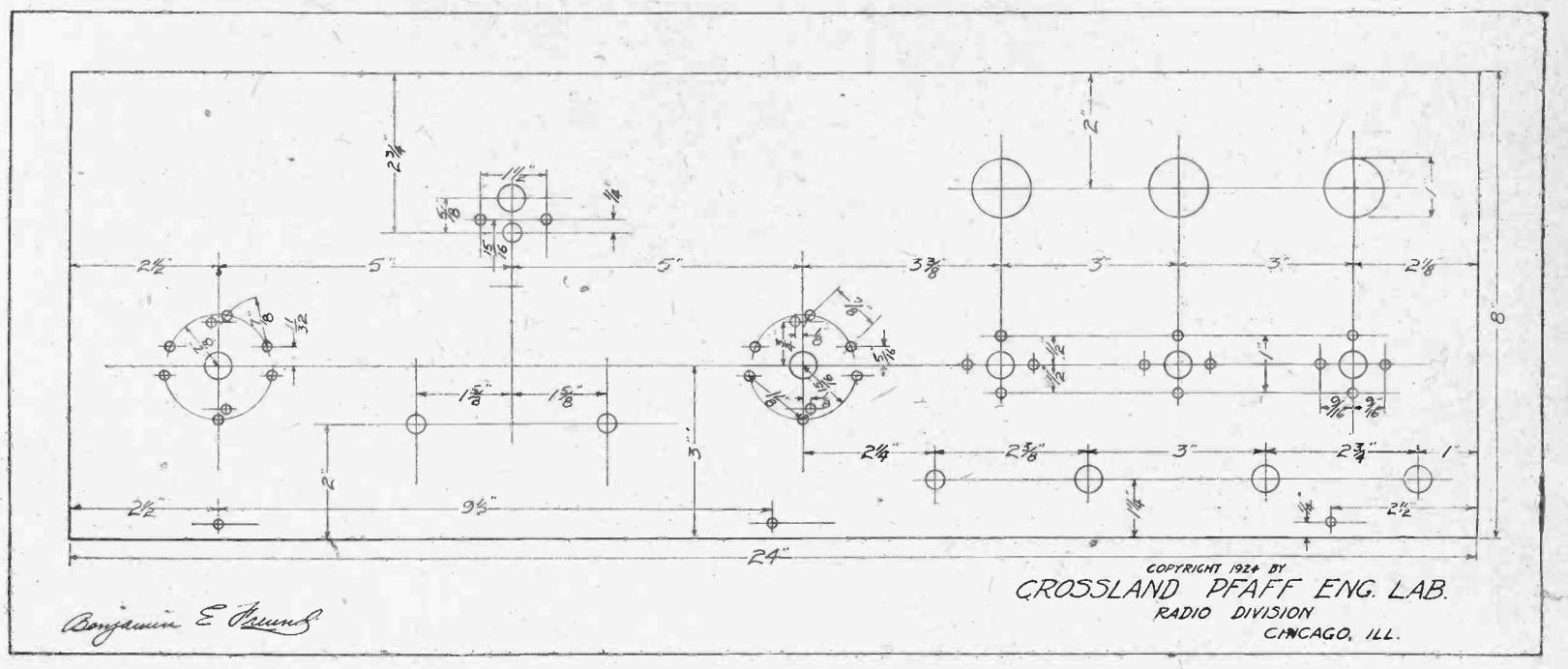
The necessary parts are two variable condensers (.0005 or .001 MFD.), a two or three coil mount and two 35-turn coils. A 35 and 50 turn coil will do just as well.

The wiring of these parts is shown in the illustration.

The .0005 or 23 plate variable condenser at the right end of the illustration is in series with the receiver in the antenna circuit. These parts are shown in the illustration.

On account of the numerous requests for a larger drawing of the drilling of the universal panel, I am reprinting the panel layout on a larger scale.

On account of the adaptability of the circuit to various circuits special parts had to be selected which were described and listed in the Jan. 10 issue of this magazine.



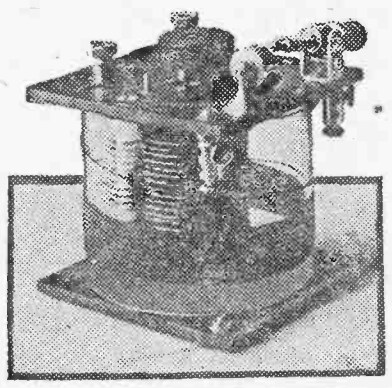
New Editor of Post Radio Magazine

D. D. Richards, experienced newspaperman and more recently interested in radio subjects, who has assumed the position of editor for The Post's Radio Magazine.

Designs New and Efficient Crystal Set

Edgar E. Webster of Downers Grove, Ill., has designed a compact crystal receiving set (shown in the accompanying photograph) which he claims will bring in distant stations clearly.

He says he has heard Minneapolis, Davenport, Iowa; Dallas, Texas; Jefferson City, Mo., and Pittsburg on his set, which is almost small enough to be carried in a coat pocket.

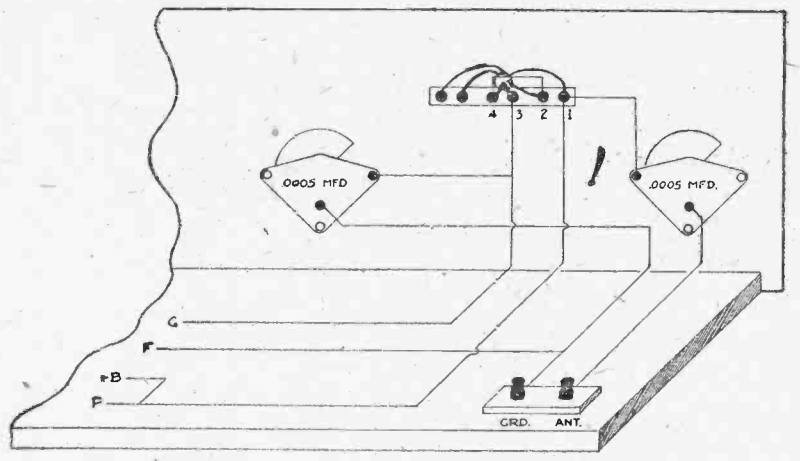


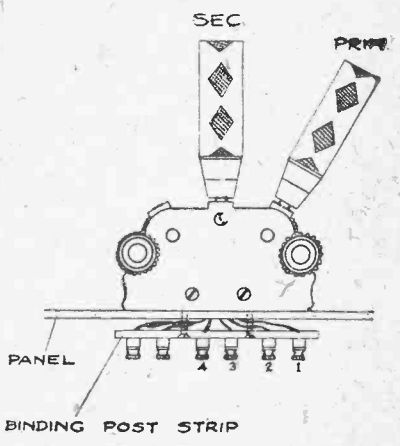
Cabinet and panel are dispensed with in the set, the coil being wound around a glass covered table mount condenser.

Mr. Webster says the set also brings splendid results when used as a wave trap. He says he gets Chicago stations at Downers Grove, twenty-two miles away, clearly.

Puts Aerial Condenser in Pan of Lubricating Oil

If you like to play around with your set here's a good one. Put your aerial condenser in a pan of high-grade lubricating oil. Fred Chapman of Waukegan tried the experiment. He found that signals came in louder in most cases. He reports, tho, that some of the time they were "not so good."





Sears-Roebuck Radio Station Opens March 1

Operation of the broadcast station to be opened by the Sears-Roebuck Agricultural foundation will begin about March 1, according to announcement made early this week. This station, which will be the largest constructed by the Western Electric company, will develop, it is said, a type of forensics differing from any now in use, which is expected to prevent absorption by the building in which the station is located and by other buildings as well.

Be sure to read the Classified Advertisements on page 15.

Radio-Frequency AddstoEfficiency of Receiving Set

Altho radio-frequency amplification is no mystery to the average experimenter or amateur, many who have but recently become interested would like to know something about it.

Radio-frequency amplification has been developed to a point of efficiency which makes it entirely satisfactory in the hands of the unskilled amateur.

One of the main reasons for the use of radio-frequency amplification is that it allows the detector tube to do its work more efficiently. As is well known, a detector tube will fail to respond to a signal whose strength is below that of a certain value. By employing a stage of radio frequency prior to the detector tube, as in Crosley radio apparatus, it is possible that a weak signal will be amplified by the radio-frequency stage to such a degree that the detector tube will find itself in a better position to rectify the signals.

Unlike audio-frequency amplification, radio frequency is not affected by disturbing tube and battery noises. This is so, because these noises are usually vibrations occurring at a relatively low rate and are effectively transmitted thru an amplifier designed for radio-frequency currents. In addition, selectivity is greatly increased. A variation of only twenty-five meters between sending stations is usually sufficient to bring in one station to the complete exclusion of the others.

In accounting for the failure of radio-frequency amplification to realize its full possibilities as well as to explain the failure of certain makes of transformers to live up to expectations, account must be taken of the fundamental difficulties that have to be overcome.

One of the obstacles has been the high capacity existing between the elements of tubes, a characteristic that presents great difficulties when using vacuum tubes as amplifiers.

The realization that the efficiency of radio-frequency amplification is directly dependent upon the accuracy with which the transformer is tuned to the incoming oscillates has aided transformer manufacturers. Correct application of this principle has resulted in transformers that are superior in range as well as in quality of reproduction in tone volume.—Crosley Radio Weekly.

Composers Laud Radio in Spreading of Tunes

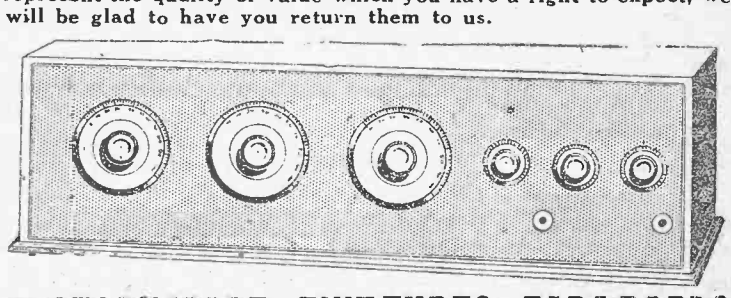
Composers and song-pluggers say the radio beats all old methods of popularizing new tunes. Lindsay McPhail, who wrote the dance hit, "Foolish Child," with Jack Nelson of WDAP, is one of the composers who gives radio credit over all other mediums of spreading tunes. A jazz tune by McPhail and Nelson recently won first prize in a radio contest.

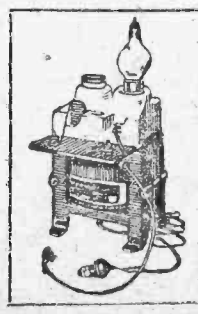
Lake Forest College Station in Operation

Lake Forest college now is operating a broadcasting station, WABA, on Wednesday evenings from 8 to 9, Central standard time. The programs consist of educational talks, literary selections, scientific information, and occasionally piano and orchestral music. It is the intention to put on programs which will be a real value to those who are interested in such things.

Dealer Sells Antenna Material Thru "Stunt"

A dealer in Connecticut made a series of snapshots of all the outside aerials that he could "shoot"—made a great big center display in the windows of the prints and put the question below, "Which is yours?" Some with poorly constructed aerials bought the necessary material to put up new ones.





Oak Park's New Station Is Broadcasting Pleasing Programs

Here is the new station Chicago phans have been asking about for the last few days. Oak Leaves station WTAY will go on the air five evenings each week from the Oak Park Arms hotel. Here are the machines that put out the programs and the people who arrange them.—THE EDITOR.

THE gap between 6 p. m. and 8 p. m. in Chicago radio programs has been filled. The Oak Leaves station WTAY opened fire last Saturday night with an early evening musical.

The Oak Park Arms hotel, Oak Park avenue and Washington boulevard, is the home of the new station. The antenna may be seen for blocks, giving an urban touch to the western suburb.

Just below the roof one may find the operating-room, if one is persevering enough to pick his way thru sundry janitorial materials. "WTAY is out for service—not for looks," was the word of the efficient L. E. Dutton as he was discovered making tests the other afternoon. Mr. Dutton is the operator.

Of 500-Watt Power.

As he tested for wavelength and frequency he answered questions to the following effect: Five hundred watts is the power. The station is on the air every night, except Monday and Sunday, from 6:15 to 8:15. It is owned and operated by the Pioneer Publishing company, publishers of Oak Leaves.

At present microphones are located in the hotel lounge. It is rumored the artists rather like the lounge. Arrangements are being made, however, to equip an upper floor room as a modern broadcasting studio.

Hugh B. Marshall is studio manager and Margaret Farr musical director. From concerts already received local plans have passed favorable judgment on these masters of ceremonies.

Looking down the list of coming features we find an agreeable array varying from "humorist" and "whistler" to "soprano" and "violinist."

Welcomed by Phans.

The usual "kicks" have come in. John Doe, living within a few blocks of the hotel, can't tune out. And the usual replies are being made: "Tune more carefully." But the weight of opinion lies with those who are glad that Oak Park has come on the radio map.

WTAY is not a new name to radio phans. The Iodar-Oak Leaves station was heard announcing those call letters last summer. But the present WTAY is an entirely new organization.

Exclusive views taken for the Radio Magazine of the new Oak Leaves broadcasting station, WTAY, at Oak Park. At the top is shown a corner of the studio. Hugh B. Marshall, studio director, is at the microphone; Mrs. H. B. Marshall at the piano. In the circle is Margaret Farr, musical director. L. E. Dutton, engineer in charge, is shown operating the transmitter in the lower photograph.

WOAW Will Broadcast Osteopathic Program

Station WOAW will help the Greater Omaha Osteopathic association celebrate the semicentennial of the founding of osteopathy on Feb. 18. It will broadcast a musical program and a brief historical sketch of osteopathy by Dr. C. J. Gaddis, Chicago, secretary of the American Oeteopathic association. Chicago osteopathic clubs, societies and fraternities will hold group meetings to "listen in" and will wire greetings to the Omaha association.

Enjoys Artist's Concerts; Sends Him a Guitar

Nick Lucas guitar virtuoso for WJAZ, the Zenith-Edgewater Beach broadcasting station, is blessing a resident of Chicago, donor of a handsome guitar. The person who wished to give this present to Mr. Lucas did not want his name known. He sent the guitar to the station with the information that he had enjoyed the work of Mr. Lucas so much he wanted to do something to show his appreciation.

You will find the classified advertisement section interesting. See Page 15.

Demonstrate Experimental Loud Talker

In a demonstration and technical paper delivered before the midwinter convention of the American Institute of Electrical Engineers at Philadelphia on Feb. 8 by W. H. Martin and H. Fletcher, engineers of the American Telephone and Telegraph company and Western Electric company, respectively, a thoro discussion of quality in broadcast reproduction of music was discussed. Many points of great interest to radio listeners were brought out. An idea of the complexity of the problem is given according to these engineers by the extraordinary range of frequencies and variation in volume which are encountered in the transmission of radio music.

The most remarkable piece of apparatus employed during the demonstration was a new and experimental form of loud speaker. Two of these instruments were hung over the stage and two others in the upper rear of the ballroom of the Bellevue Stratford. This arrangement made it possible to reproduce the Wanamaker organ and its echo organ in the ballroom with astonishing fidelity, the deep, rich tones of the pedals coming thru with the same clearness as the higher tones.

Not Yet on Market.

The loud speakers are a recent development of the telephone laboratories, but are not yet available in the market. In addition to the organ selections, other musical numbers were reproduced with all the reality of life.

