Blueprint Section Every Month

RADIO AGE

The [illegible]e of the Hour

APRIL
1925

MEET YOUR BROADCAST FAVORITES

ZENITH

TRADE MARK REG.

→LONG DISTANCE← RADIO

TRADE MARK REG.

Super-Zenith IX—the ideal radio set for the fine home

Every Night Is "Distance Night" With Zenith—

IN Chicago twelve powerful broadcasting stations are on the air every night of the week except Monday. The wave-span ranges from WBCN (266 meters) to KYW (536 meters). No testing ground in radio reception offers the difficulties experienced in this location.

But—whether it's Monday night *or any other night,* Zenith receiving sets in Chicago bring in dozens of distant stations clearly and without the slightest hum of interference . . . . and this in the very *storm center* of Chicago's broadcasting area, the near North Side.

Power to reach out and bring in distance—clarity of tone—selectivity—these are the factors which have made Zenith supreme in the field of radio reception, and in proof of that supremacy Zenith invites and welcomes side-by-side tests, in any location you may name. Its standing challenge: *More* stations in a given length of time, clearly and with volume, than can be brought in by any other receiving set on the market.

Zenith is handled only by selected dealers who give you service. We give the Zenith agency franchise only to dealers who will give you service AFTER THE RADIO IS SOLD. When you buy a ZENITH, we are not through. Our exclusive dealer's service man will call once a week or oftener if you want him. This costs you nothing. In other words, Zenith dealers have done your shopping for you.

Write us for the name of your nearest exclusive Zenith dealer

ZENITH RADIO CORPORATION

332 South Michigan Avenue, Chicago

ZENITH—the exclusive choice of MacMillan for his North Polar Expedition

The complete Zenith line ranges in price from $100 to $475.

With either Zenith 3R or Zenith 4R, satisfactory reception over distances of 2,000 to 3,000 miles is readily accomplished, *using any ordinary loud speaker.* Models 3R and 4R licensed under Armstrong U. S. Pat. No. 1,113,149. They are NON-RADIATING.

Zenith 4R - - $100
Zenith 3R - - $175

The new Super-Zenith is a six-tube set with a new, unique, and really different patented circuit, controlled exclusively by the Zenith Radio Corporation. It is NOT regenerative.

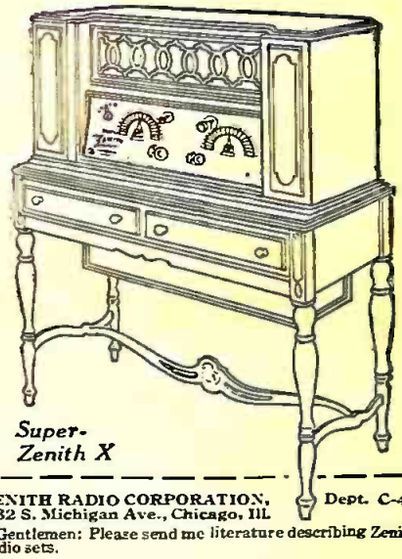
SUPER-ZENITH VII—Six tubes—2 stages tuned frequency amplification—detector and 3 stages audio frequency amplification. Installed in a beautifully finished cabinet of solid mahogany—44⅞ inches long, 16¾ inches wide, 10⅝ inches high. Compartments at either end for dry batteries. Price (exclusive of tubes and batteries) $240

SUPER-ZENITH VIII—Same as VII except—console type. Price (exclusive of tubes and batteries) $260

SUPER-ZENITH IX—Console model with additional compartments containing built-in Zenith loud speaker and generous storage battery space. Price (exclusive of tubes and batteries) $355

SUPER-ZENITH X—Contains built-in, patented, Super-Zenith Duo-Loud Speakers (harmonically synchronized *twin* speakers and horns), designed to reproduce both high and low pitch tones otherwise impossible with single-unit speakers. Price (exclusive of tubes and batteries) $475

All Prices F. O. B. Factory.



Super-Zenith X

ZENITH RADIO CORPORATION, Dept. C-4
332 S. Michigan Ave., Chicago, Ill.

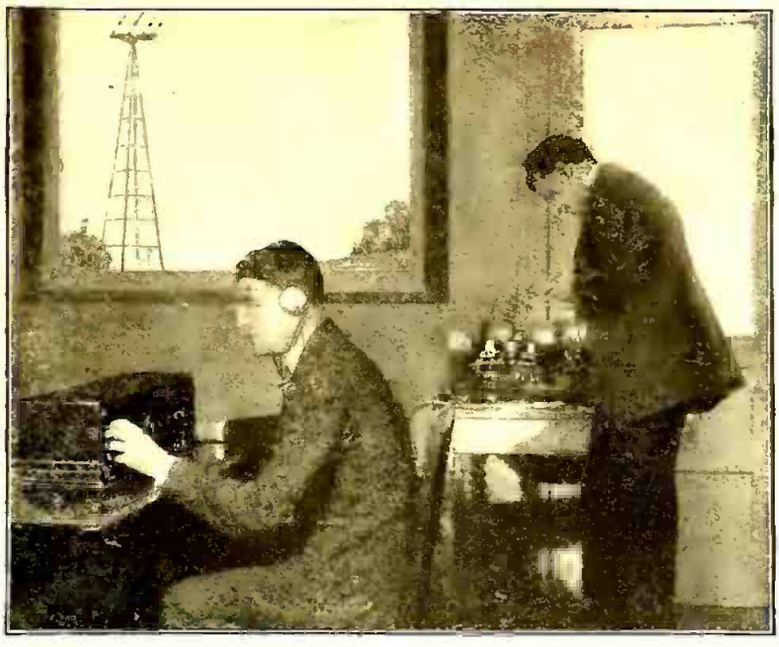
Gentlemen: Please send me literature describing Zenith radio sets.

Name.....

Address .....

I am averaging anywhere from $75 to $150 a month more than I was making before enrolling with you. I would not consider $10,000 too much for the course.
(signed) A. N. LONG,
Greensburg, Pa.

No sooner had I received my discharge (as a buck private) than I opened a radio shop of my own. I earned over $3,500 in 1 year. I wouldn't have missed the N. R. I. course for a million dollars.
John P. Zinno,
Corona, L. I.



Before I enrolled with you I was making $15 a week on a farm. Now I earn from $2,080 to $4,420 a year. And the work is a hundred times easier than before. Since graduating a little over a year ago, I have earned almost $4,000 and I believe the course will be worth at least $100,000 to me.
(signed) Geo. A. Adams,
Tamaqua, Pa.

I can very easily make double the amount of money now than before I enrolled with you. Your course has benefited me approximately $3,000 over and above what I would have earned had I not taken it.
T. Winder,
Grand Junction, Col.

Prepare Yourself For Radio —*the New Profession*

Many N.R.I. Graduates Now Earning From $50.00 to $200.00 a Week

THE biggest, best-paying field open to ambitious men today. Thousands needed at once for pleasant, interesting jobs. High Pay—Short Hours. No experience required. Learn in your spare time at home.

Here is work that is fascinating, new and easy—an industry which is growing more rapidly than any other in the world today—an industry that offers you the chance of a lifetime to "get in on the ground floor" and make big money. Right now, thousands of trained men are needed in all branches of the business. Radio operators, radio engineers, salesmen, mechanics and Radio executives are scarce and receive wonderful pay. Are you going to shut your eyes to this golden opportunity when there is a quick, easy way to get one of these splendid positions?

You can train for this "big money" field right in your own home—in your spare time. No matter how little you know about electricity or Radio, the National Radio Institute—the largest and best school of its kind in the world—will guarantee to give you a thorough Radio training in a few short months.

Salaries Doubled and Tripled

Since the National Radio Institute was founded in 1914 over 15,000 men and young men have taken this short-cut to Success in Radio. They are enthusiastic about this wonderful Course.

E. W. Barnes, Norfolk, Va., writes: "During my spare time, I make about as much repairing radio sets and building them as my regular salary."

In a letter from Arthur Ruse of Toronto we read that he has doubled his income since mastering Radio and that he earns from $50 to $100 a month in his spare time.

This page contains only a few of the thousands of letters we receive from successful graduates. Hardly a week goes by without our receiving urgent calls for our graduates.

"We need the services of a competent Radio Engineer."

"We want men with executive ability in addition to radio knowledge to become our local managers." "We require the services of several resident demonstrators" —these are just a few small indications of the great variety of opportunities open to our graduates.

This is an absolutely complete Radio Course now being offered which qualifies you for a Government First Class Commercial License and really gets you the bigger paying jobs in Radio.

Send Today for Free Book and Special Short-time Offer

Don't rely on this announcement for a true picture of the opportunities in Radio. Simply mail the coupon and we will send you a big *free book*, "Rich Rewards in Radio," which will show you *actual proof* of the big money being made by our graduates today. It will describe the course in full detail, it will tell you just how much you can earn in this fascinating profession. Best of all, you will get the details of our Special Reduced rate which is being offered for a short time. So, mail the coupon now! Make this your lucky day!

Study In Your Spare Time At Home

This is the time to go into radio. Big opportunities are now open in every branch of the work, and salaries were never so high. The thing to do is to begin studying at once, in whatever time you can spare, so that you will be able to qualify for the position you want when the time Comes. Only an hour or so every evening will quickly prepare you for radio—a profession you cannot fail to find fascinating and pleasant. Don't handicap yourself; start at once and advance with the others.

The National Radio Institute
Dept. 53 FB, Washington, D.C.

The National Radio Institute,
Dept. 53FB, Washington, D. C.

I am interested in radio as a profession. You may send me, free and without obligation, your interesting book, "Rich Rewards in Radio," all information about your spare time, home-study plan and about your free employment service. Also, the details of your Special Offer.