Both music and speech consist of combinations of sound waves of many differing frequencies. The notes of music range all the way from the lowest tones of the organ and the kettle drum, which are in the neighborhood of sixteen vibrations per second, up to the high overtones of the violin and the piccolo, which may exceed even 10,000 vibrations per second. The sounds of speech do not cover quite as wide a range of frequencies as those occurring in music. In general, most of the energy of speech is carried by the vowel sounds and at frequencies below 1,000 vibrations per second, but the fine modulations of the vowels which produce the stop consonants involved frequencies mostly above 1,000 vibrations or cycles. The production of the fricative consonants also involves higher frequencies and it was found that such sounds as "S" and "F" and "TH" have their sound spectra in the frequency range between 4,000 and 10,000 cycles.

Such a broad band of frequencies need not be transmitted in order to make speech intelligble. For example, a transmitting system, be it either wire or radio, which carries a frequency range from 500 to 2,000 cycles reproduces speech which can be easily understood. Altho these limited frequencies give intelligibility, they do not give a natural reproduction. For this reason a wider frequency range is used in broadcasting. A frequency range from 100 to 3,000 cycles gives a satisfactory degree of naturalness in broadcasting speech. Appreciable improvement is obtained by the extension of the upper end of the range to 4,000 cycles, and preferably it should be placed much higher.

Good Reproduction Obtained.

In broadcasting music, the broad sweep of its frequencies from about sixteen cycles to 10,000 cycles makes its proper handling extremely difficult, particularly when the large energy of some of the low notes such as used in the pipe organ are taken into account. However, it has been found that by transmitting a frequency range from 50 to 5,000 cycles good reproduction of most kinds of music can be given.

Another problem which offers many difficulties is the wide variation in volume which must be handled in the case of certain musical instruments.

This, according to the authors of the paper in question, constitutes one of the phases of the technique of broadcasting which requires constant attention. For speech, the variation in average power is of the order of 1,000 to 1. In music, and especially that such as is given by a symphony orchestra, the energy variation between the softest and the loudest passages may be as great as 100,000 to 1. In the present state of the electrical art it is not practicable to handle such an enormous range of volume in broadcasting. This limitation arises not so much from the capacity of the broadcasting apparatus as from the existence of extraneous noise. The softest musical passages when broadcast must be made sufficiently loud to override static and other electrical interference in the ether, receiving set noise and any incidental noise. When the softest passages are made loud enough to overcome such extraneous interference, it would be extremely expensive to provide the equipment for making the loudest passages 100,000 times as loud.

Consequently, good broadcasting requires a skilled listener and a monitoring device at the point where the program is picked up. The function of this listener is to adjust the amplifier in the broadcasting system so that its output will take due account of changes in loudness in the program. These changes in loudness must not be unduly reduced, but they must be made such as will carry best to the radio audience, without overloading any element in the broadcasting system. The skillful operation of monitoring equipment is an important factor in WEAF's successful broadcasting of such orchestras as the Capitol Symphony, the New York Symphony and the Philharmonic.

His Piano Test Puts O. K. on Radio

MORGAN L. EASTMAN of KYW recently tried a new stunt in music broadcasting. He struck a note on the studio piano and asked the phans listening in to write the note he touched. More than 3,000 replies came in from every state in the union and from Canada. Two-thirds of these responses named the note correctly.

100-Mile Wire Links Studio to WBZ Station

"This is the Boston Herald-Traveler-Westinghouse studio of station WBZ, located on the Brunswick hotel, Boston," is the announcement that will be heard for the first time in the near future heralding the opening of a radio studio broadcasting station 100 miles distant. Altho broadcasts have been made by other stations at various times at distant points from the station, this is the first time that a studio is located permanently at such a distance from the station for every-night all-the-year-round broadcasts.

This broadcasting system has been jointly worked out by the Boston Herald-Traveler, the Westinghouse Electric and Manufacturing company and the Brunswick hotel. On the top of the Brunswick hotel has been built a studio that equals anything that has been done in the past for convenience and beauty.

In order to make the project successful, it was necessary to have constructed an entirely new line from Boston to Springfield, by the Western Union company. This line is slightly over 100 miles in length and connects the studio at the Brunswick with the radio station at East Springfield. It is built of heavy copper wire even much larger than the ordinary telephone line; so that it will withstand breakage, and always be suitable for broadcasting. The line was transposed three times as often as the ordinary telephone line is transposed, in order to keep out any noise that might be heard, due to other telephone lines near-by.

At Springfield this telephone line goes to station WBZ of the Westinghouse company located at this company's plant. For the past two months the radio station has been undergoing a complete renovation so that when the studio opens, everything will be in first-class condition. The signals will radiate from the long antenna 210 feet above ground and supported from massive steel towers.

Takes Tin-Pan Sound Out of Speaker Horn

It is reported that a Belgian amateur, C. Dambal, is meeting with success in suppressing the metallic vibrations of loud speaker horns. He makes use of a composition of pitch from Judea and paraffin, dipping the horn in this mixture. The horn is subsequently covered with a very uniform coat of a dark brown fluid. Mr. Dambal states that the nasal quality of the horn is completely abolished and excellent quality is to be gotten from even poor horns after this treatment.

Minneapolis Program Is Heard in Norway

Radio fans of Minneapolis are jubilant over the fact that the voice of WLAG, known as "The Call of hte North," has been heard in Kragero, Norway, by residents of Minneapolis in Norway on a visit. The reception of the Minneapolis program in Norway was reported to station WLAG by letter from Kragero. It is estimated that the place in Norway which heard the Minneapolis program is 5,200 miles away from the sending station.

Lodge Installation Work Is Broadcast by Radio

The Independent Order of Odd Fellows held the center of the microphonic stage in the WLW studio of the Crossley Radio corporation at Cincinnati, Tuesday evening, Feb. 12. For the first time in the history of radio the installation of officers and other work of the order was broadcast. Officers of one of the Cincinnati lodges did the work in the studio and radio carried it to the listening world.

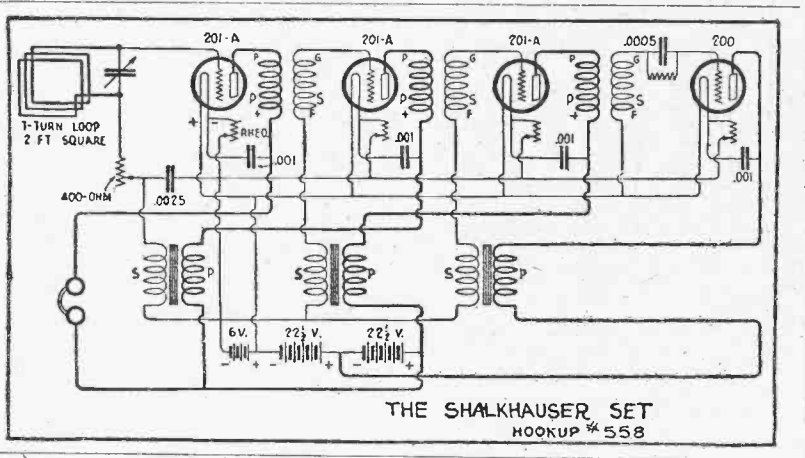
You will find the classified advertisements on Page 15.

Questions You Ask and Answers We Give

DIAGRAM IS NOT CLEAR.

1294—CHICAGO: I would like to have you check up my hook-up. I don't know if you can make out this hook-up. It is called tuned plate and grid circuit. I have used first-class material to make this set, including bakelite variometers of Manhattan 180-degree make. One Thordarson variable condenser, vernier 43-plate, one Howard rheostat, 25 ohms, not vernier. I used No. 14 covered wire to wind this set. Bakelite socket, Freshman variable grid leak .00025 loud, 201-A tube, four dry cells, one 22½ "B" battery. I receive local stations first rate. Now, friends of mine get out of town on one tube, but all I get is howl and whistle. My aerial consists of three wires forty-five feet long twisted together on roof of house. I have tried this set on a storage 6-volt battery and a Western Electric tube without any results. Since I built this set I have seen the Autoplex drawing in your magazine, which I think is very fine reading, and with the material I have it would not be hard to rebuild this set into an Autoplex. Do you think it would pay me to rebuild my set, or could you give me some pointers on how I could get out of town? This set is spaced out on a panel 14 by 7, three-sixteenths thick, and is not in cabinet; just mounted on board.

We are unable to check your set from mailed diagram. A circuit using your parts is shown.



THE SHALKHAUSER SET
HOOKUP # 558

BEST TUBES FOR REINARTZ.

1293—CHICAGO: Your Magazine is certainly a wonder and I enjoy it very much. I am using a three-tube Reinartz set that I made myself, but don't seem to be getting the results that I should. I use WD-12 tubes. All American type R21 five to one transformers. What per cent efficient is a Reinartz using WD-12 tubes? Would any other dry cell tubes work better, and if so what one? Would a 1,500-turn honeycomb coil tapped five times inserted between the detector and first stage increase the volume or distance? About the only outside station that I can get on my loud speaker is KDKA and WGY. Should my set do better? Would six-volt tubes increase my distance and volume and which ones are best? My aerial consists of two wires six feet apart, about sixty-two feet long running northwest to southwest. I never get St. Louis stations. Hardly ever hear Davenport, but have had Kansas City fine and in September I got Dallas regular, altho I haven't had them during December.

WD-12 tubes compared to storage battery tubes in a Reinartz set are about 80 per cent efficient. UV-199 tubes would be better for amplification. A 1,500-turn honeycomb coil might increase your volume according to the type of Reinartz you are using. Your results are fairly good. UV-200 tube for detector and UV-201-A tubes for amplifiers would increase your volume. Your aerial is not the best. Your wire, 100 feet long, would be much better.

ELIMINATION OF HUM.

1292—CHICAGO: I recently built a three-tube ultra-audion receiver with which I am having trouble that I cannot locate. This trouble consists of a steady, constant, low pitched hum in the phones, not noticeable on the detector, but very loud on the first stage of amplification. This hum is not due to leakage or loose joints in the aerial as all joints are well soldered and efficient insulators are used on the aerial and lead-in wire. I do not think it is due to faulty construction of the set, as all the parts used are of the best obtainable, the wiring is run in a neat and orderly manner and all joints are soldered. UV-199 tubes and Burgess dry cells, all new and from fresh stock, are used. The grid leak is a Freshman Variable and grid condenser is a Freshman mica. I might mention that the 23-plate condenser is mounted inside the tube on which the aerial inductance is wound, in order to save panel space. I am not exactly a novice at this game, having built eleven tube sets previously to the one described above. This hum is distinctly heard by connecting the phone terminals directly to the ground and aerial. The steam pipe to the radiator is used for a ground, as tests proved it to be the best. On first thought one would say that the hum was caused by induction from near-by power lines, but a review of some of my past experiences, related below, throws some doubt upon this theory.

The set was connected to a single wire aerial, 150 feet long, at right angles to some A. C. power lines mounted on poles in the alley. One end of the aerial is about 30 feet from the power lines and the lead in is taken off of the opposite end. The hum was present. Then the set was connected to a two-wire aerial, 90 feet long, at right angles to these power lines. One end of this aerial was 150 feet from the power lines and the lead-in was taken from the opposite end. The hum was also present. The set was next connected to a single wire aerial, 75 feet long, parallel to the power lines and 150 feet distant from them. The hum was still present. All three of the above aerials were located on top of an apartment building at 1903 Winnemac avenue. The Robey street cars are far enough away to be out of hearing as they go banging by. This same set was connected to a 2-wire 150-foot aerial, located on the roof of a three-story building at 1012 North LaSalle street. D. C. current is used in this district and the wires are run in underground conduits not more than 50 feet from and parallel to the aerial. The set itself was located about 20 feet from the wires. The hum was entirely absent, even on the second stage of amplification, and the set worked very satisfactorily, even bringing in California stations clearly. The quality of reception was almost at good as that obtained with a crystal set. I constructed another ultra-audion detector set, using Western Electric 216-A tubes and connected it to a two-wire aerial, 80 feet long, located at 4665 Virginia avenue. The aerial was at an angle of 45 degrees to the A. C. power lines on poles in the alley and also to the third rail of the elevated in the alley. In this case the end of the aerial to which the lead-in was connected was about 15 feet from the power lines and for a distance of about 30 feet the lead-in ran parallel to these power lines and to the third rail. The hum was so loud it drowned out even local stations. It was impossible for me to locate the trouble.

I became sore but not discouraged. I then built another set exactly like the one described above. I used the same tube but different parts. I connected this set to the same aerial and ground previously used and the hum was entirely absent and the set worked very well. By connecting the phone terminals directly to the aerial and ground the hum was distinctly heard.

Having a Reinartz coil and switches on hand I hastily constructed a Reinartz set and added four stages of audio-frequency, using 216A tubes. The hum was entirely absent even on the last stage of amplification. I am going to build the Old Reliable three-circuit Armstrong that you are describing in The Post Radio Magazine. Have even gone so far as to purchase the Kellogg condensers and variometers. Have also obtained an empty victrola cabinet, upright style, in which to mount the set, as I wish to have a nice piece of furniture as well. Any information or suggestions that you may furnish to enable me to be rid of this hum will be greatly appreciated. I have consulted some of the electrical engineers of the company whose name appears at the top of this letter and they inform me that the inductive field of a 4,000-volt A. C. line is not more than two feet in diameter and for this reason is not likely to be the cause of the trouble. When I have completed the "Old Reliable" I am going to be mighty sore if I find this hum in it and will probably be driven to radio-frequency amplification and a loop.

Without question the hum you mention is caused by induction from the power lines of which you speak. It will be impossible for a set to eliminate a disturbance that is so strong that it will accenuate the diaphragm of the phone even without a set. A possible method of eliminating this would be to run one wire parallel to and the full length of your present aerial, grounding one end of this.

FREE SERVICE

QUESTIONS asked on any subject pertaining to radio will be answered in this department in either the daily edition or the Radio Magazine published each Thursday. No charges are made for this service.

Due to the immense volume of letters being received by the Question and Answer department, the following restrictions must be made:

All letters must be plainly written in ink and perferably typewritten, and only on one side of the paper.

Drawings, hook-ups, etc., must be on a separate sheet from question and clearly drawn, showing values of parts.

Do not ask for panel layouts, construction details, etc., for a set unless they have appeared in the columns of this magazine. Self-addressed and stamped envelope must be inclosed. Address all your letters to Radio Questions and Answers Department, The Chicago Evening Post, 12-14 South Market Street, Chicago.

DONALDSON NEUTRODYNE.

1301—CHICAGO: I am an ardent fan and much interested in your Radio Magazine each week. In the one of Dec. 20, you show a compact neutrodyne set by R. C. Donaldson. Kindly send me a correct diagram of this. I notice the A plus and A minus are shown to the same lead to rheostats.

A corrected diagram for Donaldson's neutrodyne set has been mailed.

EIGHT TAPS FOR KELLOGG.

1298—CHICAGO: Could you please send me some information on the Reflex hook-up. In your first issue on the reflex you stated that a variocoupler with twelve taps should be used, and in your later issue you gave some information on some of the best variocouplers to be used on the reflex, and in this article the Kellogg variocoupler has been mentioned, but the Kellogg has only eight taps. Do you think eight taps is plenty, or are there Kellogg variocouplers with twelve taps. Also could you please tell me how I can drill thru glass, as I intend to make a glass cabinet if I succeed with my first one.

A reflex circuit generally uses a variocoupler with twelve taps, but a Kellogg with eight is O. K. To drill glass, use a common steel bit, tempering with turpentine.

USE OF RIBBBON AERIAL.

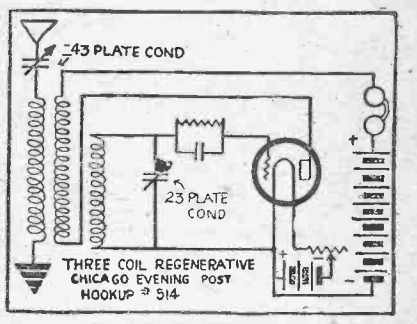
1295—DOWNERS GROVE: I want to use a ribbon aerial on a long-distance set. What is best size aerial to use and shall I run the ribbon right down to my set or just use ribbon on the aerial and a copper wire from aerial to set? How long an aerial? I live in Downers Grove, in country; no electric wires around and live on a hill.

Use 100 feet of aerial and run the ribbon direct to the set, being sure to insulate it thoroly.

CIRCUIT APPARENTLY O. K.

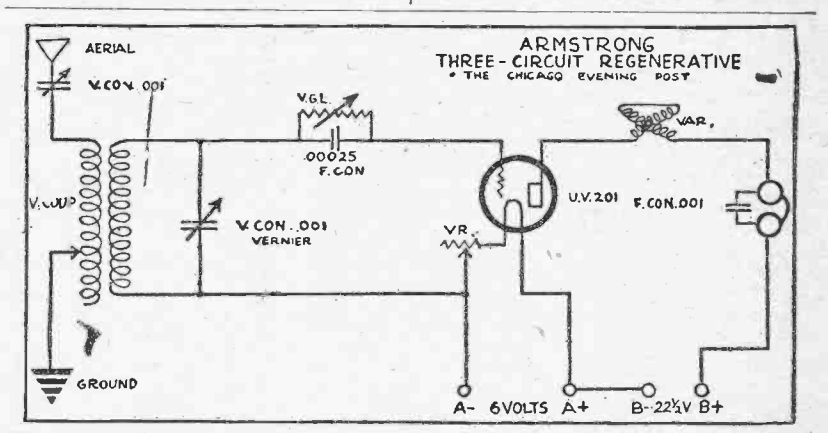
1288—CHICAGO: Have been reading with interest your radio section every week, and your handling of the various problems assures me that you can help me out with mine. I have a set as shown in attached diagram, which you will note is similar to the "Zenith" receiver. All I have been able to get with this was local broadcasting. This I get fairly good, but all the tuning must be done with the taps. The condenser tuning is broad and the tickler has no effect whatever. Have tried 17-plate and 23-plate and 43-plate condensers, the 43-plate working sharpest. This set has been very carefully made and should be good on long distance, but does not seem to regenerate. Does it make any difference which end of the "tickler" goes to the plate and can you tell me if the number of coils on the "tickler" and "secondary" are correct? Have a first-class antenna, single wire, 100 feet. Works fine with other sets. If you can check this over for me and suggest something that will help me get this set working corectly I will be greatly indebted to you.

Your circuit is apparently O. K. The coupling between the primary, secondary and tickler should be very close. We are returning mailed circuit, changed the polarities of your batteries and the position of your rheostat to agree with it.



GOOD RESULTS WITH SUPERDUC.

1200—CHICAGO: In replying to your request of Jan. 3 in regards to the result on your new superduc set, wish to state that I received the following on loud speaker: KDKA, WCDP, KFKX, WDAF, WGR, WHAZ, WLW, WOC, WOS, WTAZ, WOR, WRC, WGY. Also GBM, Northern Electric company, Montreal, Canada, received Monday, Jan. 7, also Jan. 14. I would like to know if it is possible to add one step of push-



Continued on Page 12.

Questions You Ask and Answers We Give

Continued from Page 11.

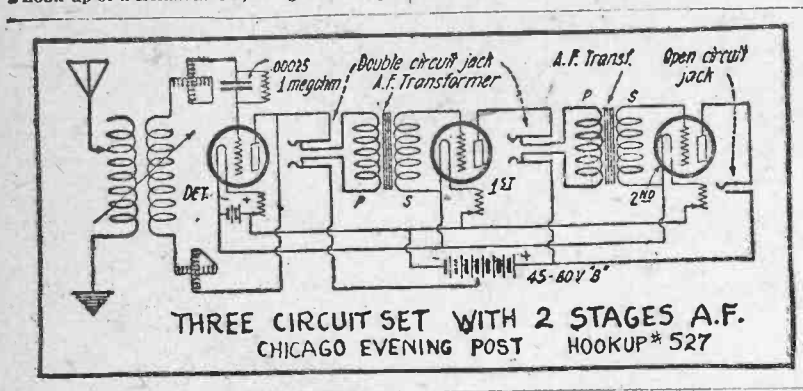
pull transformer to a two-step audio so as to receive more volume on out-of-town stations; if so, please send hook-up.

The hook-up you request for one stage of push-pull amplification is shown.

TWO STAGES IMPRACTICAL.

1291—Chicago: Will you kindly send me a hook-up of a Reinartz set, using two stages of radio-frequency, the detector and two stages of audio-frequency, using WD-11 tubes. Would I be able to operate this set on a loop aerial and how far should I be able to receive? Think the Radio Magazine on Thursday is the thing. Have not missed an edition yet.

We have not the hook-up you request, as two stages of radio-frequency is not practical on the Reinartz set. A circuit showing one stage of radio-frequency is shown.



THREE CIRCUIT SET WITH 2 STAGES A.F.
CHICAGO EVENING POST HOOKUP * 527

ARMSTRONG REGENERATIVE.

1201—CHICAGO: Kindly publish the Armstrong regenerative hook-up in your next magazine. What will cause a tube to choke up? I have a good vernier rheostat and have tried several grid leaks. I get a station loud but not clear. When I try to clear it up my tube stops oscillating. I also changed filament connections.

The hook-up you request is shown. Your tube chokes because you are probably using the wrong amount of "B" battery. Try varying this until the correct voltage is found.

SUPERDUC HOOK-UP.

1206—CHICAGO: I would appreciate if you could give me a hook-up of your Superduc with one stage of audio. I have a Reinartz two-tube set and have trouble getting DX stations. I cannot wait until Thursday to get your radio section. It is the best one yet.

The hook-up you request is shown.

THREE-CIRCUIT REGENERATIVE.

1203—CHICAGO: I would like to build myself a set. I like the Armstrong three-circuit regenerative receiver set the best. Will it be strong enough to bring in stations like Havana, Cuba; Mexico City, Los Angeles? Can I use UV-199 tubes on this set? Can I use UV-199 tubes for all three, or must there be a different one as detector? Would a 44-plate variable condenser with 5-plate vernier be better for finer tuning or is the 43-plate vernier better? Would you please send me a drawing or a blue print of "Old Reliable."

The three-circuit regenerative set will receive as far as you specify. UV-199 tubes will work O. K. with the proper "C" battery. Of course, more volume would be obtained with storage battery tubes. A 44-plate variable condenser will work just as well as a 43-plate. The hook-up you request is shown.

HAGERMAN CRYSTAL.

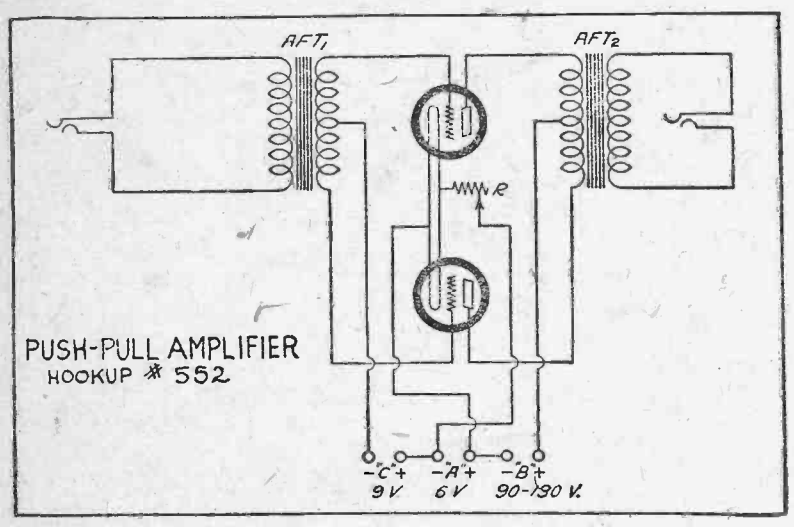
1205—CHICAGO: Please send or publish the hookup for the Long Distance Crystal Receiving Set that you published.

The hook-up of long-distance crystal set is shown.

BETTER THAN DRY CELLS.

1202—CHICAGO: As a constant reader of your column, I will take the liberty to ask you a few questions, which I hope you will answer as you have so kindly done for so many others. There is an "A" and "B" battery made by the Welch Battery Company of Flint, Mich., the parts of which are sold separate and the phan can make them up in a Mason fruit jar. Is this battery dependable, and would there be any danger of it burning out a UV-201 A tube? They claim that this battery, when consisting of several of these jars connected together can be charged thru a rectifier, the same as any storage battery, and that it causes less noise in the tubes. From the looks of them is seen a possibility, but I am not up well enough on batteries to judge. If these batteries are all right they will make a great saving over the regular storage battery, and while they are kind of bulky, still, space does not matter so much with me, as I am using a console type cabinet.

We are not familiar with the "A" and "B" battery you mention in your letter. It is possible tho to make a battery of this kind. If properly constructed, it would be much better than dry cells.



REFLEX SET.

1313—DULUTH: I have an Aeriola Senior receiving set which I would like to convert into a one-tube reflex, using UV-199 tube. I inclose the Aeriola Senior hook-up, and I would like to have you indicate thereon the necessary changes to make it a reflex circuit, and any other information you may be able to give me will be greatly appreciated.

Hook-up of one-tube reflex set, as per your request, has been mailed.

ULTRA-AUDION.

1309—CHICAGO: I recently listened in on a very good set made up of a variometer and a variable condenser. It is much better than a Reinartz set I have. Kindly send me any comment you might care to make and a hook-up of the variometer and variable condenser set, showing capacity of all condensers.

Diagram of an ultra-audion hook-up with variometer and variable condenser, as per your request, has been mailed.

NEUTRODYNE SET.

1308—CHICAGO: I am anxious to build a receiving set as large as five tubes and would like a little advice as to what set to build. I have an Erla three-tube reflex and am not satisfied, after 10 o'clock at night. I have no selectivity, as I cannot get by WJAZ and WDAF. Now, I would like to build a set that I could get out of town while these stations are broadcasting if it is possible to do so. How is the Sun receiving set or the Fada neutrodyne, and would it make any difference in the efficiency in regard to volume and selectivity if I were to build it a little larger so that it would not be so compact for it would be a little easier to work on? I am thinking of building either one of these sets and would appreciate your candid opinion as to which one would give me the best results. Or recommend a set that is better than these two if you know of any.

We would recommend the neutrodyne set for your requirements.

BODY CAPACITY.

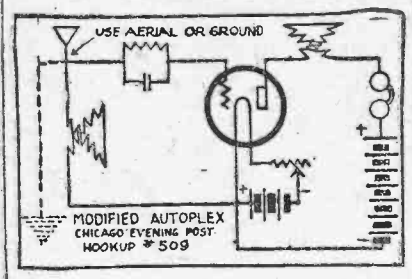
1310—CHICAGO: Will you answer this question for me concerning radio? What causes body capacity? When I put my hands near the dials of the machine there seems to be a strange noise and I find it hard to tune the same. What can I do to stop this?

When tuning a set your body collects energy the same as an aerial. It is this energy that causes the interference you mention which is commonly called "body capacity." There is no practical way to eliminate this. Vernier knobs on the dials would help.

WAVELENGTH.

1316—CHICAGO: I have the old Armstrong regenerative one-tube set, two variometers and variocoupler, the variocoupler between the two variometers. I seem to be able to get stations with lengths of 500 meters and down distinctly in a radius of 300 miles, but over and including KYW I have poor results since the change in wavelength. I am using WD-11 tube, 1½-volt unit 4-cell power A battery and 22½-volt tapped B battery. I have a Murdock variable 23-plate condenser between ground on aerial. Results are good except as stated above, no howling or body capacity to speak of. With this arrangement results are good except KYW and stations over 500 meters. Now, is there a coil or something like a wave-trap that I can insert on the outside of my set to pick up stations of 500 meters and over? I hear KWY faintly. What I want to do is lengthen the wavelength of my set without changing the set over or the aerial. Aerial is a four-wire, each wire about twenty feet long. I look forward every week for your magazine; also have one of your binders to preserve same.

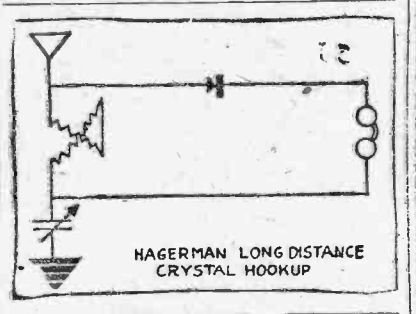
To raise the wave-length of your set, insert a 75-turn honeycomb coil in series with the grid and plate leads of your tube.



DETECTOR TUBE.

1320—AURORA: My Atwater Kent radiodyne set does not give me enough volume to operate a Magnavox loud speaker. What can be the cause? I have inspected my aerial (135 feet single wire, including lead-in wire) and find it O. K., and the results are no better with a twenty-foot indoor aerial. My B battery tests 90 volts and I have just recharged the A battery. Also the connections from batteries to machine are O. K. There is one binding post on the machine calling for a plus 20-volt. I noticed the results are the same whether the plus 20 wire is on or off the binding post. I use four Cunningham amplifying tubes and one detector tube, also Cunningham. Can you suggest anything to remedy this difficulty (lack of sufficient volume)?

There must be something wrong in the wiring of your set. It will be impossible for us to locate this without a wiring diagram. Try an amplifying tube for a detector with 45 volts on the plate.



RHEOSTAT OHMAGE.

1919—CHICAGO: I am inclosing slip showing winding of a Reinartz coil, which, I am told, will receive up to 360 meters. Where must I add wire to increase the range up to 500 or 600 meters? What is a good hook-up for a single tube set using this coil? I was contemplating using this one. How many ohms should rheostat be for WD-11 tube? I am enjoying your Thursday Radio Magazine immensely.

Hook-up as mailed us is the best obtainable, using coil mentioned. There is no method whereby the wavelength of the coil could be increased practically. A WD-11 tube should have a 6-ohm rheostat.

AMPLIFYING DIAGRAM.

1327—WILMETTE: I am inclosing a lay out of the circuit I am using, which is very selective except when WJAZ is going, and it is almost impossible to "shake" them. I therefore tried a wave-trap made of a 30-turn coil and 23-plate condenser, first the inductance and capacity in parallel, and then in series, with each combination tried in series with aerial, with ground and across aerial and ground binding posts, with no desirable results. Will you kindly send me a diagram of the correct way to make a wave-trap? Also advise if there is anything I can do that will possibly improve my present receiver. With a single tube I get New York, WJZ, WGY, Dallas, Omaha, Fort Worth, etc. I am adding two stages of amplification. Will you give me the best hook-up for this, or is the diagram you published about three weeks ago the best for my set? I certainly appreciate the Radio Magazine, as it is both interesting and helpful to those who, like myself, like to make their own sets.

Hook-up for a wave-trap, as per your request, appeared in the Dec. 20 issue of the Radio Magazine. Hook-up for two stages of amplification for your present set has been mailed.

AMPLIFIER WITH JACKS
CHICAGO EVENING POST HOOKUP * 525

INFORMATION GIVEN.