Name..... Age.....

Street.....

City..... State.....

RADIO AGE

The Magazine of the Hour

Established March, 1922

WITH WHICH IS COMBINED RADIO TOPICS

Volume 4 *April, 1925* *Number 4*

CONTENTS

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A Chat With the Editor

WITH this issue RADIO AGE enters its fourth year of service to the radio public. We are no longer a "new" magazine. There are only four other radio publications in the United States that can claim longer life than RADIO AGE. We would hesitate to try to count those which have come into the field since we first filled up our desk inkwell in March, 1922. Many of those publications have budded, burgeoned for a brief season, and suffered sudden blight.

We greet our new and old readers with a word of appreciation for their continued interest in our efforts and for their many letters of encouragement and approval. We have made some enemies in the past three years and are proud of it.

The Radio Corporation of America is trying to wrest from us the name of our magazine and our lawyers are resisting that astonishing attack. The Radio Corporation wants to seize our name and give it to the magazine which it owns and controls.

Our counsel demanded proof of the Corporation's contention that our use of our name injures the business of the Corporation's own organ, Wireless Age. The Corporation thereupon asked for thirty days additional time to answer our questions. The answer of the Corporation must be filed at the U. S. Patent Office on or before March 21st.

On March 18 the corporation also must appear before the Federal Trade Commission with a defense to the Government's charge that the Corporation is involved in a trust conspiracy. Busy week for the radio patriots, we'll say.

It is possible that radio fans who buy sets and parts and who stand for fair play and sportsmanship will love us all the more for the enemies we have acquired.

Frederick Smith

Editor of RADIO AGE

RADIO EDITORIALS

THERE are many recent evidences that the art and business of radio are approaching a position of stabilization. Radio artists are forming an organization. Radio announcers in the East have organized an association. The object in both instances is to improve the daily product of the microphone.

It is estimated there are fully 10,000 entertainers who go on the air each day in the more than 500 broadcasting stations now in operation in the United States. While there are said to be 10,000,000 regular daily listeners, it is estimated that almost 25,000,000 were in the audience that heard the inaugural ceremonies at Washington on March 4. This was accomplished by the interconnection of stations across the country.

Many millions are hearing the Victor and Brunswick hours of music at regular intervals. This access to millions of homes is achieved also by inter-connection of stations in various districts of the country.

While the tendency toward organization is a healthy sign, and while it carries with it a promise of greater and more uniform excellence of entertainment, there is a danger lest too extensive a degree of consolidation may bring us nearer to a monopoly of the air. This is a contingency heartily feared by thinking radio fans and earnestly desired by big radio interests which have dreamed of monopoly since KDKA electrified the country with its first broadcasting.

The American Telephone and Telegraph company, sometimes alluded to as one of the Four Horsemen of Radio, appears to have control of telephone line connections whereby trans-continental re-broadcasts are made possible. While the A. T. and T. professes that the service of supplying wire connections with its New York station, WEAF, is rendered impartially and at a reasonable cost to those independent stations which desire to join the group broadcasting, the writer is in possession of figures which show that the charge for this service is by no means a nominal one.

Although the purpose of the Victor hours of music is to advertise the records of the Victor Talking Machine Company and thereby promote sales of those records, the independent stations which re-broadcast these excellent musical features pay a good price for the privilege. So, it seems, radio is still importantly dependent upon the telephone combine.

IT IS worth the while of broadcasting interests throughout the country to bear in mind that any arrangement which makes any one, or even several eastern cities, the chief source of radio entertainment is neither the best arrangement nor in the long run will it be found the most popular one. This is a country of great distances and diversified interests and taste. It is to be regretted that the Chicago Civic Opera Association could not have found it possible to have permitted the broadcasting of solos by its great artists during the past season. It is questionable whether the broadcasting of complete operas is always practicable and desirable but millions of music lovers could have enjoyed songs from the Auditorium stage. This would certainly not have resulted in a decrease in the sale of tickets at the box office. On the contrary, it might have stimulated sales. California has many broadcasting stations of premier excellence. The great West has talent in abundance. One of the most significant phases of radio is that it eliminated sectional lines and brings North, South, East and West into closer relationship.

HAVE you observed that it is now possible to buy tubes at a price far below the figures of a year ago? Also, have you noticed that several independent manufacturers have entered the field with good tubes at reasonable prices? Good omens! We have suspected recently that a great deal of the current chatter about boot-leg tubes was the result of propaganda instigated by the pocket book interests associated with a big corporation which wanted the public to buy its tubes and no others. Tube prices were ridiculously high for three years. Forcing the fans to pay exorbitant prices for tubes was not calculated to boost the popularity of radio. But competition has now stepped in and the set-builder can buy tubes that are made by independents and are good tubes in the bargain. Our own technical men have tested several kinds of these tubes and found them to be excellent in performance and durability.

A RECENT decision by a Delaware federal court granted an injunction restraining the Radio Corporation of America from selling tubes made by the Westinghouse Lamp Company, a subsidiary of the Westinghouse Electric and Manufacturing Company. It appears that the corporation which has been suing manufacturers on all sorts of claims of patent infringements was itself accused in dealing in tubes which were alleged to be infringements on the right of the DeForest Company. The final decision in this tube suit should interest the radio public. It has its amusing aspects. Read some of the facts about the court's decision in this issue of RADIO AGE.

THE United States Government has called upon the great army of radio fans to co-operate in what is destined to be the first real test of radio broadcasting in this country. The Government asks that the fans be patient while the super-power tests are being conducted and to await results with an open mind.

With the first announcement that "super" or increased power was to be tried out, there was some grumbling on the part of fans living near the proposed super-power locations. They complained they would not be able to hear anything once the strong stations got on the air. They looked upon the super-stations as a just cause to junk their receiving sets.

The Government does not take this stand. If the super-stations make it impossible for fans to hear anything else, it has been explained, they will not be licensed permanently. The thing to be remembered at this time is that present super-power operations are purely *experimental* and not definite. The minute the Government finds these stations are detrimental to the welfare of radio, they will be abolished. This is a promise; and our country usually lives up to its promises.

Now You Can Afford —
a modern precision-made set which "cuts through"

¶ Tuned radio frequency for distance and selectivity, reflex for economy, the unequaled loudspeaker tone quality and volume which comes with ALL-AMERICAN precision manufacture—all are present in this *non-radiating* three-tube receiver. ¶ And, owing to the economy of "wiring it yourself," ALL-AMAX SENIOR costs *less* than a *finished one-tube set* of equally high quality. ¶ *Take it home today* from your favorite radio store; wire it this evening, and "tour the country" before you retire for the night! **Price $42.**

The RADIO KEY BOOK has, concentrated in its 48 pages, the answers to those questions you have been wondering about. It is a radio education in itself. Send ten cents, coin or stamps, for your copy.

ALL-AMERICAN RADIO CORPORATION
PIONEERS IN THE INDUSTRY
2680 Coyne Street - - - Chicago

ALL-AMERICAN Guaranteed Radio Products

Standard Audio Transformers
3 to 1 Ratio, type R-12...$4.50
5 to 1 Ratio, type R-21... 4.75
10 to 1 Ratio, type R-13... 4.75

Power Amplifying Transformers (Push-Pull)
Input type R-30.....$6.00
Output type R-31..... 6.00

Rauland-Lyric
A laboratory grade audio transformer for music lovers. R-500.....$9.00

Universal Coupler
Antenna coupler or tuned r. f. transformer. R-140.....$4.00

Self-Tuned R. F. Transformer
Wound to suit the tube. R-199 $5.00. R-201A $5.00

Long Wave Transformer (Intermediate Frequency)
(15-75 kc.) R-110.....$6.00

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Tuned type (filter or input). R-120..$6.00

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(Oscillator Coupler). R-130 $5.00

Super-Fine Parts
Consisting of three R-110's, one R-120 and one R-130 $26.00

The ALL-AMAX Sets
This shows how they come to you—mounted complete on panel and baseboard, with full photographic wiring instructions, blueprints, and a 48-page instruction book.

All-Amax Junior

A one-tube reflex set that brings in the locals on the loudspeaker, with wonderfully clear tone quality, or tunes them out and gets real distance. *Non-Radiating.* Price $22

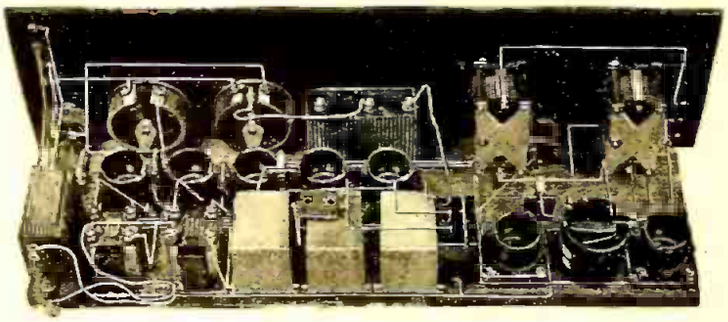
ALL-AMERICAN

Largest Selling Transformers in the World

* *Tested and Approved by* RADIO AGE *

Silver-Marshall, inc.
RADIO EQUIPMENT

Silver Supers Approved by the "Who's Who" of Radio



Coast to Coast with Speaker Volume on a Loop

DESCRIBED LAST MONTH IN RADIO AGE AS

A RECEIVER THAT WILL SERVE FOR YEARS

SILVER SUPERS ✻

Embody the Latest In Radio

THE FACTS

BASIC FACTS make Silver Supers the logical selection of the man who wishes to build the best. Briefly enumerated these facts are: The universal endorsement of the leading authorities in Radio—the unsurpassed reception records set by Silver Supers—S-M Two-Ten and Two-Eleven matched, tested and charted Transformers—the admitted correctness of the principles embodied in the design—simplicity of construction and the low cost. For the man who wants to build his own Receiver, and who wants to build the best for years of use, there is just one set. . . . the SILVER SUPER.