1326—CHICAGO: I am an interested reader of your Radio Magazine. I have an ultra-audion hook-up with tapped coil. It has given good service, but have had in mind the rebuilding of it and the putting in of the best parts I can buy. I am now waiting for your "Superduc," to which I want to add two stages audio-frequency. Can you tell me privately what is the best make of variable condenser, one with the least loss? Also variometer, rheostats, grid leaks, variable and sockets? Will there be anything special in the amplifying unit for the "Superduc" circuit?

The information that you request has appeared in the last three issues of The Post Radio Magazine.

ULTRA-AUDION HOOK-UP.

1317—CHICAGO: Will you please send me a hook-up using a variometer, 43-plate condenser and WD-11 tube? Will square bus wire do to hook this set up? Please state size of batteries and grid leak and condensers. What is the distance of this set? Is tuning hard?

We are mailing ultra-audion hook-up which will receive one thousand miles and is not hard to tune.

OLD RELIABLE.

1314—REDDICK: Referring to your "Old Reliable," can I not use other condensers instead of Kellogg? Are they as good?

Any variable condenser can be used on the "Old Reliable."

KOPPRASH HOOK-UP.

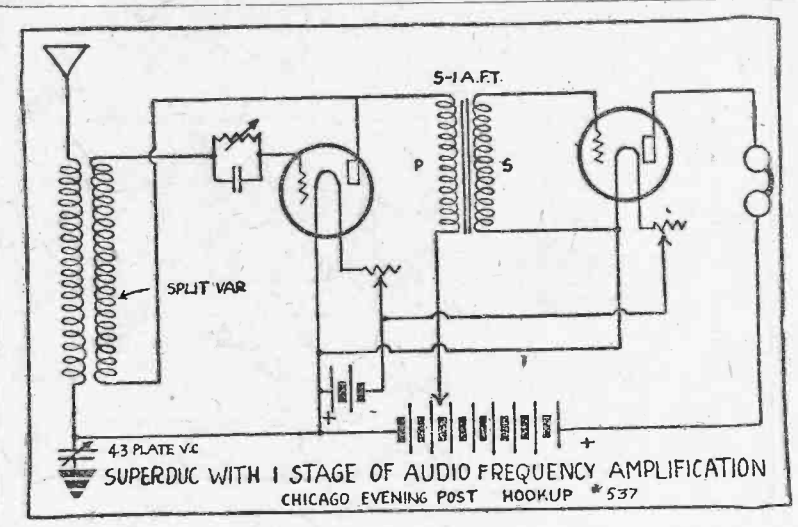
1329—CHICAGO: I have had no success this winter in getting out-of-town stations on Monday night with my Kopprash circuit. Should there be some changes made in the parts on account of the change in wavelengths? If you have a diagram of this circuit I would appreciate it if you would send me a copy showing the parts to be used.

We have not a diagram of the Kopprash circuit. Inclosed you will find hook-up, using parts you have, which is surprisingly good.

ANTENNA TROUBLE.

1322—CHICAGO: I have built one of Mr. Hagerman's crystal sets with very poor results. Here is a list of parts I used: One E. P. M. variometer, one Signal variable condenser, one 7x10x3-16 inch panel and one R. W. detector.

Hook-up as shown is O. K. Your trouble probably lies in your aerial. Use one of one wire at least 100 feet long and in a straight line, and 6 to 8 feet above all obstacles.



SUPERDUC WITH 1 STAGE OF AUDIO FREQUENCY AMPLIFICATION
CHICAGO EVENING POST HOOKUP * 537

Planets May Call by Radio, Says Thurston

By Howard Thurston.

THE air is full of mystery. Few people realize what a wonderful opportunity is awaiting them in the air. The discovery of the radio has made it easier for the air investigators and great results are predicted for the pioneers in this new field of scientific research.

It is but a seemingly brief step backward to the time when the Simon Lake submarine made its appearance and when the Wright brothers brought out their airplane and Haynes exhibited his automobile. Each of these seeming mysteries was proved practical as the years have passed. Why not, then, grasp the opportunities for utilizing the marvelous invention of the radio to further the experiments with the hidden secrets of the air?

Scientists, astronomers and dreamers are seeking the heavens for new things heretofore thought mythical but the advent of the radio will make it easier for them to solve some of the seemingly impossible mysteries. My constant wish is to be able to hear a message from Mars or one of the other planets, because I firmly believe in the theory that they are inhabited and some day will reveal their innermost secrets to us by means of the radio.

Studies the Air.

Every minute I can spare from my work is given over to the study of the air and I carry a special receiving set with me and have it placed by my bed each night. I often find it is time for breakfast and have not been asleep at all but listening to the strange sounds that come from the air.

I have been told that static is annoying some of the radiophans, but it holds a great meaning to me because I believe static is some form of electrical energy that is being sent from some of the planets. If the radiophans would try, as I do, to interpret the sounds called static, they might be able to discover that some radio operator on the planets was sending an important message that would enlighten the dwellers of this earth. Communication with and from the planets will be possible and I believe that time is not far distant.

One of the reasons for my belief that the radio will reach some listener in the other worlds is the increase in power of the broadcasting stations. I have spoken to many studio directors since my first talk from the WLW station in Cincinnati, when I played there last year at the Grand opera-house, and they have all assured me that the great power of the stations is now making it possible for the broadcast talks to reach nearly around the world. Why then is it not possble to reach outward as well as in a direct line? Surely if the radio waves go forth with such great energy that the broadcast message is heard at distant places they must go outward toward the planets. That is why I believe the static we hear is but a message from these untouched places.

Has Complete Laboratory.

In my home at Beechurst, White Stone Landing, L. I., I have a completely equipped laboratory which serves as an experimental place for my radio researches as well as my attempt to solve the mysteries of the spirit world. Would it not be wonderful if the radio should prove a means of communication with the spirit world as well as with the planets?

I am greatly encouraged with the result of the work I have done so far and only wish that I could devote more time to the further study of this marvelous force of radio. My Hindu assistant, Abdul, is of great service to me in my experimental work, because he seems to have an understanding of the occult air and believes, as I do, that the mysteries of the air will be revealed in a short time.

When the television, or ability to see by radio, is an established thing, then it will not be long until the planets are reached. Just think of sitting in your living-room and talking to and seeing what is to be revealed by the Martians, Jupiterians and others which now seem so far away and impossible. It will come with a perfection of radio.—Crosley Radio Weekly.

Today's Programs and Schedules

Continued from Page 3.

Wednesdays—At 7:30 p. m. only.

WIAB—Rockford, Ill., 252 meters: Monday and Friday evenings; Monday evening, 9 p. m., MacDonald's Melody orchestra, in latest hits; Friday evening, 8 p. m., vocal and instrumental selections; Sunday, 12:30 p. m., religious services by the Rev. Toykmann and choir of the Mission Tabernacle church.

WJAN—Peoria, Ill.; 280 meters: Daily except Sunday.

Day—9 a. m., live stock market; 9:15 a. m., weather; 11:30 a. m., Chicago, Peoria and St. Louis live stock and grain markets; 1:30 p. m., Chicago and Peoria grain and produce markets; United States agriograms.

Evening—Tuesday and Thursday, special musical program to be announced by radiophone.

WRM—Urbana, Ill., University of Illinois; 360 meters: 8:50 to 9:30 p. m., lectures and news.

WTAS—Elgin, Ill., Charles E. Erbstein; 265 meters: Wednesday evening schedule, 8:30 p. m., musical program.

OUT-OF-TOWN STATIONS

(Central Time Is Shown.)

KDKA—East Pittsburg; 326 meters:

Day—8:45 a. m., live stock; 10:55 a. m., time; 11 a. m., weather; 11:10 a. m., organ; 5:15 p. m., dinner concert.

Evening—6:30 p. m., talks; 6:45 p. m., children's period; 7 p. m., markets; 7:15 p. m., talk; 7:30 p. m., concert; 8:55 p. m., time; 10:30 p. m., concert.

WBZ—Springfield, Mass.; 337 meters:

Day—10:55 a. m., time; 5 p. m., dinner concert.

Evening—6 p. m., talk; 6:30 p. m., kiddie story; farm period; 7 p. m., concert; 8 p. m. story for grown-ups; 8:55, time.

WCAE—Pittsburg, Pa.; 462 meters:

Day—11:30 a. m., news and weather program; 2:30 p. m., news; 3:30 p. m., markets; 5:30 p. m., dinner concert.

Evening—6:30 p. m. "Uncle Kaybee"; 7 p. m., silent; 7:15 p. m., talk; 7:30 p. m., music.

WEAF—New York city; 492 meters:

Day—10 a. m., talk; 10:30 a. m., markets; 2:30 to 3:45 p. m., Alumni Service, Columbia university; 3:45 p. m., Abraham Lincoln; 4 p. m., music.

Evening—6 to 9 p. m., religious service; sport talks, music.

WHN—New York city; Lowe's State broadcasting station; 360 meters:

Day—1:15 to 4:30 p. m., music.

Evening—8:30 to 10:45 p. m., music.

WGI—Medford Hillside, Mass.; 360 meters:

Day—11 a. m., selection on the Ampico; selections on the Brunswick console; 11:40 a. m., weather; 11:45 a. m., farmers produce market report; 4:30 p. m., closing stock market report, live stock markets, agriograms; 5:15 p. m., Boston police reports; 5:30 p. m., meeting of the Big Brother Amrad club.

Evening—8 p. m., police reports; 6:30 p. m., evening program; 7:15 p. m., reading of Boy Scout oath.

WHAZ—Troy, N. Y.; 330 meters; This station broadcasts only on Monday evenings.

WGY—Schenectady, N. Y.; 380 meters: Silent night Wednesday.

Day—10:55 a. m., time; 11:30 a. m., markets; 11:45 a. m., weather; 5 p. m., produce and market reports; 5:30 p. m., adventure story.

Evening—6:45 p. m., musical program.

WGR—Buffalo; 319 meters:

Day—9:45 a. m., weather; 11 a. m., produce and live stock; 11:30 a. m., organ recital; 1:30 p. m., Chicago Board of Trade; 2:30 p. m., New York Stock exchange; 3 p. m., tea-time music; 5:30 p. m., dinner music.

Evening—8:30 p. m., news.

WJY—New York city; 405 meters: Tuesday, Thursday, Friday, 6:30 to 10:30 p. m., Sunday, 1:30 to 4:30 p. m., and 7 to 9:30 p. m.

WJZ—New York city; 455 meters: No silent night.

Day—2 to 4:30 p. m., talks, music, markets.

Evening—6 to 9:45 p. m., music, talks. Sunday, Tuesday, Thursday, Friday and Saturday evenings.

WOO—Philadelphia; 599 meters: Silent

Day—10 a. m., grand organ; 10:30 a. m., United States weather forecast; 10:30 a. m., United States naval observatory time signals; 11 a. m., luncheon music by the Tea Room orchestra; 3:45 p. m., grand organ and trumpets; 4 p. m., sport results and police reports.

Evening—Silent.

WOR—Newark, N. J.; 405 meters:

Day—1:30 to 6:30 p. m., music and talks.

Evening—Silent.

WRC—Washington, D. C.; 469 meters: Silent Tuesday, Thursday and Saturday evenings.

Day—2 p. m., fashions; 2:10 p. m., song recital; 2:25 p. m., national conference board; 2:30 p. m., song recital; 2:45 p. m., travel talk; 2:55 p. m., piano recital; 4:15 p. m., international code; 5 p. m., children's story.

Evening—Silent.

WRW—Tarrytown, N. Y.; 273 meters:

Evening—6:30 to 8:45 p. m., music and talks.

WDAR—Philadelphia, Pa.; 395 meters:

Day—10:45 a. m., daily almanac; 11:02 a. m., organ recital; 1 to 2 p. m., Arcadia concert; 3:30 p. m., recital from the studio, Sal Zaleb's orchestra, Maze cafe.

Evening—6:30 p. m., Dream Daddy with the boys and girls.

Midwest Programs.

WCX—Detroit, Mich.; 517 meters:

Day—1 p. m., news bulletins; 1:15 p. m., stock quotations; 1:50 p. m., weather; 3:15 p. m., music; 5 p. m., dinner concert; 6 p. m., musical program.

Evening—7 p. m., music.

WJAX—Cleveland; 390 meters: Silent every night except Tuesday and Thursday.

Evening—7:30 p. m., talks and music.

WLAG—Minneapolis, Minn.; 417 meters: No silent nights.

Day—9:30 to 9:45 a. m., announcements; 10:45 to 11:15 a. m., household hints; 11:35 a. m. to 12 m., surprise program; 2 to 2:30 p. m., Woman's club; 2:40 to 4 p. m., daylight concert; 4 to 4:30 p. m., short story; 5:30 to 6 p. m., children's stories.

Evening—6, sport talk; 6:15, orchestra; 7:30, Gatun lectures.

WLW—Cincinnati; 309 meters: Silent Friday and Saturday.

Day—10:30 a. m., weather; 1:30 p. m., business reports; 3 p. m., markets; 4 p. m., business reports.

Evening—10, Odd Fellow program.

WOC—Davenport, Iowa; 484 meters: Silent Tuesdays.

Day—10 a. m., opening market quotations; 10:55 a. m., time signals; 11 a. m., weather and river forecast; 11:05 a. m., market quotations; 12 noon, chimes concert; 2 p. m., closing stocks and markets; 3:30 p. m., educational program and concert; 5:45 p. m., chimes concert; 6:30 p. m., Sandman's visit.

WSAI—Cincinnati, United States Playing Card Company; 309 meters: Tuesday, Thursday, Saturday evenings.

Evening—7 to 9, talks, music.

Southwest Programs.

KSD—St. Louis; 546 meters: Silent Friday.

Evening—8:30 p. m., vocal and instrumental music.

WBAP—Fort Worth, Texas; 476 meters:

Day—10 a. m. to 4 p. m., markets and financial review.

Evening—7:30 p. m., concert; 9:30 p. m., music.

WDAF—Kansas City, Mo; 441 meters:

Day—3:30 to 4:30 p. m., musical matinee, Johnnie Campbell's Kansas City Club orchestra.

Evening—6 p. m., weather; 7 p. m., music and lectures.

WFAA—Dallas, Texas; 147 meters: Silent Wednesday.

Day—12 noon, address.

Evening—8:30 p. m., music.

WHAS—Louisville; 400 meters: Silent Mondays.

Day—4 to 5 p. m., selections by the Walnut theater orchestra; Walter Davison, conductor; selections by the Strand theater orchestra, Harry S. Currie, conductor.

Evening—9 to 10:30 p. m., music.

WHB—Kansas City, Mo.; 411 meters: Silent Monday, Wednesday and Friday.

Day—8:25 a. m., stock reports; 9:25 a. m., grain market; 12:35 p. m., music; 2 p. m., ladies' hour.

Evening—7 p. m., music.

WMC—Memphis; 500 meters: Silent Wednesday.

Day—Stock and news every half hour from 9 a. m. to 10 p. m.

Evening—8:30 p. m., Chisca Philharmonic orchestra.

WSB—Atlanta, Ga., Atlanta Journal; 429 meters:

Day—5 p. m., talk; 5:30 p. m., kiddies' program.

Evening—8:30 p. m., program; 11 p. m., frolic.

Pacific Coast Programs.

KPO—San Francisco; 425 meters: 500 watts: Crair F. Morrison, station director; Ada Morgan O'Brien, program director. Friday night silent.

Day—2 p. m., time signals from the naval observatory; 3 to 4 p. m., Rudy Sieger's Fairmount Hotel orchestra, by remote control.

Evening—8 p. m. to 1 a. m., music.

U. of Nebraska Has Powerful New Station

THE present radio transmitter at the University of Nebraska is made up of Standard Radio corporation parts and has a rated power output of 500 watts. The equipment is used in the so-called "master oscillator" circuit, using one 50-watt tube as a modulator, and two quarter-kilowatt tubes as power amplifiers, thus giving a power input of one-half kilowatt to the antenna. A standard Western Electric microphone and amplifier are used to modulate the input to the transmitter.

The equipment was formerly used at the state capitol by the department of markets and marketing and was purchased by the university during the past summer after broadcasting was discontinued at the capitol. The new transmitter, which has been completely reassembled and rewired, replaces a 100-watt set which was used last year and which gave fairly satisfactory results. Signals from the old set were reported from thirty-eight states last year, and it is expected that a much better record will be attained with the new and more powerful outfit.

Antenna 85 Feet High.

The old antenna has been replaced with a four-wire T-cage, which is approximately 85 feet high and 110 feet long across the top. It is supported at one end by the tower of "U" hall and at the other by the steel smoke stack of the power-house.

A room in the electrical engineering building has recently been equipped with sound absorbing draperies to keep down echoes, and a new piano has been secured. Musical programs are given every Wednesday night at 8:30 o'clock on 275 meters. Weather forecasts, road reports and other information are also given daily at 9:45 a. m. and 12:40 p. m.

The station is also equipped with two very good receiving sets and a Western Electric power amplifier and loud speaker, thus making it possible to entertain visitors without the use of headsets. One receiver is a standard Grebe CR-9 set with detector and two stages of audio-frequency amplification. The other is a regulation DeForest set rewired into a three-circuit regenerative receiver using honeycomb coils. The first receiver has a wave length of from 150 to 3,000 meters and the second covers the entire waveband from 150 to 20,000 meters. It is possible to use the loud speaker with either of these sets.

Students Give Concerts.

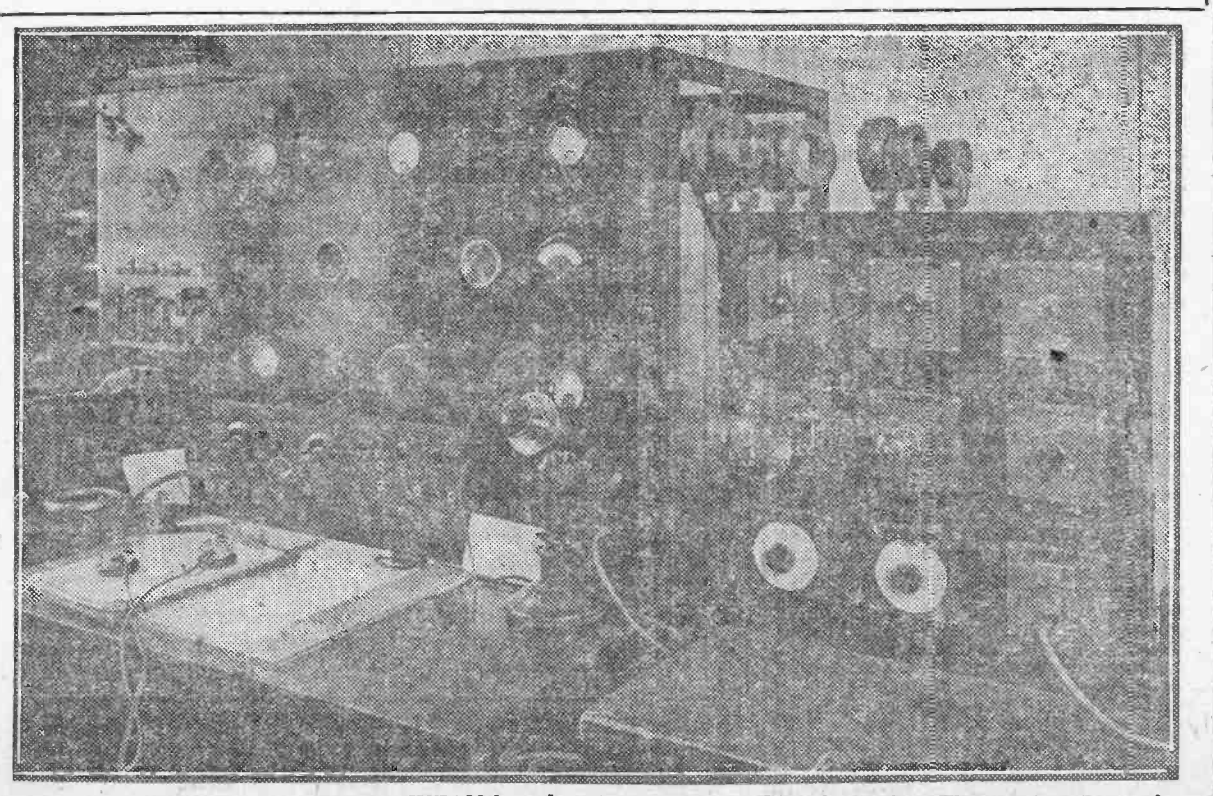
The station depends upon the school of fine arts and the students and faculty for the programs given. Last year students from the dramatic art courses also assisted greatly by giving readings and recitations.

Reports of signals from WFAV or 9 YY (the station's test license) are requested.

Canadian Railway to Establish Radio Stations

The officials of the Canadian National railway are planning to establish several broadcasting stations along the railways from which news of the railroads, concerts and the usual radio programs will be sent to the 10,000 employes of the roads. This scheme has been hit upon as one that will tend to keep the employes in touch wtih the policies of the railway and will give the officials a chance to talk directly with employes, tho some of them may be located in remote places. The plan also contemplates the selling of radio receiving outfits to the employes at cost, so that all may be equipped to take advantage of the broadcasting stations.

CORNHUSKERS' BROADCASTING STATION



Transmitter and receiver at WFAV broadcasting station at Lincoln, Neb. The station is at the University of Nebraska, the "Home of the Cornhusker."

Broadcasting Stations and Schedule of Programs

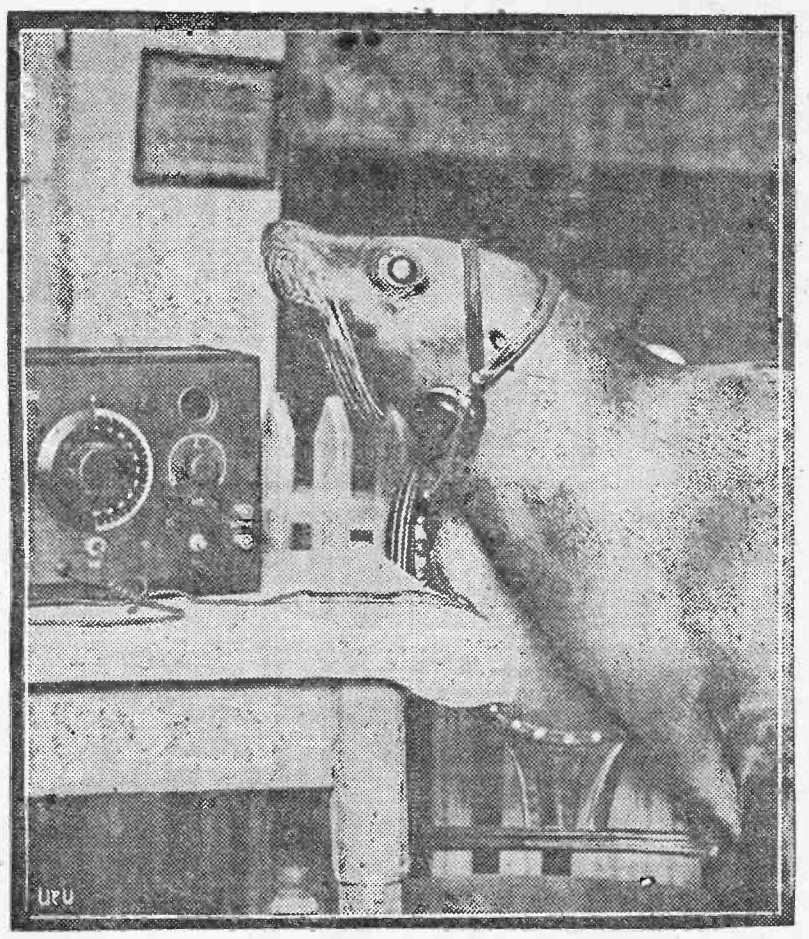
Continued from Page 2.