APPROVED

THE LIST of those who have endorsed Silver Supers very nearly constitutes the "WHO'S WHO" of Radio. Approval is thunderous when it includes these experts: Arthur H. Lynch of Radio Broadcast, Capt. John Irwin of Radio Broadcast's "Covered Wagon," Gerald M. Best, Technical Advisor of Radio Magazine, M. B. Sleeper of Radio Engineering, Frank D. Pearne of Radio Age, Iverson C. Wells of Everybody's Radio, and R. E. Hughes through his six Newspapers. Add the Chicago Herald and Examiner, American Radio Journal, Citizens Radio Call Book, On the Air Magazine, and the cautious Christian Science Monitor and WTAS Broadcasting Station . . . then you will know that Silver Supers have been approved by the "WHO'S WHO" of Radio.

BUILD YOUR OWN—it's easy—GET THESE PARTS

LABORATORY MODEL	Price Each
2 Silver .0005 Low Loss Condensers No. 301	$4.50
2 4 in. Moulded Dials—Tapered Knobs	1.00
1 U. S. L. 7 Ohm Rheostat	1.10
1 U. S. L. 240 Ohm Potentiometer	1.50
7 Insulated Top Binding Posts	.05
1 Carter 102A Jack	.80
1 Carter 101 Jack	.70
2 210 Transformers	8.00
1 211 Transformer	8.00
1 Silver Oscillator Coupler No. 101	2.50
7 Benjamin Spring Sockets (199 or 201A?)	1.00

LABORATORY MODEL, *(Cont.)*	Price Each
2 Thordarson 3 1-2:1 Audio Transformer	4.00
1 On-off Switch	.60
3 .5 MFD By-pass Condensers	.90
2 .00025 Mica Condensers with Leak Clips	.45
1 .002 Mica Condensers	.40
1 .000045 Balancing Condensers	1.50
1 5 Meg Ohm Grid Leak	.50
1 1 Meg Ohm Grid Leak	.50
1 7x24x3-16 in. Bakelite Panel, Drilled, Grained and Engraved (Specify with or without meter hole.)	7.00
1 7x23x1-2 in. Oak Base Board, Bus-Bar, Spaghetti, Screws Nuts, Solder, Lugs	1.50

Complete Parts for the Silver Super—Laboratory Model, $63.60
Laboratory Model Blue Prints, 50c
McMurdo Silver's Book, "THE PORTABLE SUPER-HETERODYNE, 50c

S-M TWO TENS and TWO ELEVENS Long Wave Transformers supplied in sets of two or three Two Tens (iron-core interstage) and one Two Eleven (filter for input or output) with identical peaks and separate curves. Curves plotted in our own Laboratory and recorded directly on the transformer's tag. Both peak at 5000 meters and pass an 11 Kilocycle sideband without distortion.
Price of either type each.....$8.00

S-M DISTORTIONLESS AUDIO AMPLIFIER gives perfect tone quality on all vocal and orchestral music, and that with greater volume. The cost is no more than that of ordinary transformer coupled amplifiers.
Price each.....$17.95

S-M LOW LOSS CONDENSER Type 301, straight line, low loss, grounded rotor condenser of the most approved and advanced design. For maximum efficiency, the Silver Low Loss Condenser should be used in the 4-Tube Knockout, and all sets where extreme efficiency is desired. Cap. .0005 Mfd.
Price each.....$4.50

4-TUBE KNOCKOUT on a 70-foot antenna will equal the startling performance of the Silver Supers. Send for McMurdo Silver's own description of this, his latest circuit. It contains a wealth of information and complete assembly instructions.
Price.....25c

GUARANTEE—Every S-M Product is sold on the Satisfaction or your money-back basis.

WRITE for illustrated Literature describing the latest developments in Radio.

Eastern Distributor

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RADIO EQUIPMENT
110 So. Wabash Ave. CHICAGO

✻ *Tested and Approved by* RADIO AGE ✻

RADIO AGE
The Magazine of the Hour

M. B. Smith
Business Manager

A Monthly Publication Devoted to Practical Radio

Frederick A. Smith
Editor

Something for the Experimenter—

Tests in Circuit JUGGLING

By ARMSTRONG PERRY

25 Hookups Possible with But a Few Parts

THERE has been considerable reduction in the prices of radio receivers, but it may be news to some fans that it is possible to secure electron tube sets as low as one dollar per. It has been done and you can do it.

The examination of a hundred single-tube hook-ups shows that many contain the same or similar parts. Reading a diagram from left to right, the first thing encountered is an inductance coil. There may be two or three. If two, they may be in a variometer or a variocoupler. If three, one of them is usually a tickler.

Following the path of the antenna current toward the grid, we find a grid condenser shunted by a grid leak. Tracing the course of the output from the plate, we pass the tickler, if there is one, the phones, and the "B" battery. In the filament circuit there is an "A" battery and a rheostat to regulate its supply of current to the filament.

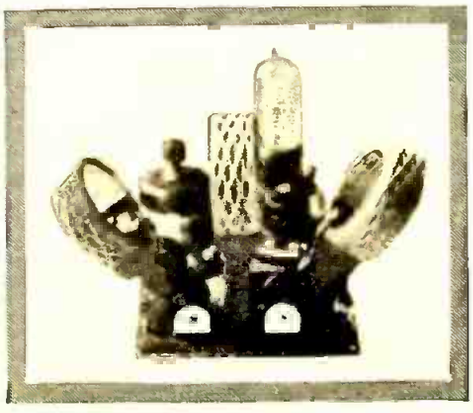
Anyone who will write on a piece of paper the names of the parts used in one-tube receivers will be surprised that they are so few. The ordinary regenerative and non-regenerative circuits can be built with about a dozen pieces of apparatus. Even the reflexes, with their amplifying transformers, require no more than fifteen to twenty. It follows, therefore, that as many as twenty-five different hook-ups can be made from the same parts, merely by arranging them according to different diagrams. A complete set of parts that may be assembled into as many as twenty-five different hook-ups can be purchased for $25.00. It follows, therefore, that the cost per receiver is but one dollar. Moreover, the parts can be so mounted and connected that the connections can be changed in a few moments, giving the operator any one of the circuits that he has the parts for, so he actually may have under his hand the whole twenty-five receivers.

Honeycombs Are Good

MENTION honeycomb coils and some dealers and fans immediately cry "Obsolete!" Let them shout. They have failed to follow the example of the busy little bee, inventor of honeycomb, who knows enough to stick to a good thing when he finds it. Modern business has discovered that nothing moves so many goods as fads. Since fads are short-lived, it is necessary to create a new one as often as possible. Honey-comb coils were once a fad. They work just as well now as they did then. Probably they will work even better, when used with some new types of apparatus. Government tests proved that on short waves they were not so efficient as on wavelengths above 1,000 meters, but it is possible to purchase straight-wound short-wave coils of the same dimensions and values as honeycombs, similarly mounted and interchangeable.

So if you want to do some experimenting that will increase your store of radio knowledge and afford you some pleasant as well as instructive hours in addition, we suggest that you get a three-coil mounting and some coils and use them as the inductance in your one-dollar receivers.

It is not necessary to buy all sizes of coils. Secure a catalogue that shows the wavelengths covered by coils of different sizes and you will see that the wavebands overlap. When shunted by a .001 condenser, a 25-turn coil will cover the wavelengths used by amateur radio telegraphers, a 50-turn coil most of the band used by the broadcasters, a 100-turn coil the higher broadcasting wavelengths and the ship-to-shore traffic. If you want to go on up to the Army and Navy wavelengths, or pull in the trans-oceanic traffic from the high-power stations, larger coils may be selected. The condenser, if connected in series with a coil, will reduce its wavelength. If mounted so that the turn of a switch will change the connection from series to parallel, or vice versa, it will have the maximum adaptability.



A front view of one of the experimental models built by Mr. Perry. Remarkable distance and selectivity have been achieved with these simple sets.

The three-coil mounting with from three to six coils takes the place of many pieces of apparatus. The variometers and variocouplers made with a tube for a stator and a ball for a rotor have become so popular that it has been almost forgotten that the main thing in such apparatus is the control of the positions of the windings with respect to each other. When parallel, they give the maximum inductive effect. When at right angles to each other, they give the minimum inductive effect. A coil swung on a hinge can form just as many angles, with respect to an adjacent stationery coil, as one turned on a ball. The tube-and-ball variometer and variocoupler have one advantage over the hinge type in that they keep all the windings closer together at all settings, so experts choose them when a highly efficient piece of apparatus is needed to cover a certain restricted range of wavelengths.

Covers Wide Band

HOWEVER, we cannot expect everything in a dollar outfit, and though the three-coil mounting may not develop the highest efficiency at every wavelength, it is generous in the width of the band that it covers. Even if a single-coil circuit, such as the ultra-audion, is being used, you can yank out your 25-turn coil when the jargon of the hams becomes unbearable, plug in a 1500-turn coil, and immediately soothe your irritation by listening to the smooth, rhythmic sending of the big commercial stations. Or, if local broadcasting stations are fighting

A back view of one of the $1.00 receivers. Notice the adjustable grid leak and the three honeycomb coils which efficiently received ship-to-shore traffic when the set was plugged into an electric light socket in Chicago.

each other for the right of way down your antenna, a quick shift of coils may rid you of all but one. A dozen single-coil, variometer and variocoupler hook-ups can be tested in a single evening.