WDAK—Hartford, Conn., the Courant, 261 meters.
WDAO—Dallas, Texas, Automotive Electric company, 360 meters.
WDAP—Chicago, Ill., Board of Trade, 300 meters.
WDAR—Philadelphia, Pa., Lit Brothers, 395 meters.
WDAS—Worcester, Mass., 692a Main street, Samuel A. Waite, 360 meters.
WDAU—New Bedford, Mass., Slocum Kilburn, 360 meters.
WDAX—Centerville, Iowa, First National bank, 360 meters
WDAY—Fargo, N. D., Radio Equipment Corporation, 244 meters; director, L. W. Hamm; daily, 9:30 a. m., weather; Tuesday, Thursday, Saturday, 7:30 to 8:30 p. m., music; Sunday, 4 to 5 p. m., orchestra.
WDBC—Lancaster, Pa., Kirk, Johnson & Co., 258 meters.
WDBF—Youngstown, Ohio, 254 West Federal street, Robert G. Phillips, 261 meters.
WDZ—Tuscola, Ill., Star Store building, James L. Bush, 278 meters.
WEAA—Flint, Mich, Fallain & Lathrop, 280 meters.
WEAB—Fort Dodge, Iowa, Standard Radio Equipment company, 360 meters.
WEAF—New York, N. Y., American Telephone and Telegraph company, 492 meters.
WEAG—Edgewood, R. I., Nicholas-Hineline-Bassett Laboratory, 231 meters.
WEAH—Wichita, Kan., Wichita Board of Trade, 244 meters.
WEAI—Ithaca, N. Y., Cornell university, 286 meters.
WEAJ—Vermillion, S. D., University of South Dakota, 360 meters.
WEAM—North Plainfield, N. J., Borough of North Plainfield (W. Gibson Buttfield), 250 meters.
WEAN—Providence, R. I., Shepard company, 273 meters.
WEAO—Columbus, Ohio, Ohio State university, 360 meters.
WEAP—Mobile, Ala., Mobile Radio company, 360 meters.
WEAR—Baltimore, Md., Baltimore American and News Publishing company, 360 meters.
WEAS—Washington, D. C., Hecht company, 360 meters.
WEAU—Sioux City, Iowa, Davidson Brothers company, 360 meters.
WEAY—Houston, Texas, Iris theater (Will Horowitz Jr.), 360 meters.
WEB—St. Louis, Mo., Benwood company, 360 meters.
WEV—Houston, Texas, Hurlburt-Still Electrical company, 360 meters.
WEW—St. Louis, Mo., St. Louis university, 261 meters; 9 a. m., estimated receipts of live stock at public stockyards; opening trend of hog market; opening futures, wheat for St. Louis and Kansas City; opening trend of market; Liverpool cables; 10 a. m., official weather reports, river stages; 2 p. m., closing market quotations, live stock, grain markets, fruits and vegetables, eggs and poultry; 5 p. m., special weather and river bulletins, agrigrams, etc.; other special musical program will be announced previously.
WFAA—Dallas, Texas, Dallas News and Dallas Journal, 476 meters.
WFAB—Syracuse, N. Y., 802 McBride street, Carl F. Woese, 234 meters.
WFAF—Poughkeepsie, N. Y., H. C. Spratley Radio company, 360 meters.
WFAH—Port Arthur, Texas, Electric Supply company, 360 meters.
WFAJ—Asherville, N. C., Hi-Grade Wireless Instrument company, 360 meters.
WFAM—St. Cloud, Minn., Times Publishing company, 360 meters.
WFAN—Hutchinson, Minn., Hutchinson Electric Service company, 360 meters, 100 watts; daily 12 noon to 12:05 p. m., Twin City radio programs; 12:05 to 12:20 p. m., long distance radio discussion; 12:20 to 12:25 p. m., markets; 12:25 to 12:30 p. m., news; Tuesdays, 8:10 p. m., entertainment.
WFAQ—Cameron, Mo., Missouri Wesleyan college, 360 meters.
WFAV—Lincoln, Neb., University of Nebraska, department of electrical engineering, 360 meters.
WFI—Philadelphia, Pa., Strawbridge & Clothier, 395 meters; 9:15 a. m., produce market and live stock reports; 12 m., Meyer Davis Bellevue Stratford hotel concert orchestra; 12:50 p. m., agricultural report; 1 p. m., concert by Louisa Knowlton, cellist; Strawbridge & Clothier male quartet; John Owens, tenor; Edayfed Lewis, tenor; Harold Simonds, barytone; John Vandersloot, bass; Loretta Kerk, pianist and accompanist; 5:30 p. m., Meyer Davis Bellevue Stratford Hotel concert orchestra; 6 p. m., "Snowball" talks to the children.
WGAL—Lancaster, Pa., Lancaster Electric Supply and Construction company, 248 meters.
WGAN—Pensacola, Fla., 216 West Romana street, Cecil E. Lloyd, 360 meters.
WGAQ—Shreveport, La., Glenwood Radio corporation (W. G. Patterson), 360 meters.
WGAR—Fort Smith, Ark., Southwest American, 360 meters.
WGAU—Wooster, Ohio, Radio Monufacturing and Service company (Marcus G. Limb), 226 meters.
WGAW—Altoona, Pa., 1918 West Chestnut street, Ernest C. Albright, 261 meters.
WGAY—Madison, Wis., Northwestern Radio company, 360 meters; daily, 1 to 4:30 p. m., concert and tests; 7:30 p. m. concert; Sunday, 7:30 p. m., radio chapel, sacred music.
WGAZ—South Bend, Ind., South Bend Tribune, 360 meters.
WGI—Medford Hillside, Mass., American Radio and Research corporation, 360 meters.
WGL—Philadelphia, Pa., 2303 North Broad street, Thomas F. Y. Howlett, 360 meters.
WGR—Buffalo, N. Y., Federal Telephone and Telegraph company, 319 meters.
WGV—New Orleans, La., Interstate Electric company, 360 meters.
WGY—Schenectady, N. Y., General Electric company, 380 meters
WHA—Madison, Wis., University of Wisconsin, 360 meters.
WHAA—Iowa City, Iowa, State University of Iowa, 283 meters.
WHAB—Galveston, Texas, Clark W. Thompson, 360 meters.
WHAD—Milwaukee, Wis., Marquette university, 280 meters; J. B. Kremer, program director; L. E. Coodes, H. P. Warring, Wednesday, 7:30 p. m.
WHAG—Cincinnati, Ohio, University of Cincinnati, 222 meters.
WHAH—Joplin, Mo., Hafer Supply company, 360 meters.
WHAK—Clarksburg, W. Va., Roberts Hardware company, 360 meters.
WHAL—Lansing, Mich., Lansing Capital News, 248 meters.
WHAM—Rochester, N. Y., University of Rochester (Eastman School of Music), 360 meters.
WHAP—Decature, Ill., Otta & Kahn, 360 meters.
WHAQ—Washington, D. C., Semmes Motor company, 360 meters.
WHAR—Atlantic City, N. J., Paramount Radio and Electric company (W. H. A. Paulus), 231 meters.
WHAS—Louisville, Ky., Courier-Journal and Louisville Times, 300 meters; silent Monday night; daily, 4 to 6 p. m., music; 5 p. m., news; 7:30 to 9 p. m., music, lectures.
WHAV—Wilmington, Del., Wilmington Electrical Special company, 360 meters.
WHAZ—Troy, N. Y., Rensselaer Polytechnic Institute, 380 meters.
WHB—Kansas City, Mo., Sweeney School company, 411 meters.
WHD—Morgantown, W. Va., West Virginia University, 360 meters.
WHK—Cleveland, Ohio, Radiovox company (Warren R. Cox), 360 meters.
WHN—Ridgewood, N. Y., George Schubel, 360 meters.
WIAB—Rockford, Ill., Joslyn Automobile company, 252 meters. Monday and Friday, 8 to 930 p. m. Sunday, 12:30 p. m.
WIAC—Galveston, Texas, Galveston Tribune, 360 meters.
WIAD—Ocean City, N. J., Ocean City Yacht club (Howard R. Miller), 254 meters.
WIAF—New Orleans, La., 139 North Alexander street, Gustav A. DeCortin, 234 meters.
WIAI—Springfield, Mo., Heer Stores company, 360 meters.
WIAJ—Neenah, Wis., Fox River Valley Radio Supply company (Quinn Brothers), 224 meters.
WIAK—Omaha, Neb., Journal-Stockman company, 278 meters.
WIAO—Milwaukee, Wis., School of Engineering of Milwaukee, 360 meters.
WIAQ—Marion, Ind., Chronicle Publishing company, 226 meters.
WIAR—Paducah, Ky., Paducah Evening Sun, 360 meters.
WIAS—Burlington, Iowa, Home Electric company, 360 meters.
WIAU—Le Mars, Iowa, American Trust and Savings bank, 360 meters.
WIK—McKeesport, Pa., K. & L. Electric company (Herbert F. Kelso and Hunter J. Lohman), 360 meters.
WIL—Washington, D. C., Continental Electric Supply company, 360 meters.
WIP—Philadelphia, Pa., Gimbel Brothers, 509 meters.
WJAB—Lincoln, Neb., American Electric company, 360 meters.
WJAD—Waco, Texas, Jackson's Radio Engineering laboratories, 360 meters.
WJAF—Muncie, Ind., Press Publishing company, 360 meters.
WJAG—Norfolk, Neb., Norfolk Daily News (Huse Publishing company), 283 meters.
WJAK—Greentown, Ind., Clifford L. White, 254 meters.
WJAM—Cedar Rapids, Iowa, 302 3d Avenue West, D. M. Perham, 268 meters.
WJAN—Peoria, Ill., Peoria Star, 280 meters.
WJAQ—Topeka, Kan., Capper Publications, 360 meters, 100 watts; director, J. A. Machel; weather, news, roads, etc.; daily, 9 to 9:45 a. m., bond gossip, financial news and grain markets; 10 to 10:45 a. m., quotations upon foreign exchange, live stock, grain, bonds and stocks, financial news bulletins and weather reports; 2 to 2:45 p. m., quotations upon grain, stock, butter, eggs, poultry, foreign exchange and bonds, financial news bulletins and weather reports; 3 to 3:45 p. m., quotations upon fruits and vegetables, butter, eggs and poultry, live stock, hay and grain, flour and feed, foreign exchange, bonds and stocks, weather reports.
WJAR—Providence, R. I., The Outlet company (J. Samuels and Brother), 360 meters.
WJAS—Pittsburg, Pa., Pittsburg Radio Supply House, 360 meters.
WJAT—Marshall, Mo., Kelly-Vawter Jewelry company, 360 meters.
WJAX—Cleveland, Ohio, Union Trust company, 360 meters.
WJAZ—Chicago, Ill., Chicago Radio laboratory, 448 meters.
WJD—Granville, Ohio, Richard H. Howe, 229 meters.
WJH—Washington, D. C., White & Boyer company, 273 meters.
WJX—New York, N. Y., Deforest Radio Telephone and Telegraph company, 360 meters.
WJY—New York, N. Y., R. C. A., 405 meters.
WJZ—New York, N. Y., R. C. A., 455 meters.
WKAA—Cedar Rapids, Iowa, 1444 2d avenue, East, H. F. Paar, 268 meters.
WKAD—East Providence, R. I., Charles Loof (Cresent park), 240 meters.
WKAF—Wichita Falls, Texas, W. S. Radio Supply company, 360 meters.
WKAN—Montgomery, Ala., United Battery Service company, 226 meters.
WKAP—Cranston, R. I., Dutee W. Flint, 360 meters.
WKAQ—San Juan, P. R., Radio Corporation of Porto Rico, 360 meters.
WKAR—East Lansing, Mich., Michigan Agricultural college, 280 meters.
WKAV—Laconia, N. H., Laconia Radio club, 254 meters.
WKAW—Beloit, Wis., Turner Cycle company, 242 meters.
WKAX—Bridgeport, Conn., 1789 Park avenue, William A. MacFarlane, 231 meters.
WKAY—Gainesville, Ga., Brenau college, 280 meters.
WKC—Baltimore, Md., Joseph M. Zamoiski company, 360 meters.
WKY—Oklahoma City, Okla., WKY Radio shop, 360 meters.
WLAC—Raleigh, N. C., North Carolina State college, 360 meters.
WLAG—Minneapolis, Minn., Cutting and Washington Radio corporation, 417 meters.
WLAH—Syracuse, N. Y., 425 Brownell street, Samuel Woodworth, 234 meters.
WLAJ—Waco, Texas, Waco Electrical Supply company, 360 meters.
WLAK—Bellows Falls, Vt., Vermont Farm Machine corporation, 360 meters.
WLAL—Tulsa, Okla., Naylor Electric company, 360 meters.
WLAN—Houlton, Maine, Putnam Hardware company, 283 meters.
WLAP—Louisville, Ky., 306 West Breckenridge street, W. V. Jordan, 360 meters.
WLAQ—Kalamazoo, Mich., 108 Elm street, Arthur E. Schilling, 360 meters.
WLAT—Burlington, Iowa, Radio and Specialty company, 360 meters.
WLAV—Pensacola, Fla., Electric Shop, 254 meters.
WLAW—New York, N. Y., police department, City of New York, 360 meters.
WLAX—Greencastle, Ind., Putnam Electric company (Greencastle Community Broadcasting station), 231 meters.
WLB—Minneapolis, Minn., University of Minnesota, 360 meters.
WLW—Cincinnati, Ohio, Crosley Manufacturing company, 309 meters.
WMAB—Oklahoma City, Okla., Radio Supply company, 360 meters.
WMAC—Cazenova, N. Y., Fernwood street, J. Edw. Page (Olive B. Meredith), 261 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WMAH—Lincoln, Neb., General Supply company, 254 meters; H. C. Harvey, station director; Monday and Friday, 9 to 10:30 p. m., dance music.
WMAJ—Kansas City, Mo., Drovers Telegram company, 275 meters; J. E. Cook, operator; daily, 8:15 a. m., to 2:25 p. m., markets and news.
WMAK—Lockport, N. Y., Norton Laboratories, 360 meters.
WMAL—Trenton, N. J., Trenton Hardware company, 256 meters.
WMAM—Beaumont, Texas, Beaumont Radio Equipment company, 360 meters.
WMAP—Easton, Pa., Utility Battery service, 246 meters.
WMAQ—Chicago, Ill., Chicago Daily News, 448 meters; Miss Judith C. Waller, director; program announced daily.
WMAV—Auburn, Ala., Alabama Polytechnic institute, 250 meters; Sunday morning and afternoon church services; evening, lectures.
WMAY—St. Louis, Mo., Kingshighway Presbyterian church, 280 meters.
WMAZ—Macon, Ga., Mercer university, 268 meters.
WMC—Memphis, Tenn., "Commercial Appeal" (Commercial Publishing company) 500 meters, George D. Hay, announcer; F. Y. Root, operator.
WMU—Washington, D. C., Doubleday-Hill Electric company, 261 meters.
WNAC—Boston, Mass., Shepard stores, 278 meters.
WNAD—Norman, Okla., University of Oklahoma, 360 meters.
WNAL—Omaha, Neb., 5019 Capitol avenue, R. J. Rockwell, 242 meters.
WNAN—Syracuse, N. Y., Syracuse Radio Telephone company, 286 meters.
WNAP—Springfield, Ohio, Wittenberg college, 231 meters.
WNAQ—Charleston, S. C., Charleston Radio Electric company, 360 meters.
WNAR—Butler, Mo., C. C. Rhodes, 231 meters.
WNAS—Austin, Texas, Texas Radio Corporation and Austin Statesman, 360 meters.
WNAT—Philadelphia, Pa., Lemmig Brothers company (Frederick Lemmig), 360 meters.
WNAW—Fort Monroe, Va., Peninsular Radio club (Henry Kunzmann), 360 meters.
WNAX—Yankton, S. D., Dakota Radio Apparatus company, 244 meters.
WNJ—Albany, N. Y., Shotton Radio Manufacturing company, 360 meters.
WOAC—Lima, Ohio, Maus Radio company, 266 meters.
WOAD—Sigourney, Iowa, Friday Battery and Electric corporation, 360 meters.
WOAE—Fremont, Neb., Midland college, 360 meters.
WOAF—Tyler, Texas, Tyler Commercial college, 360 meters; Director, A. B. Chenier; a. m., markets; afternoon, music; evening service Sunday.
WOAG—Belvidere, Ill., Apollo theater (Belvidere Amusement company), 224 meters.
WOAH—Charleston, S. C., Palmetto Radio corporation, 360 meters.
WOAI—San Antonio, Texas, Southern Equipment company, 385 meters.
WOAJ—Parsons, Kan., Ervins Electrical company, 258 meters.
WOAK—Frankfort, Ky., Collins Hardware company, 240 meters.
WOAL—Webster Groves, Mo., 4 Jefferson road, William E. Woods, 229 meters.
WOAN—Lawrenceburg, Tenn., Vaughn Conservatory of Music (James D. Vaughn), 360 meters; 8 p. m., music.
WOAO—Mishawaka, Ind., Lyradion Manufacturing company, 360 meters.
WOAP—Kalamazoo, Mich., Kalamazoo college, 240 meters.
WOAR—Kenosha, Wis., Henry P. Lundskow, owner and operator, 360 meters.
WOAT—Wilmington, Del., 215 Market street, Boyd M. Hamp, 360 meters.
WOAV—Erie, Pa., Pennsylvania National Guard, 2d Battalion, 112th Infantry, 242 meters.
WOAW—Omaha, Neb., Woodmen of the World, 526 meters; evening entertainment every night.
WOAX—Trenton, N. J., 600 Ingham avenue, Franklyn J. Wolff, 240 meters.
WOAZ—Stamford, Texas, Penick Hughes company, 360 meters.
WOC—Davenport, Iowa, Palmer School of Chiropractic, 484 meters.
WOI—Ames, Iowa, Iowa State college, 360 meters.
WOK—Pine Bluff, Ark., Pine Bluff company, 360 meters.
WOO—Philadelphia, Pa., 13th and Market streets, John Wanamaker, 509 meters; director, Gordon H. Cullen.
WOQ—Kansas City, Mo., Western Radio company, 360 meters.
WOR—Newark, N. J., L. Bamberger & Co., 405 meters.
WOS—Jefferson City, Mo., Missouri State Marketing bureau, 441 meters.
WPAB—State College, Pa., Pennsylvania State college, 283 meters.
WPAC—Okmulgee, Okla., Donaldson Radio company, 360 meters.
WPAH—Waupaca, Wis., Wisconsin department of markets, 360 meters.
WPAJ—New Haven, Conn., Doolittle Radio corporation, 268 meters.
WPAK—Agricultural College, N. D., North Dakota Agricultural college, 360 meters.
WPAL—Columbus, Ohio, Superior Radio and Telegraph Equipment company, 286 meters.
WPAM—Topeka, Kan., Auerbach & Guettel, 360 meters, 100 watts; W. A. Beasley, director; markets; special programs 6:15 p. m.
WPAP—Winchester, Ky., 222 Lexington avenue, Theodore D. Phillips, 360 meters.
WPAQ—Frostburg, Md., General Sales and Engineering company, 360 meters.
WPAT—El Paso, Texas, St. Patrick's cathedral, 360 meters.
WPAU—Moorhead, Minn., Concordia college, 360 meters.
WPAZ—Charleston, W. Va., Dr. John R. Koch, 273 meters.
WPG—New Lebanon, Ohio, Nushawg Poultry farm, 243 meters.
WQAA—Parkesburg, Pa., Horace A. Beale Jr., 360 meters.
WQAB—Springfield, Mo., Southwest Missouri State Teachers' college, 236 meters.
WQAC—Amarillo, Texas, 108 East 8th street, E. B. Gish, 360 meters.
WQAD—Waterbury, Conn., Whitall Electric company, 242 meters; 6:30 to 7:45 p. m., Monday, Wednesday and Friday.
WQAE—Springfield, Vt., Moore Radio News station (Edmund B. Moore), 275 meters.
WQAF—Sandusky, Ohio, Sandusky Register, 240 meters.
WQAH—Lexington, Ky., Brock-Anderson Electrical Engineering company, 254 meters.
WQAL—Mattoon, Ill., Coles County Telephone and Telegraph company, 258 meters.
WQAM—Miami, Fla., Electrical Equipment company, 300 meters. Director, R. H. Horning. Tuesday, 7 to 8 a. m., 9 to 10 a. m., Sunday.
WQAN—Scranton, Pa., Scranton Times, 280 meters.
WQAO—New York, N. Y., Calvary Baptist church, 360 meters.
WQAQ—Abilene, Texas, West Texas Radio company, 360 meters.
WQAS—Lowell, Mass., Prince-Walter company, 266 meters.
WQAV—Greenville, S. C., Huntington and Guerry (Inc.), 258 meters.
WQAW—Washington, D. C., Catholic university, 236 meters.
WQAX—Peoria, Ill., Radio Equipment company, 360 meters.
WQAZ—Greensboro, N. C., Greensboro Daily News, 360 meters.
WHAA—Houston, Texas, Rice institute, 360 meters.
WRAD—Marion, Kan., Taylor Radio shop (G. L. Taylor), 360 meters.
WRAF—Laporte, Ind., The Radio club (Inc.), 224 meters.
WRAH—Providence, R. I., Stanley N. Read, 231 meters.
WRAL—St. Croix Falls, Wis., Northern States Power company, 248 meters.
WRAN—Waterloo, Iowa, Black Hawk Electrical company, 236 meters. Director, H. B. Plowman; 5 to 6 p. m. week days; 8:15 to 9:15 p. m. Monday, concert.
WRAO—St. Louis, Mo., Radio Service company, 360 meters.
WRAP—Winter Park, Fla., Winter Park Electrical Construction company, 360 meters.
WRAU—Amarillo, Texas, Amarillo Daily News, 360 meters.
WRAV—Yellow Springs, Ohio, Antioch college, 360 meters.
WRAW—Reading, Pa., Avenue Radio shop (Horace D. Good), 238 meters.
WRAX—Gloucester City, N. J., Flaxon's garage, 268 meters.
WRAY—Scranton, Pa., Radio Sales corporation, 280 meters.
WRAZ—Newark, N. J., Radio Shop of Newark (Herman Lubinsky), 233 meters.
WRC—Washington, D. C., Radio Corporation of America.
WRK—Hamilton, Ohio, Doron Bros. Electric company, 360 meters.
WRL—Schenectady, N. Y., Union college, 360 meters.
WRM—Urbana, Ill., University of Illinois, 360 meters.
WRR—Dallas, Texas, City of Dallas (police and fire signal department), 360 meters.
WRW—Tarrytown, N. Y., Tarrytown Radio Research laboratory, 273 meters.
WSAB—Cape Girardeau, Mo., Southeast Missouri State Teachers' college, 360 meters.
WSAC—Clemson College, S. C., Clemson Agricultural college, 360 meters.
WSAD—Providence, R. I., J. A. Foster company, 261 meters.
WSAG—St. Petersburg, Fla., City of St. Petersburg (Loren V. Davis), 244 meters.
WSAH—Chicago, Ill., 4801 Woodlawn avenue, A. J. Leonard, Jr., 248 meters.
WSAI—Cincinnati, Ohio, United States Playing Cards company, 309 meters.
WSAJ—Grove City, Pa., Grove City college, 360 meters.
WSAK—Middleport, Ohio, Foster Egner (Daily News, Pomeroy, Ohio), 258 meters.
WSAL—Brookville, Ind., Franklin Electric company, 360 meters.
WMAF—Dartmouth, Mass., Round Hills Radio corporation, 360 meters.
WSB—Atlanta, Ga., Atlanta Journal company, 429 meters. No silent night. Day schedule 12-1 p. m., musical program; 2:30 p. m., weather; 5-5:30 p. m., bedtime story. Evening—8-9 p. m., popular concert.
WSL—Utica, N. Y., J. & M. Electric company, 360 meters.
WSY—Birmingham, Ala., Alabama Power company, 360 meters.
WTAC—Johnstown, Pa., Pennsylvania Traffic company, 360 meters.
WTAS—Elgin, Ill., Charles E. Erbstein, 275 meters. Evening schedule—7:30 p. m., musical program.
WTAU—Tecumseh, Neb., Ruegy Battery and Electric company, 360 meters.
WTAW—College Station, Texas, Agricultural and Mechanical college, 360 meters.
WTAY—Oak Park Arms hotel, Pioneer Publishing company, 447.4 meters, 6:15 to 8:15 every evening, except Sunday and Monday.
WTG—Manhattan, Kan., Kansas State Agricultural college, 485 meters.
WWAD—Philadelphia, Pa., Wright & Wright, 360 meters.
WWAX—Laredo, Texas, Wormser Brothers, 360 meters.
WWB—Canton, Ohio, Daily News Printing company, 360 meters.
WWI—Dearborn, Mich., Ford Motor company, 360 meters.
WWJ—Detroit, Mich., Detroit News, 580 meters. Silent Saturday. Day schedule—8:30 a. m., household hints and talks for women; 9:25 a. m., weather; 10:55 a. m., time signals; 2 p. m., concert. Evening schedule—8:30 p. m., concert.
WWL—New Orleans, La., Loyale university, 360 meters.
WWT—Buffalo, N. Y., McCarthy Brothers & Ford, 360 meters.
WWZ—New York city, Wannamaker's department store, 360 meters.