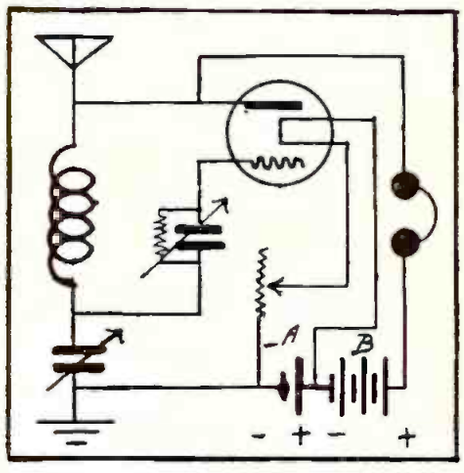
Portability, also, is within your reach with such an outfit. There are condensers, hard to find but in the market, that have the capacity of a 43-plate contraption in less than one-fourth the space. They are equally variable and have dials like the big condensers. Rheostats come in many sizes and shapes. Small parts like the grid leak and condenser can be squeezed in anywhere. A cigar box cover is large enough to mount the whole outfit. By judicious selection of two cigar boxes, you can secure as a panel a cover that will fit snugly into the other box. When such an oufit is finished, it should be plainly marked "Radio" to avoid disappointing one's friends. If a Pittsburgh stogie box is used, this precaution is unnecessary, for no one would think of raising the cover anyhow.

There are a few fine points to remember when purchasing parts. If you want a portable set, you will need a tube that will operate on dry cells. Each type of tube has its own characteristics. One may work very well with a 1-megohm grid leak and another may work better with from 3 to 5 megohms. A variable grid leak will fit any tube, and is even better than a handful of the cheaper leaks of different fixed resistance values. A variable grid condenser increases the elasticity of the set also.

A dozen wires of various lengths, made up with clips, lugs or other convenient devices on both ends, will save much time in changing connections. Small switches may be installed at points where many and quick changes may be desired.

Satisfactory DX

How far can you hear with such an outfit? That is usually the first thing a beginner wants to know. The first hookup I used was a combination of ultra-audion and Colpitts circuits, using a single coil. I was in Chicago and the outfit exhibited a splendid loyalty to the home talent. It kept KFI at a distance and did not give WEAF a Chinaman's chance to interfere. As there was no local code traffic, it cheerfully brought in ship-to-shore messages from the Atlantic seaboard, and the time signals from NAA.



Here is another of the hookups built with the "$1.00 circuit" by Mr. Perry. This hookup differs fram the one shown on Page 7 in that only one coil is used. This arrangement insures excellent long-distance broadcast reception.

In New York and Washington whence, because of its lightness and small bulk it was easy to carry it, it quickly forgot the city of its birth and turned a deaf ear to WLS and all the rest of the Chicago stations. However, I have friends with hundreds of dollars tied up in sets that operate within the broadcasting wave-band only, who cannot get out-of-town stations without going where they are.

Selectivity? Well, it did not seem to want to miss anything that was going on locally. But on a farm or in a town a hundred miles from the nearest broadcasting station, it would separate cleanly stations with wavelengths reasonably far apart, if carefully tuned. In tuning, the separation of the coils, the adjustment of the variable condenser, the fine control of filament current, the accurate setting of the grid leak and condenser, all played important parts, as well as the selection of coils.

Taken by and large, an investment of $25.00 in such an elastic, portable, experimental outfit, yields the largest dividends in radio fun and experience of any I ever made.

Keep Connections Straight

USE flexible wire in making the connections, and keep them short and straight. If you care to, you can use stranded wire, with clips on the ends. This will enable you to change over from one circuit to the other very rapidly.

Of course, the resistance will be quite high and the results will not be as good. But for experimental purposes it answers quite well. Using that system, it is possible to wire almost any circuit in about twenty-five minutes.

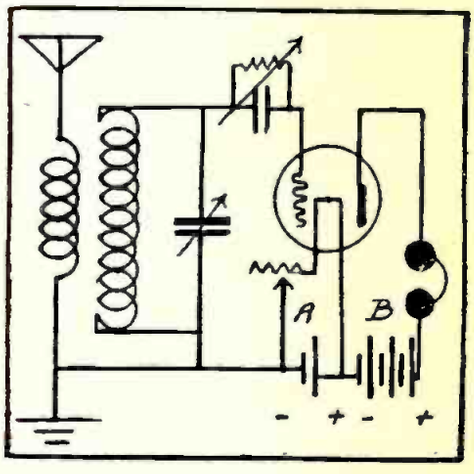
After you have tried a great many hookups with your $25 layout you may wish to tie to one of them, in which event be sure to solder all connections carefully, making the leads as short as possible and you will have no cause to regret the time or money spent. Care in the use of soldering paste or flux will return the usual dividends.

The standard three honey-comb coil hookup will be found to be the best and the most selective. Signals from a long distance and signals from stations whose wavelengths are about the same can be separated quite easily.

This method of tuning seems to be forgotten in the present days of "dynes" and "supers," but nevertheless, it is very efficient.

Consider the number of three circuit tuners on the market, whose principle is exactly the same as the tuning of the standard three honey-comb coil system.

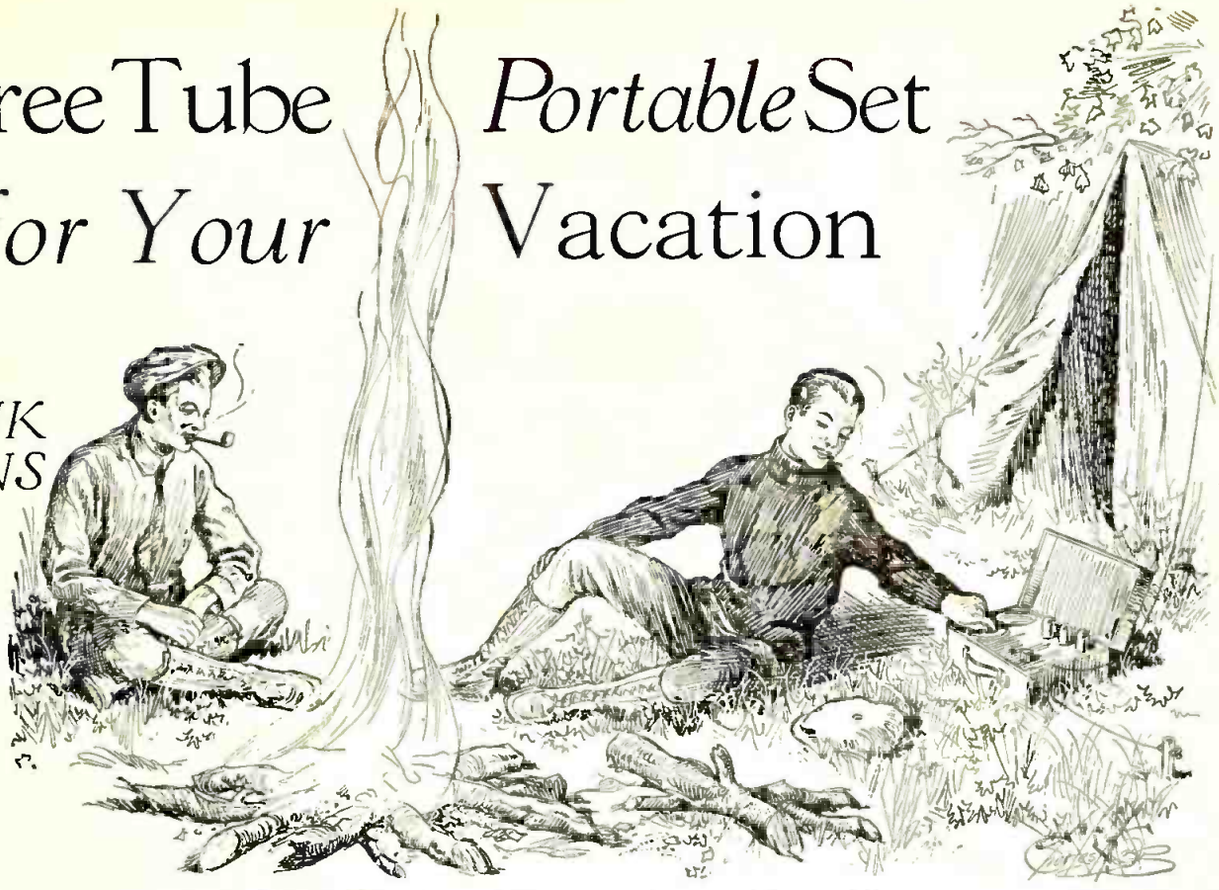
(Many fans will no doubt try their luck at building several of the twenty-five hookups possible with Mr. Perry's unique arrangement of parts. RADIO AGE will print your hookup from the apparatus specified if you will send your data to the "Pickups and Hookups" Editor.)



Above is the third hookup the experimenter may construct fram very few parts. This employs a primary of the aperiadic type which increases selectivity to a great extent. While it does nat achieve phenomenal results in DX work, it is unusually satisfactory in a big city where there are a number of braadcasters.

A Three Tube *Portable* Set *for Your* Vacation

By
H. FRANK HOPKINS



Include a Portable Set in Your Traveling Equipment This Summer and Your Joys Will be Unlimited

Have you seen God in His splendors,
Heard the text that nature renders?
(You'll never hear it in the family pew.)
The simple things, the true things,
The silent men who do things—
Then listen to the Wild—
It's calling you. (*Service*)

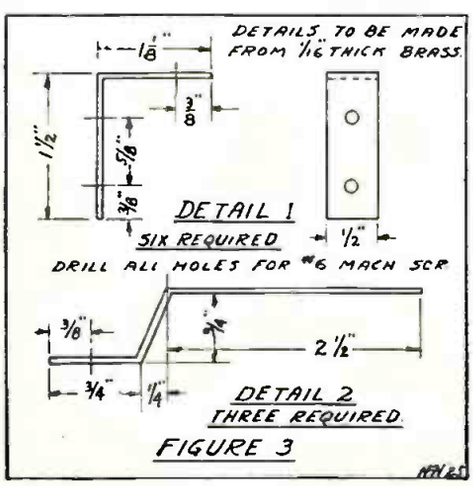
YOU, among the rest of us, no doubt, are getting restless and looking forward to summer and the annual two weeks. A sort of dreamy feeling creeps over you and work seems out of the question. The fishing tackle is looked over; the golf clubs, perhaps, or the camping outfit are also inspected. An increasing demand for time tables and road maps. All are symptoms of that disease, that contagious malady of April and May—"Spring Fever."