New York Lecturers Talk on "Influence of Radio"

For more than thirty years the New York city board of education has maintained courses of free public lectures. These lectures are known all over the country as "The University of the People." This week, responding to the popular interest in radio and the demand for accurate information about it, Dr. Ernest L. Crandall, director of the lecture bureau, assigned to all lecturers the topic "The Influence of Radio on American Life." The lecturers who discussed this subject at various lecture centers of the board in the five boroughs of Greater New York were Arthur D. Rees, Prof. William B. Otis, Prof. Nelson P. Mead, Dr. Sydney N. Ussher, Dr. Hubert H. Harrison, Mrs. Mary Elizabeth Lease, Miss Jennie M. Davis and George A. Hastings.

NEW TRICK FOR TRAINED SEALS



Trained seals are about the slickest animals in the world. Here we have Jackie trying to learn to listen in on a radio concert. He can balance a ball on the tip of his nose and play on musical instruments, but hasn't learned yet how to adjust his phones. You will notice he missed his ears.

Opinions of Radiophans

FROM "STEVE HIMSELF."

RADIO EDITOR: I have seen statements in your paper, as well as others, about "the monoply of the air." Some people are always kicking, because they have been born that way. As a matter of fact, I find the best in the air coming from Chicago stations.

I have had my set exactly five weeks, and this is my first experience as a broadcast listener. WDAP, on the Drake hotel, is on the air at 300 meters, and WJAZ, at the Edgewater Beach hotel, at 448. Now, these two stations are very strong coming in. Another strong station in between these two is WHB, Kansas City, Mo., at 411 meters. Now, with extreme patience, I tuned in KHJ, Los Angeles, Cal., at 395 meters. Now, don't misunderstand me, I got California in between these two Chicago stations that are mentioned, time being 10:55 p. m., Jan. 25. I have witness as to this. Let me impress upon each and every radiophan that I am not trying to tell you how good my set is, but for those who want distant stations while Chicago is on is this: Have patience in tuning. You can't get them by moving your dials five or more notches at a time; keep your lights low, or your Chicago stations will butt in.—STEVE BOBOWSKI, 1000 North La Vergne Avenue.

What Is Wrong?

RADIO EDITOR: The subject of what constitutes the greatest difficulty today in radio reception seems to be given considerable space lately.

To those living in the larger cities, the greatest difficulty, and greatest nuisance in connection with radio reception, is due to the existence of too many broadcasting stations located in the same vicinity. Or, too, many stations in the same vicinity that are permitted to broadcast simultaneously.

The sputterings of the amateur and commercial telegraph, the howls of the "single circuit regenerative" receivers, are of no consequence, if the overlapping wave bands of several local stations operating simultaneously absolutely blanket all outside reception. Moreover each station is on the air too long. Everything they have to offer with few exceptions can be given in a short time. Te interminable reading of telegrams and announcements of prize contests are subjects that should be omitted, as well as thirty-minute "world crier service."

The use of radio as an advertising medium, its chief use today, is going to result in its own defeat if not used more moderately and with more discretion. All are shouting their wares together, too long and too loud, and the nearest and loudest under the circumstances naturally is the one that is heard.—V. A. MATTESON.

P. S.—Please do not think that this is written because I am having troubles due to an inferior receiver. I have several excellent ones. One a neutrodyne, the other regenerative and very selective. I receive—when anyone can.

DX Records

LIKES "SUPERDUC."

RADIO EDITOR—After buiying The Post and reading about the Superduc de Luxe I decided to stick together the Superduc by itself and try it. I used the following: I Raven variometer (which I split), 1 Bradley slat, 1 crl grid leak, 1 43-plate condenser, 89 cents, 1 UV-199 tube, and a 75-foot aerial. I did not solder any connections or make corners square and received the following from 8:30 to 11:30: KYW, WDAP, WMAQ, WJAZ, WHB, Kansas City; WCAE, Pittsburg, Pa.; WBAP, Fort Worth, Texas; WKY, Oklahoma City, Okla.; WHAS, Louisville, Ka.; WGY, Schenectady, N. Y.; WFAA, Dallas, Texas. The Chicago stations I could hear twenty feet from the phones clearly. I am now going to build the Superduc de Luxe.—ROBT. H. ROYERSON, 7230 Maryland avenue.

RADIO EDITOR—Here is my DX record for Monday night, heard on my one-tube ultra-audion between 6:30 and 10:30: WDAF, Kansas City; WCAE, Pittsburg; WBAK, Harrisburg, Pa.; WGY, Schenectady, N. Y.; WHB, Kansas City; WPAB, State College, Pa.; KDKA, Pittsburg; WOC, Davenport; WOAW, Omaha; WOO, Philadelphia; WBAP, Fort Worth; WRC, Washington; WWJ, Detroit; WOS, Jefferson City, Mo.; WHAZ, Troy, N. Y.; WAAW, Omaha; WCBD, Zion, Ill.; WBAY, Columbus, Ohio; WSB, Atlanta; KSD, St. Louis; WOR, Newark; WLW, Cincinnati; WEAF, New York city; KFKX, Hastings, Neb.; WMC, Memphis; WTAS, Elgin; WGR, Buffalo.—M. STACHURSKI, 3242 Lowe avenue.

One From Omaha.

Omaha, Neb.

Radio Editor: Here is a list of stations heard on Wednesday night (silent night for Omaha), Feb. 6, between 7 p. m. and 12:30 a. m. They were heard on an Armstrong three-circuit with two steps of audio-frequency. I heard all stations on the loud speaker:

WEAF, New York city; WCAE, Pittsburg; WOO, Philadelphia; WMAQ, Chicago; WAAW, Omaha; KSD, St. Louis; WOS, Jefferson City; WDAF, Kansas City; WGR, Buffalo; WJAZ, Chicago; KFI, Los Angeles; WDAP, Chicago; WMC, Memphis; KDKA, Pittsburg; WCAP, Washington, D. C.; WCX, Detroit; WLAG, Minneapolis; WAC, Davenport; KYW, Chicago; WTAM, Cleveland; WNAD, Norman, Okla.; WBAP, Fort Worth; WSB, Atlanta; KHJ, Los Angeles; WHAA, Iowa City, Iowa; KFKB, Milford, Kan.

You have the best radio magazine by far. It is certainly a dandy.—LANE M. AXTELL.

One-tube Ultra-Audion.

Chicago, Ill.

Radio Editor: Here are my DX loggings: WOR, Newark; KDKA, East Pittsburg; WOAW, Omaha; WBAP, Fort Worth; WWJ, Detroit; WTAS, Elgin, Ill.; WCBD, Zion, Ill.; KSD, St. Louis WEAF, New York; WDAR, Philadelphia; WHB, Kansas City, Mo.; WOC, Davenport, Iowa; WCX, Detroit; WHAS, Louisville; WCAE, Pittsburg; WTAM, Cleveland; WIAO, Milwaukee; KFKX, Hastings, Neb.; WOS, Jefferson City, Mo.; WGY, Schenectady, N. Y.; WOO, Philadelphia; WDAF, Kansas City, Mo.

I have a one-tube ultra-audion. Success to your Radio Magazine.—STANLEY BRANDSEN, 4418 North Campbell avenue.

DEFENDS AMATEURS.

RADIO EDITOR: Have been reading your Radio Magazine for quite a while and think it is better than any other I've seen, altho I don't think much of broadcasting. I have noticed quite a few people have sent in ideas on how to put up a broken aerial without taking the pole down. Why don't people use their brains and equip all masts with a pulley. Pulleys may be obtained at any hardware store for 15c, and if good galvanized cable is used, no trouble with breaking or rusting will be had for an indefinite length of time. Also many B. C L.'s have been kicking about the amateurs, especially in Oak Park, altho they are no worse there than anywhere else.

For those who want to know, we do not transmit between the hours of 8 and 10:30 p. m. local standard time, and Sunday morning during local church services.

At any time outside of that one is liable to be disturbed if he has a cheap and inefficient set. I have done it and I know other fellows who have tuned out a 1KW spk. set located within three blocks of their stations and received concerts on 360 meters. The spark was on 200 meters. Most any night on my set I hear ships in the b. c. band, and probably much of the qrm which B. C. L.'s report is from them. If anyone wants to report interference, I would advise him to learn the code and know what he is talking about, as I don't think the amateurs make as much qrm as credited with by a long shot.

"Don't try to get selectivity as good on a crystal as on a three-circuit set and you will get along better."—R. G. DUFFIELD JR. (9ECB), 225 Franklin Street, Wheaton, Ill.

ANOTHER PLEASED "CUSTOMER."

RADIO EDITOR: Inclosed find $1.35 for which send me the Thursday Evening Post for one year with the Radio Magazine. I find it one of the best radio magazines in the country and I sure like to read it, as it is very interesting.

Last week I hooked up the "Old Reliable" from your magazine and it sure works fine. Even tuned out our WOAW local station which was going on full blast. Thursday noon tuned out our WAAW station and South Omaha while both were going and got Chicago Board of Trade and Davenport, Iowa. Both came in fine. Last Wednesday night I got twenty-two different stations and when I went to bed there still were a lot of stations in the air. The farthest I got that night were Schnectady, N. Y., and Los Angeles, Cal.

I have been a radiophan now for a year and the other night was the first time I tuned in a station down in Arizona. I got Tucson.

I have got the hook-up now on just common boards, but have a bakelite panel 7x24, but I am going to have a hard time getting it in that size as I am getting another 43-plate Kellogg condenser and am using a 180-degree Fada coupler and an Atwater-Kent variometer, Bradley stat, a grid lead and condenser. Expect to get good results when it is mounted on the bakelite panel. Also am usilng a Kennedy two-stage amplifier which works good. The out-of-town stations come in almost as loud as the local ones.—HARRY A. SMALL, 1421 Sherwood Avenue, Omaha, Neb.

Cure for Squeals.

RADIO EDITOR: Here is my idea to help eliminate some of the reradiation squeals: First, stop publishing complete programs; second, ask the phans to see how complete a program they can send in from any one DX station, instead of how many DX stations they can log in a night or a week.

That would be a real DX test and at the same time everybody would finally get tuned in, and we would not have the reradiation squeals.

For instance, on Sunday evening I tuned in WCAP at 7:30 p. m., and heard every selection rendered until they signed off at 10:13½, eastern standard time. I sent them a complete list of every selection, and thanked them for the splendid evening's entertainment, as it was the most complete I had ever heard.

Several times it would fade away for 8 to 10 seconds and then come back, and once in a while I would get a reradiation squeal from some other set, but it did not last long, and when they either tuned in or tried some other station, the WCAP was still there. I never moved a dial for one and one-half hours.

I think your magazine a great help. I am not criticizing your publishing the complete programs, but let the phans pick them up and send them in to you.

Instead of seeing how many DX stations you can get in one evening, see how complete a program you can get.—SAM KENAGA, 4327 West Adams street.

Lebanon, Ind.

Radio Editor: Having noticed several DX receptions with crystal receivers in The Chicago Evening Post Radio Magazine, I let you know of some records I have made with my crystal set. Friday night I heard the following broadcasting stations:

KDKA, East Pittsburg; WCBD, Zion, Ill.; WHAS, Louisville; WGY, Schenectady; WDAF, Kansas City, Mo.; WDAP, Chicago; WOS, Jefferson City, Mo.—CLARENCE F KRAMER, 414 East Pearl street, Lebanon, Ind.

The Chicago Evening Post Radio Magazine

RADIO EXCHANGE

Radio Classified Advertisements will be inserted in this section at 5c per word per insertion. Minimum 10 words. Two initials count as one word. No display type, cuts or borders allowed.

5c a Word

If box number is desired, allow four extra words. Box answers will be mailed to advertisers free of charge. Address The Chicago Evening Post, Radio Department, 12 South Market-st.

SETS FOR SALE.

$110—A RARE BUY—$110.

The Famous Crosley Model XJ. A 4-tube set that has no equal. Coast to coast on loud speaker. Amazing clearness, simplicity and selectivity. Beautiful cabinet. Manufactured and guaranteed by largest radio builders in America. Set up in your home complete with all accessories, including the celebrated MUSIC MASTER loud speaker, for $110. LOCKWOOD RADIO SALES CO., 1409 Mallers Building. Dearborn 3593.

BASS RECOMMENDS, GUARANTEES AND INSTALLS the latest five-tube Radiodyne Atwater-Kent Number 10, the EQUAL of any, the PEER of most; selectivity the highest; Chicago installations made in one hour from receipt of order.

BASS CAMERA COMPANY,
Graflex Headquarters of America,
109 N. Dearborn-st. State 7410.

NEUTRODYNE RECEIVER

—New, for $75, or complete with tubes, batteries, phones and loud speaker unit for $125; only best parts and equipment used; also make sets to order at low cost; for this bargain call SCHMALZIGAN, 218 E. Garfield-blvd. Kenwood 1317.

WESTINGHOUSE 3-TUBE RECEIVING SET 301-A Cunningham tubes, one 6-volt storage battery, two 45-volt B batteries, two head phones, one loud speaker, one Edison attachment for graphophone, $80; one 2-volt Willard storage battery, $1.50. Call evenings. Seeley 3242. 2131 Park-av.