Have you stopped long enough to think what an added pleasure it would be to take the radio along this time? Remember the evenings around the old camp fire, telling the fish stories and reciting the day's adventures? Or maybe it is at the sea-shore, those long remembered hours that seem like minutes when you live them over again. How nice it all was, and how much more you would have enjoyed it if you had had the old winter's stand-by, your radio, along to furnish music to sing to, to dance to or just to listen to.

A Real Companion

LET us include a radio this time and see how different it will all seem, to be out in the great open spaces, far from the rush and din of the hot, dusty, city, with just the sky, your pal and the radio. Real music, the news of the day, and for the business man, the market reports, all at your finger tips. Don't you think it would be worth a trial? I took mine last year and that will be my first thought this time and all of those to follow. I am going to describe the set I used so you too can take one this year to give you as much pleasure as mine gave me.

The first thing to look for in a set such as this is simplicity, compactness and weight. It must be simple to operate, simple to build, compact and portable, and as light as can be, requiring as small an antenna as possible and be as sturdy as it can be to withstand all of the knocks and abuse it will get in moving from place to place. Not an elaborate set; just a moderate-priced, good, substantial receiver with batteries and loud speaker self contained.



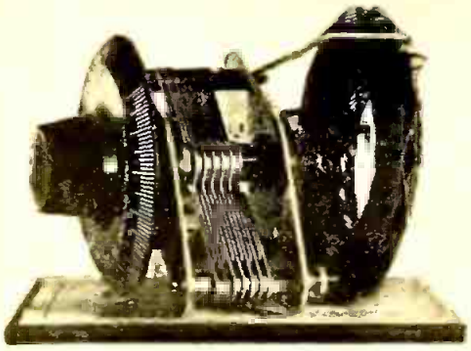
Above is shown the method of making the brackets for the 3-tube portable set described in this article.

The next step will be to secure a good strong grip such as used for school books, the inside measurements should be at least eighteen inches long, twelve inches high and five inches deep. This should be given a few coats of waterproof varnish and allowed to dry thoroughly to make it as moist-proof as possible, to prevent warping.

When the grip is prepared, the panel can then be laid out and the various brackets and straps made, and put aside until the set has been built and is ready to mount.

The most difficult task in the construction of this set will be to properly arrange the parts to conserve space. The diagram shown in figure two will greatly lessen this task, as it can be followed for almost any size case over that described. Some may want to place the parts in a different manner; if so, care should be taken to see that the tuning element is as far away from the audio transformers as possible, and that the tubes are so placed that they can be removed easily, as it is a good plan to take them out and carry them in their original boxes while transporting the set from place to place, as a tube can be very easily damaged by sharp jolts and rough handling when in a rigid fixture, such as a socket.

The next step will be to make the two



A rear view of the tuner for Mr. Hopkins' portable set, showing the method of mounting the coils on the back of the condenser. (Radio Age Photo)

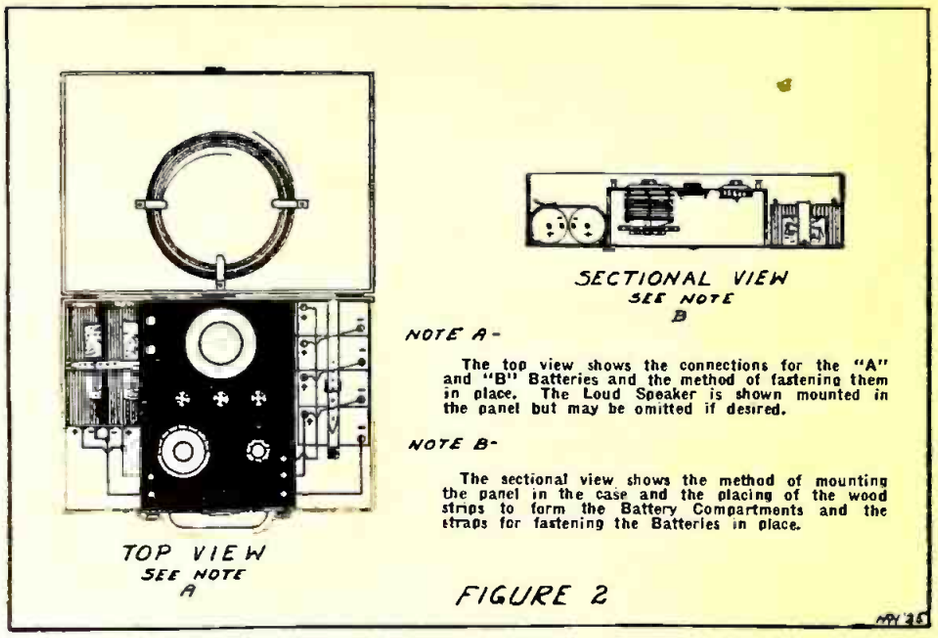


FIGURE 2

spider-web coils. This is about one of the most simple and fool-proof coils for the fan to build. There is less chance to go wrong and less mechanical skill is required. It is also one of the most efficient of low loss coils. The only thing necessary to wind this coil is a spider frame having about fifteen spokes. This may be purchased at a cost of about twenty-five cents at any reliable dealer.

Winding the Coils

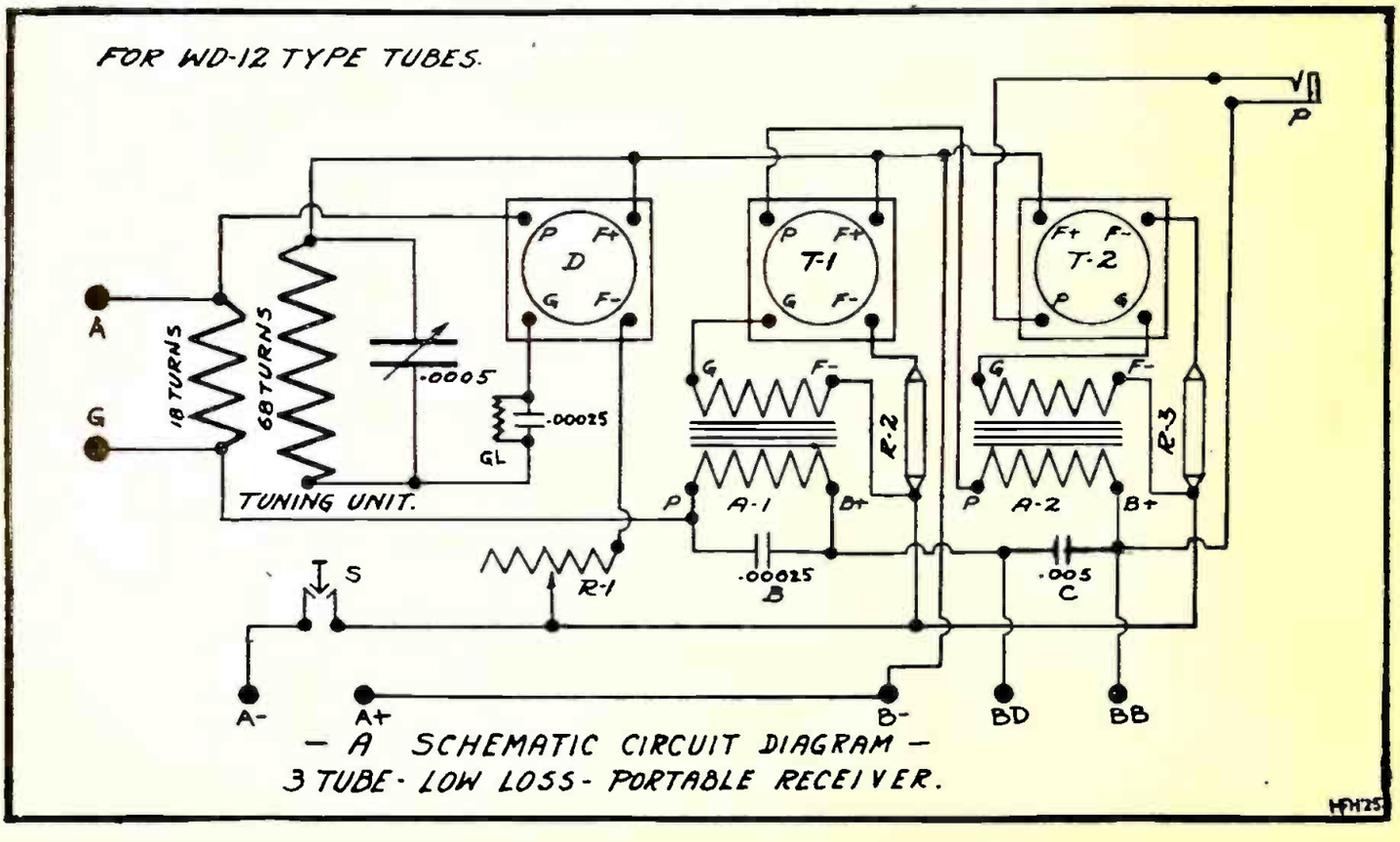
THESE coils should be wound in a clockwise direction, leaving about six inches of free end for each connection. They will be wound over two spokes and under two spokes as described in the article on the De Luxe receiver published in the February issue of RADIO AGE. One of the coils will be wound with eighteen turns of number twenty-four B and S gauge, double silk covered, copper magnet wire, the other coil will consist of sixty-eight turns of the same wire. When one coil is finished, it should be treated with a good solution of collodium and allowed to dry thoroughly and the spokes removed. The edges of this coil will then be given a good coat of collodium to prevent the wires from coming loose or it may be sewed with silk thread.

The second coil will be built up in the same way and the two coils will then be securely fastened together as shown in the picture of the tuning unit on page 10. This may be done with collodium, also, or they may be sewed together or even glued. The completed coil unit will then be mounted on the condenser and connected. One side of the secondary coil will connect to the rotor plates of the condenser and the other side to the stator, or stationary plates and the tuning element is completed and ready to mount on the panel. The bracket shown in figure three, as detail one, will be used to mount the coil and should first be covered with friction tape or other good insulator.

The panel will now be prepared. The instruments should be placed around until they are satisfactorily arranged, their mounting holes marked and the panel drilled. A hole about one-half inch in diameter should be drilled for the shaft of the tuning element and three holes to pass the shells of the tube sockets. These sockets will be mounted on the under side of the panel with the shell projecting through to the top. A three gang socket may be used if desired, as it is more suitable for this type of mounting.

All of the equipment will be mounted on the back of the panel, as there is not sufficient room for a shelf. This will

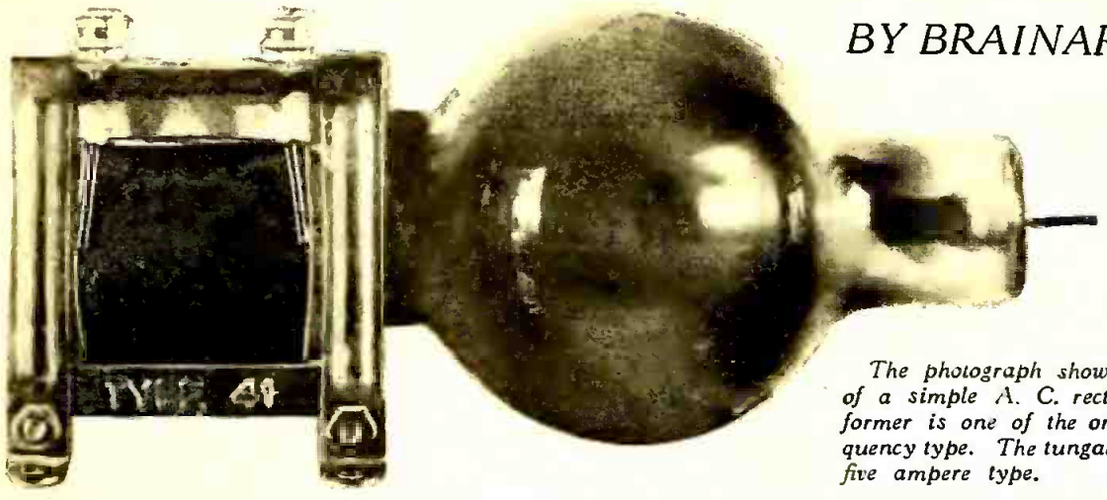
(Turn to page 67)



— A SCHEMATIC CIRCUIT DIAGRAM —
3 TUBE - LOW LOSS - PORTABLE RECEIVER.

Getting "B" Voltage with an A. C. RECTIFYING System

BY BRAINARD FOOTE



The photograph shows the main parts of a simple A. C. rectifier. The transformer is one of the ordinary audio frequency type. The tungar bulb is one of the five ampere type.

NON-TECHNICAL men who have been interested in radio have often asked just why it was that the necessary voltage for the plate circuits of our amplifying tubes could not be secured from the unchanging and reliable source—the lamp socket. Of course, in those few city locations where the lighting circuits are furnished with direct current, this is a comparatively simple matter, but inasmuch as the vast majority of us have A. C. instead, the problem isn't quite so easy.

Naturally, the alternating voltage will not do of itself, since the reversals of polarity, taking place 120 times every second, cause what is called a "60 cycle" hum, so loud as to utterly ruin broadcast music or voice. It therefore becomes necessary to convert or change this alternating voltage into a steady voltage —to change the alternating current into direct current.

To perform this feat a "rectifier" is employed. The rectifier is any device which permits current to pass in one direction more readily than in the other, thus leaving a "balance" of voltage which is always in the same direction. The more nearly perfect the rectifier, the more nearly does it exclude *all* current in the reverse direction. The familiar crystal detector is a rectifier, but hasn't the current carrying power or the approach to perfection that is necessary for "B" rectification. A good rectifier may be formed of a collection of jars containing a lead electrode and an aluminum electrode, dipping into a solution of borax. This, while feasible, is messy and too much of a nuisance for general satisfaction.

The Vacuum Tube

THE most perfect rectifier known is the vacuum tube itself. Although not looked on exactly in this light, there are tubes used as rectifiers—as witness the tungar battery charger that uses a large tube containing a filament and a plate for the rectifying work. In Fig. 1 we find the principle of a tube rectifier

A Plate Unit for An A. C. Lamp Socket

illustrated. At the top we have a connection to a 110 volt alternating current source, and at the bottom the output terminals for the direct current. One terminal of the A. C. runs straight over to the D. C. side, while the other lead is interrupted by the rectifier. This is a tube containing a filament and a plate. The filament is lighted by a battery and its temperature regulated by a rheostat. Electrons are then given off by the filament as soon as the direct current posts are closed through some circuit where the voltage is to be used, and the plate is then charged positively. The dotted arrows show the direction of electronic flow, whereas the full arrows show the assumed direction of current flow.

Thus the vacuum tube points out that the old assumption of current flowing from positive to negative is in reality incorrect, though it does no harm to consider that the current of electricity does go in that direction so long as we understand which way the electrons actually proceed. In such a rectifier circuit, it is easy to remember in case of doubt that the positive lead always comes from the rectifier filament circuit and the negative from the remaining side of the A. C. supply line.

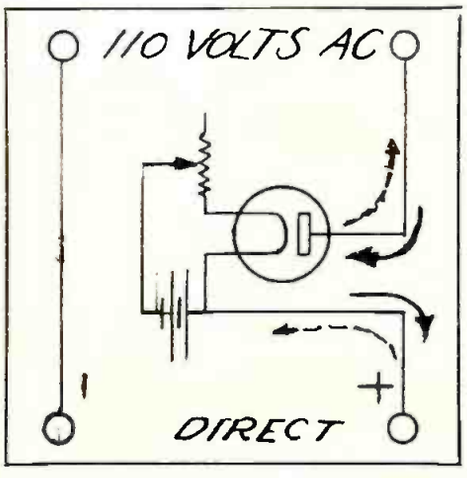


Fig. 1. The simplest rectifier, using a vacuum tube. Dotted arrows point out electron flow. Full arrows show current flow as assumed before the advent of tubes.

Now, getting our rectifier down to workable proportions, we at once run up against the question of the tube. The UV 201A or the C301A tube will answer with perfect satisfaction, even though it has an extra element which doesn't seem essential. The grid, being nearer to the filament, does more of the rectifying than the plate, so that the grid is in truth the "plate" of the rectifier. However, to slightly increase the electronic stream and thus make it possible to obtain more voltage on the D. C. side, both grid and plate are connected together as the "plate" of the rectifier tube.

Transformers

IT IS not convenient to illuminate the rectifier by means of a battery, so a simple bell ringing transformer is adopted instead. These are used in house wiring for supplying power to doorbells and buzzers and are very cheap little instruments (S1 to S2) and have a 6 or 8 volt output. Now, while a straight connection to the 110 volt line will function, it is preferable for several reasons to interpose a transformer between the rectifier unit and the line. In the first place, the A. C. "hum" doesn't get through quite so easily that way, and then it is impossible to short-circuit the line and blow fuses through errors in connections when a transformer is inserted.

The ordinary audio frequency amplifying transformer is just the thing for the purpose. It must be a good strong one, with its parts securely clamped or bolted together at several points. An insecurely assembled transformer may do for audio

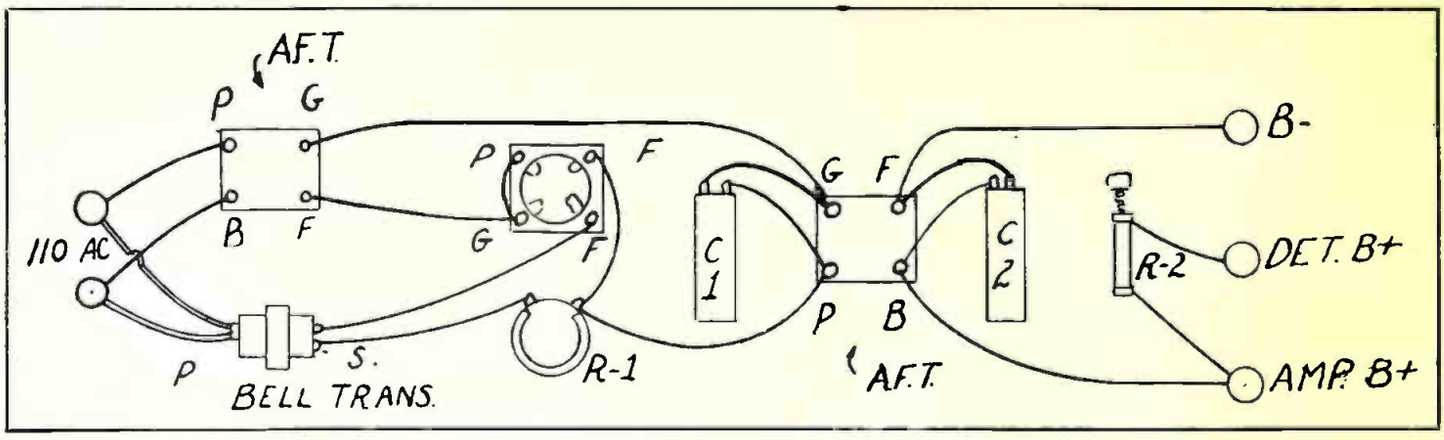


Fig. 2. A one tube "B" voltage rectifier, suitable for sets using no more than three receiving tubes.

amplification, but with 110 volts A. C. on its primary, the laminations of the core will start to vibrate with a 60 cycle frequency. Referring to Fig. 2, we observe that the primary of the A. F. transformer is connected across the A. C. line, as is the primary of the bell ringing transformer.