5-TUBE NEUTRODYNE $70—With tubes, $90; complete parts for Old Reliable, mounted on slate, Kellogg condensers, $40; $7.50 loop aerial, $3.50; 2 UV-202 power tubes, $5 each; call after 7 p. m., 2107 N. Hamlin-av. (2d apt.). Phone Spaulding 4116.

SUPER-SENSITIVE CRYSTAL SETS—Will pick up broadcasts up to 15 miles without aerial; with aerial and ground, longer distances; no tubes or batteries to bother with; guaranteed; $15 complete. ANDREW DEVORE, 637 Cass-st., Chicago. Phone Superior 7223.

5-TUBE NEUTRODYNE—Including tubes, batteries, speaker, aerial; ready to listen-in; best parts used, $100. CAVERLEY, 4742 Winthrop-av. Sunnyside 5992.

3-TUBE SETS—With batteries, tubes, loud speaker, phones; installed complete, $110; other sets made to order. D-246, Chicago Evening Post.

3-TUBE R. C. S.—Storage battery, charger, loud speaker, phones. H. WASHBURN, 875 N. LaSalle-st. (top floor).

3-TUBE SET—Loud speaker, batteries, etc., complete; bargain. 2900 N. Racine-av. (2d floor).

3-TUBE RADIO SET—Very reasonable. CONNOLLY, 3352 Flournoy. Nevada 9131.

SETS FOR SALE.

FREE INSTALLATION.

Special for one week only. A long-distance radio set installed in your home complete for $35. Crosley Model Ace V. Finest 1-tube set on the market. Receiving range of 1,500 miles. Remarkable clearness. Guaranteed by largest radio builders. LOCKWOOD RADIO SALES CO., 1409 Mallers Building. Dearborn 3593.

ULTRA-AUDION SET (NEW)—Complete with tube, batteries, etc., $18; gets long distance. S. KALE, 2744 N. Troy-st., city.

WESTINGHOUSE R. C. RADIOLA V—Complete; 3 tubes, A-B batteries, phones, $85. Graceland 4714.

NEW 3-TUBE COCKADAY—Complete, $100; includes Pathe speaker, fine cabinet. Sunnyside 9740.

3-TUBE BREMER-TULLY—Very good distance getter, $50. Englewood 0592 after 4.

3-TUBE ERLA—Complete—Batteries, loud speaker; new; $90. Calumet 3538.

PARTS FOR SALE.

GUARANTEED DETECTOR and Amplifier Tubes $2.85—Radio storage batteries, $11.75; double life Twin dry cells, 55c; 22½-volt small B batteries, 98c; large 22½-volt, $1.98; 45-volt, $3.15; guaranteed fresh; 23-plate variable condensers, $1.25; 11-plate, 98c; complete stock of panels and cabinets; radio sets made to order at a great saving. EASTMAN ELECTRIC COMPANY, 558 W. Madison-st. Phone Franklin 2015.

3 GENUINE PEANUT "N" TUBES—Guaranteed new and perfect; will sell for $3.50 each. Address D-244, Chicago Evening Post.

RADIO SERVICE.

I ASSEMBLE, REWIRE or build radio sets at home; have sets ready to listen-in; some distinctive features. C. BURGE, 112 S. Homan. Nevada 3616.

RADIO SETS MADE, repaired, rewired or rebuilt; all work guaranteed; moderate charges. WOODLAWN RADIO CO. Midway 4257.

RADIOS BUILT, REPAIRED.
Work guaranteed; charges reasonable. TOM W. BURROUGHS, 743 Oakwood-blvd. Atlantic 5426.

SETS AND SERVICE.

BARGAINS IN RADIO SETS, PARTS AND CABINETS — Rewiring and repairing SMITH, 3968 Drexel-blvd.

PARCEL POST SERVICE.

RADIO SUPPLIES AT GREATLY REDUCED prices postpaid to your door east of the Rockies. Satisfaction guaranteed, or money refunded. Send your order today and be convinced. Remit by postoffice or express money order. 20% must accompany all C. O. D. orders. Tubes, C11, C12, C301A, WD11, WD12, UV201A, C299, UV199, $4.50; C300, UV200, $4.40. Headsets: Brandes, $4.95; Federal, $5.95; Murdock, $3.95; Baldwin Type C, $9.45; Baldwin Type C Unit, $4.65. Filkostat, $1.80. Bradleystat, $1.65. Bradleymeter, 200 ohm, $1.80; Univernier, with dial, $1.15. All American Transformers, 5-1, 10-1, $3.90. Howard Multi-plug, $1.80. Send for list. Michigan Radio Co., 17 W. Grand Ave., Chicago, Ill.

DISTANCE IMPROVEMENTS.

DISTANCE PHANS! SOMETHING NEW!

Clear up that "mushy" distance; increase record 50%. Simple attachment. NOT A WAVE-TRAP. Thirty minutes to construct. Use with any set. The "WILLARD FILTER" does the trick! Why wonder that the other fellow gets distance clearly? Get this DISTANCE SECRET! Complete directions; blueprints; panel template, only 50c to first 200 writing, as an introductory price. Send money order to WILLARD RADIO SERVICE, 1914 Oakdale Ave., Chicago, Ill.

AERIAL WIRE.

COPPER RIBBON AERIAL, 100 FEET, $2.25. CLIPS ENCLOSED.

½-inch wide, .010 thick. STRAND LABORATORIES, 1512 N. Leamington-av. Tel. Mansfield 1067; write or phone.

AERIALS.

IF YOU WANT a good aerial, put up right and reasonable, call M. L. SHOSTRAND, Sheldrake 0344.

FIRST-CLASS AERIALS—Constructed reasonably. MR. SCHULZ. Hyde Park 0072.

REPAIRS.

RADIO SETS REPAIRED—Rewired or rebuilt; satisfaction guaranteed; charges reasonable. SIDNEY H. STONE, 5233 Glenwood-av. Edgewater 0805.

SALES AND SERVICE.

SEE OUR RADIO TABLES—PRACTICAL for every receiving set; write for circular or call. G. H. OTTO, 120 W. Lake-st., 2d floor.

POST CLASSIFIED RADIO ADS BRING RESULTS

RADIO CHAIN STORES

3 STORES IN CHICAGO

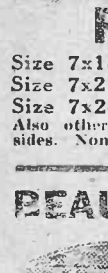
Chicago Leading Radio Stores' Offers

Amazingly low prices on high quality radio merchandise that will most strongly appeal to all radiophans who KNOW values. Join the crowds in this sale that runs to next Thursday

TUBES

CUNNINGHAM and RADIOTRON TUBES at special cut prices for this week only:—201A, 199, WD12 or WD11. On sale here at only-------- $4.69

WESTINGHOUSE WR-21 TUBES



Detector or Amplifier, for use with 3 dry cells, does away with storage batteries. Very specially priced for this sale at

$3.25

Two for $5.75

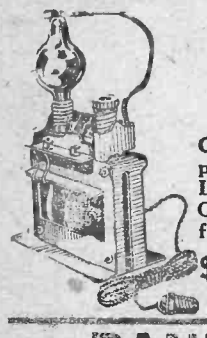
REINARTZ 1-Tube Set

Complete, assembled. All parts in mahogany finished cabinet. Specially priced for this week's sale at

$15.95

PARTS ONLY—Unassembled. Price--- $11.45

BATTERY CHARGER WITH GENUINE TUNGAR BULB



Charges 2 amperes per hour. List price $18. Our Special price for this sale,

$8.69

PANELS

Size 7x18, special--------$1.50
Size 7x21, special-------- 1.70
Size 7x24, special-------- 1.98
Also other sizes. Highly polished both sides. None better anywhere.

THIS WONDER SET SYNCHRODYNE

The set without an equal. No other receiving set on the market now comes even near equaling it. If you came to us with twice the money we ask we could not show you anything superior to it. Neither could any other store. There is none better. It is the marvel of all radio receiving sets. Do not think of buying any other set until you have seen this one. Remember—we offer this set COMPLETE—no extras! Set comes in a very high grade cabinet, all parts assembled, including—

A $300 Value for $151.49

- Five Radiotron Tubes
- Loud Speaker
- Storage Battery
- Battery Charger
- B Batteries
- Head Set
- Aerial Wire
- Ground Wire
- Insulators
- Phone Plugs and
- Ground Clamp

Each Set with a Guarantee or Money Refunded. Complete with all listed parts, as above, for $151.49.

The parts used in these sets are the highest grade manufactured, and guaranteed to function properly.

SPECIAL WE ALSO SELL THESE SETS ON TIME PAYMENTS. COME IN AND LET US GIVE YOU DETAILS.

HEAD SETS

The Famous Baldwin Head Sets, listed at $12.00 a pair, offered in this six-day sale at an unusually low price----- $6.69

SPECIAL

We have 200 Kilbourne - Clark guaranteed single Head Sets which we are offering at a special price, the best value in Chicago $1.19 (Only One to a Customer.)

OTHER SPECIAL VALUES	LIST PRICE	SALE PRICE
Roller-Smith ---------	$8.00	$3.68
Edsh ----------	7.50	4.25
Berwick 3000 ohm----	7.00	2.98
Berwick 2000 ohm----	6.00	2.68
Manhattan 3000 ohm--	6.00	3.68
Manhattan 2000 ohm--	5.00	3.25
Brandes ----------	6.50	4.95

LOUD SPEAKER

Beautifully finished. Stands 22 inches high. Guaranteed workmanship. With Edsh Unit,

$8.49

With Baldwin Unit,

$9.69

CABINETS

Solid Oak and Mahogany Finish. Note the Prices:—

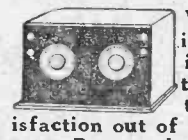
6x10½ $2.10
6x21 ..... 2.75

We have all other sizes in stock.

Radio Corporation Cabinets

Genuine Veneer Finish Mahogany. 9½x13¼. $10.00 value. Special --- $2.69

WAVE TRAPS



Will tune out all interference. This is an essential to the fan who wants to get utmost satisfaction out of his set. Parts only---- $4.98

COMPLETE—In highly polished cabinet, specially priced at $7.95.

Our Guarantee!

Is your absolute assurance of complete satisfaction. We guarantee that EACH and EVERY article described herein—or that we sell you—is first-class in quality and workmanship—and warranted to satisfy you our customer. WE INSTALL RADIO SETS ON APPROVAL. Leave—or send us—your name and address.

IF IT'S RADIO—WE'VE GOT IT

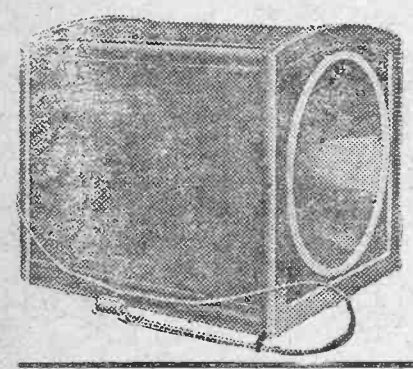
STORAGE BATTERIES

We guarantee each battery for TWO YEARS. If you have any trouble at all return for cash refund. Special prices for this sale:—

- 60 Ampere Hours $10.48
- 80 Ampere Hours 11.75
- 100 Ampere Hours 13.95
- 120 Ampere Hours 15.95

There are no better storage batteries than these. They are the best. Our responsibility is back of each battery.

BEAUTIFUL MAHOGANY-FINISHED LOUD SPEAKER

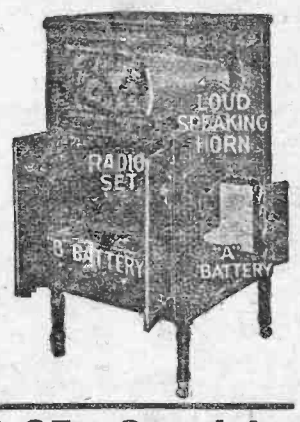


This is an article of beauty. It will decorate your home. This Loud Speaker comes with Baldwin Loud Speaker Unit. An exceptional bargain, at ------- $13.85

SOMETHING NEW

HIGH-CLASS RADIO CABINET. We were fortunate in getting 100 of these for this sale. All you do is put your set (or build your set) into this beautiful mahogany-finished cabinet. Has a place for batteries. Loud Speaker included less unit, but is wired complete. Factory cost, $50. Our Sale price, only --------- $34.95

Delivery Free in City



Synchrodyne Kit

Consisting of 3 Radio Frequency Transformers and 3 Precision Condensers. $25.00 value. Special at---- $19.95

Come in and get our prices on all makes of knocked-down sets.

HYDROMETERS

Guaranteed List 75c, Special! 49c

SPLIT VARIOMETERS—Highly finished, molded silk wound utility $2.75
ELECTRIC SOLDERING IRONS—Guaranteed for one year $1.75
DOUBLE PHONOGRAPH ADAPTERS—Special at..... 69c
E. S. X. TALKING MACHINE ATTACHMENT—Special..... $1.19
RUBBER PHONE ADAPTERS—Offered at..... 25c
[illegible]-SLIDE TUNERS—Special this week only at..... $1.95
[illegible] RHEOSTATS—6½ ohm, special sale at..... 19c
HARD RUBBER 3 IN. U. S. DIAL—Each, at..... 10c
SWITCH LEVERS—Each 9c
SWITCH POINTS—With nuts, special, per dozen..... 10c

LARGE 22½-VOLT B BRIGHT STAR BATTERIES

(Not More Than 3 to a Customer) EACH $1.29

VARIABLE CONDENSERS

All Bakelite End Plates	Regular Price	Our Price	Plain Style	Regular Price	Our Price
43-Plate Vernier	$7.00	$3.48	43-Plate	$4.00	$1.69
23-Plate Vernier	6.00	3.15	23-Plate	3.50	1.39
14-Plate Vernier	5.50	2.98	11-Plate	2.50	1.25
3-Plate Vernier	2.00	.98	5-Plate	2.50	1.15

We will make or repair any make of set. Consult with our radio engineers.

5c, 10c and 25c Specials

- Pathfinder 19c
- Spaghetti, assorted colors, yd.....7c
- 2 ft. length Square Wire.....2 for 5c
- Round Hook-up Wire, 25-ft. coil for 25c
- Telephone Cord Tips.....2 for 5c
- Soldering Lugs, all sizes, dozen...10c
- Porcelain Insulators 5c
- Composition Insulators 10c
- Contact Points, per dozen 5c
- Stops, dozen.....5c
- Switch Levers..10c
- Adjustable Levers for 19c
- Battery Porcelain Switch 19c

We have many close-outs at bargains. Come in and LOOK—or ASK—for them.

OTHER SPECIALS

- Tri-Coil R. F. Transformers. Special at---- $1.95
- Hercules 4-Way Plugs, Each, 65c. Two for--- $1.19
- Molded V. T. Sockets, Each, 35c. Three for- $1.00
- V. T. Sockets, each---------19c
- Enclosed Crystal Detector---79c
- Phone Jacks, up from--------19c
- Phone Cords, special at-------33c
- Raven Hygrade Variometer, $2.19
- Jefferson Transformer-----$2.48
- Antenella or Ducon Aerial Plug—Does away with outside Aerial. Special price-- 98c
- Klosner Vernier Rheostats —special for this sale.. 79c
- Reinartz Mounted Coils----$1.59

3 CHICAGO STORES

RADIO CHAIN STORES OF AMERICA

3 CHICAGO STORES

167 W. RANDOLPH — 9 SOUTH CLARK — 2423 NORTH HALSTED

OPEN EVENINGS AND SUNDAY

MAIL ORDERS FILLED