The secondary of the bell transformer is connected to the filament posts of the tube socket through a rheostat R-1 of about 15 ohms resistance. The plate and grid posts are connected together and to one of the secondary posts of the audio transformer—it makes no difference which. In order to smooth out the remaining irregularities and ripples in the rectified current, it is necessary to provide a "filter" circuit. This is composed of two coils of wire wound on an iron core and two large fixed condensers. The condensers absorb electrical energy when the voltage increases and they give it out again when the voltage drops, thereby having the effect of steadying the voltage. They are merely reservoirs which maintain the voltage constant. The "choke" coils act like flywheels on a gasoline engine. Without the flywheel, the motion of the engine would naturally be uncontrollably jerky, but with it the energy is stored in the heavy wheel and "smoothed out" through its inertia. The coils oppose any sudden change in voltage or current strength. Thus, with condensers to equalize the voltage and with coils to oppose any change in the voltage, the pulses of direct current released via the tube are "ironed out" into a continuous and unruffled uni-directional current.

The choke coils are conveniently suited in their requirements to two windings of another audio frequency transformer, this being any non-descript make of transformer, since it neither carries a heavy current nor is subject to alternating voltage. The output binding posts, "B" plus and "B" minus, are connected to the amplifier terminals of the set. For the detector, unless it's a soft tube, a variable resistance having a resistance variable between about 10,000 and 75,000 ohms, is inserted in series with the detector plus "B" post. This resistance is shown at R-2. Except with the ultra-audion circuit, it is necessary to provide a by-pass condenser in the plate circuit of the detector, as from "DET." "B" to minus "B."

Limits of the Rectifier

As shown in Fig. 2, "B" voltage may be supplied to a three tube set, detector and two stages of audio or any other combination using three tubes or less. It is essential that the rectifier tube be a good one, new if possible, for an exhausted tube—one that does work passably in the audio socket—won't do for rectification. The detector may be supplied with voltage from the unit, although if it is a soft tube calling for an exact plate voltage of from 20 to 25 volts, it is pretty hard to regulate it with sufficient accuracy with the resistance R-2. In such cases it is best to employ a separate 22 1-2 volt "B" battery for the detector. In that case, a four tube set might be used with the unit, supplying actual voltage to only three tubes, however.

One very fine feature of the rectifier is its fool-proof quality. You may short-circuit the D. C. posts as often and as long as you please without harming a thing. You may even place the filaments of your most precious tube across the "B" posts without burning it out! This safety feature is due to the sudden drop to zero in the output voltage when more than about 15 milliamperes of current are called for. The old story of tubes going "west" from an erroneous application of "B" voltage can't be repeated.

A few words as to the condensers C-1 and C-2. In case the loud speaker only is to be used, these may be two microfarads each without noticeable hum from the A. C. line. However, for headphone use it is better to increase these to four mfds. each by using two 2 mfds. condensers in parallel on either side of the choke coils. Suitable condensers are made by many electrical firms for telephone purposes, and are merely long strips of tin-foil separated by thin waxed paper, sealed tightly within tin containers. They should be of good quality, or internal vibration due to loose sheets and leakage through inferior insulation may detract from the good operation of the unit.

(Turn to page 61)

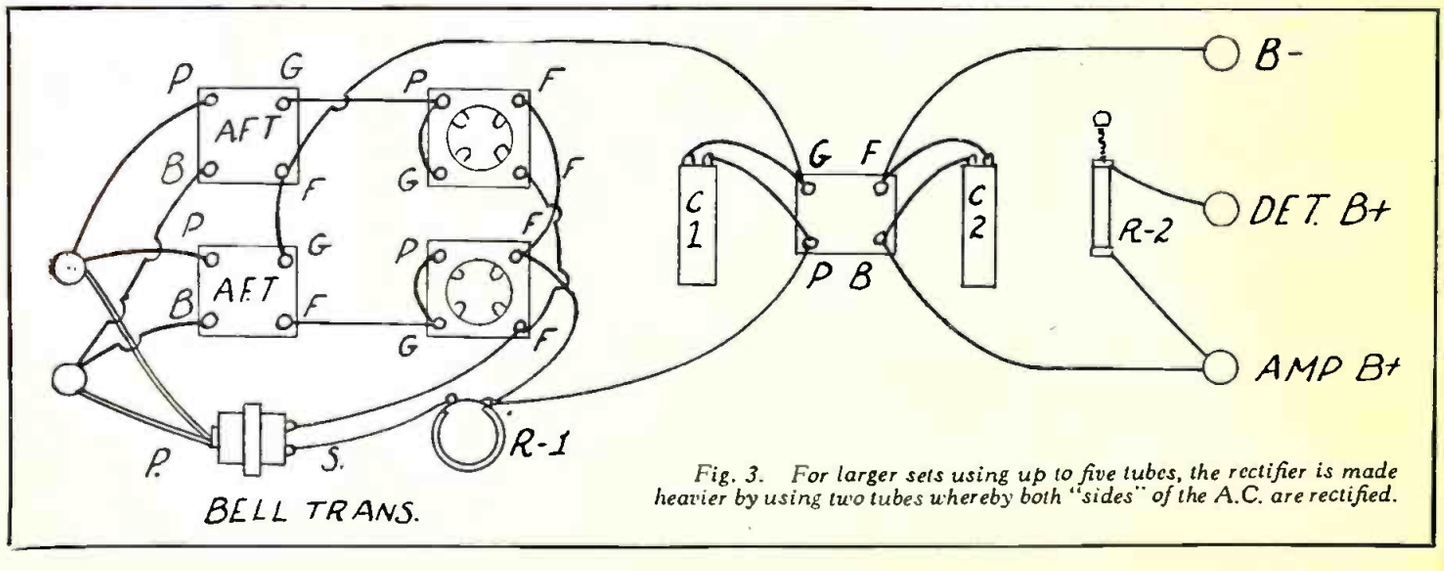
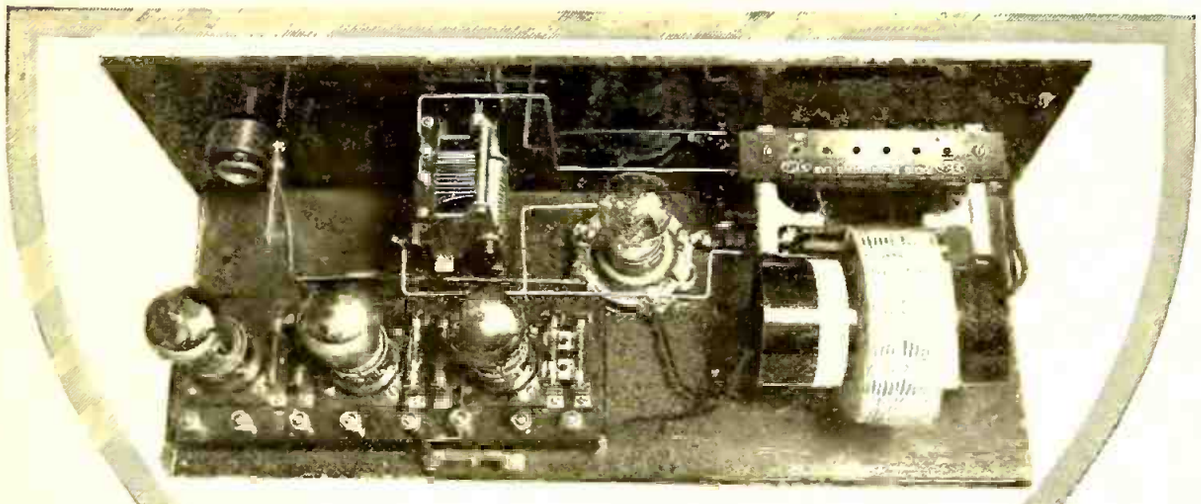


Fig. 3. For larger sets using up to five tubes, the rectifier is made heavier by using two tubes whereby both "sides" of the A.C. are rectified.

¶ *A Hookup* for Those *who* "*Roll* Their Own"



ABOVE is a view of the 3-circuit tuner partially wired. The resistance coupled amplifier at the left will give maximum volume with the least distortion.

A *Set* for *True* *Tone* Quality

Quiet DX a *Big* *Advantage*

Adding a Good Amplifier to the 3-Circuit Tuner

By ALBERT E. SONN

OUT of the hundreds of home-made receiving sets a large number are designed with some type of three circuit tuner. This hookup has proven of great value to every radio fan who "rolls his own," and without a doubt it is the most sensitive and selective type of circuit so far known. One might call it a "poor man's radio," because it is so very easy to construct and so simple to operate, to say nothing of the small cost of parts. As a general rule, the present day radio fan is not content with earphone reception and he most always plans his receiving set with loud speaker operation in view.

Although very little has been done to add radio frequency amplification to the three circuit tuner, at least two stages of audio amplification are generally included in the outfit. Low loss parts such as coils and condensers play an important part in the makeup of an efficient receiver. A well designed layout of the parts should also be kept in mind with special effort put upon the tuning parts of the circuit, which should be wired with care.

Perfect Tone Desired

IN an effort to improve upon the ordinary three circuit tuner with its usual two stages of transformer coupled amplification, the writer set out to design a receiving set which would give as near to perfect reproduction of voice and music as possible. Having an ear for musical tones, audio amplifications with transformers did not always satisfy the writer.

Having in mind the standard form of resistance coupled amplification, which is recognized as the most successful system of amplifying for quality reproduction, the standard three circuit set was put together so as to include this form of amplification. This takes the place of the ordinary transformer-coupled job, thereby doing away with the choice of transformers. "Turn-ratios" or "amplification constants," "C" batteries and so forth were all forgotten for the time being, as the resistance coupled amplifier is far simpler to install and operate. Other advantages are, that it saves upon B battery, consuming a great deal less current than the ordinary two step amplifier with transformers. Actual measurements have proven this to the writer.

The circuit constructed was put to several tests, not only by the builder himself, but a number of others who tried it for their own satisfaction. Everyone gave a very favorable report upon its remarkable operation. Believing that the circuit is well worth consideration, the writer is passing along the information to his fellow readers.

THE 3-circuit tuner is one of the most popular sets among the home builders.

It is easy to construct and furnishes clear music. Particularly is it efficient for the fan who wants loud speaker operation without going to great expense in buying parts. This article by Mr. Sonn, a well known Eastern radio engineer, tells how to make this 4-tube set so that it will give a true reproduction of broadcast reception.

Selection of Parts

MUCH printers' ink has been used in instructing radio fans how to select good parts in which the electrical losses are very low. It is felt that every radio fan has been warned against cheap and inferior parts. There are a few really good variable condensers on the market. There are a lot called "low loss type," which are of poor construction, although their makers claim all sorts of things for them. Select a good condenser of .0005 mfds. capacity (approx. 23 plates). This condenser tunes the secondary coil of the vario-coupler. With a good condenser and a poor coupler we do not gain much. Choose a good condenser to match a low loss coupler. The type shown in the photograph was picked out by the writer as it has proven in other sets to be of the ideal type. It tunes sharp in this circuit and has ability to pick up and hold a great many stations not heard at all in other couplers.

It has an adjustable primary, which is very important. This consists of about 8 turns of No. 16 DCC wire wound on a three inch tube. The secondary is wound in basket weave style and contains about 45 turns of wire. The plated

coil contains 18 turns of No. 18 wire wound on a tube similar to the primary. The secondary is about 3¾ inches in diameter. The three coils are mounted on a special aluminum stand for panel mounting.

The antenna and ground are connected to the ends of the aerial coil of 8 turns. Flexible leads are provided for this purpose.

The secondary is connected across the .0005 variable condenser and the ends go to the "grid" and "Fil." connections in the circuit. The tickler winding is in the plate circuit, one side going to the plate terminal of the detector tube and the other to the input posts of the resistance coupled amplifier circuit. Care should be taken to follow the drawing closely. The input circuit also connects to the positive B battery at about 45 volts.

The "input" is also shunted with a .002 micadon fixed condenser. The latter condenser is important, as the set will not work without it.

Amplifier Unit Employed

HAVING been through the "mill" with various forms of resistance coupled amplifiers using either variable or fixed resistances, experience taught the writer to be extremely careful in the selection of a unit to go with this regenerative receiver. Accuracy of leak resistances and permanency are very important. Fixed condensers of the right value also play an important part in this circuit. Leaks which change in resistance value every time the weather changes are to be avoided. The latter are usually found in cheap forms of grid leak resistances. It is difficult for the set builder to tell if he has an inaccurate resistance in the circuit. He must take the maker's word for the resistance value, although it may have changed several points in a week's time.

The unit selected was just the right size to fit on the base board, and as it has all of the resistance units and condensers already in circuit, the chance of going wrong in its use was hardly possible. The sockets and mounts for the leaks and condensers were all mounted in a block of bakelite with binding posts arranged on the side for all connections. This saved a good deal of space that otherwise would be occupied by sockets, mountings and condensers.

The "input" terminals were also located in a convenient place so that the detector tube circuit could be coupled up with very short leads. As can be seen from the drawing, one of the "input" wires connects to the detector B battery, while the other connects to the plate wire from the tickler coil. The bakelite base contains all the necessary connections for "A" and "B" battery.

A small fixed resistance was connected to the negative side of the filament circuit from the storage battery. This did away with an extra resistance on the panel. The amplifier tubes do not require a critical adjustment and a fixed resistance will do at this point. A 20 ohm rheostat was provided on the panel to control the detector voltage.

The convenient form in which the resistance coupled amplifier is laid out, makes it unnecessary to wire up this part of the circuit. Following specified instructions, a .002 fixed condenser was placed across the "input" terminals.

A "B" battery of 90 volts will work this amplifier, although 135 volts or three 45 volt "B" battery blocks are required for better volume. It is suggested that 90 volts be tried out first, and if the volume is not enough, it is very easy to add another battery. The tubes required are of the 201-A or C 301-A type. Attempts to use dry cell types of tubes only prove fruitless. It is well to "swop" tubes around in their sockets until a good combination is found. Some tubes work better than others for amplifiers.

The detector should also be of the 201-A type.

THIS four tube receiver will certainly satisfy the DX hound, as it will pull pretty nearly everything in the "air." It will bring in these stations with a clear cut tone. There is no distortion unless the transmitter is distorting.

Excellent on DX

A log run on this set for a period of two weeks showed that it "brought home the bacon" on the DX list. One of the remarkable things about it was that it did not appear noisy on DX.

In fact, it was the smoothest operating outfit the writer has tried within the past year or two. A glance at the photograph also impresses one with the extreme simplicity of the wiring.

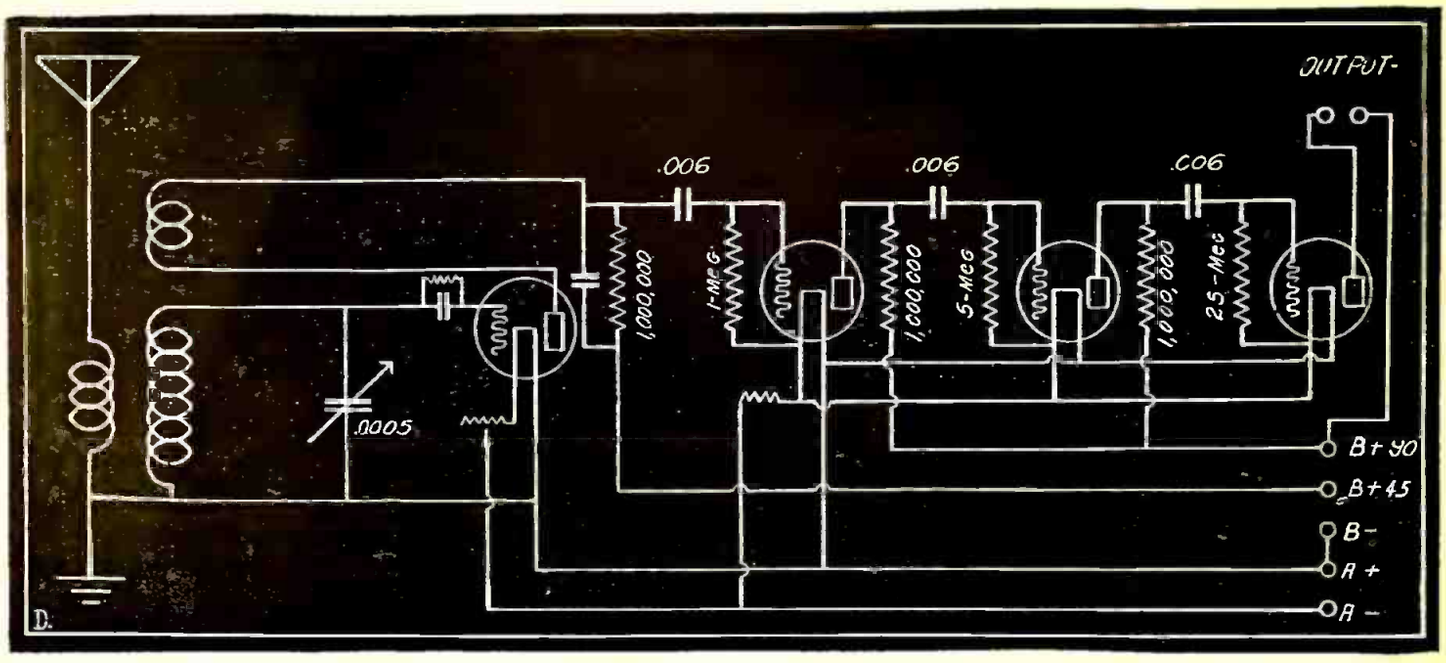
Check up on the wiring carefully and see that all connections are tight. A loose connection destroys the usefulness of many sets. It is a good plan to go over each piece of apparatus before mounting it on the baseboard or sub-panel and tighten every bolt or nut that is used for connecting purposes.

Tube sockets and rheostats must be gone over in this manner, especially before they are mounted. Connections on these are rather inaccessible, once they are fastened to the sub-panel or baseboard.

Fixed condensers should be tested before they are fastened in place permanently. Do not solder directly to a fixed condenser, as this will often cause the tin-foil to fuse and run together, thus making the condenser useless. Use a soldering lug to solder the wire on the smaller end, and with the aid of a small nut and bolt fasten the other end to the fixed condenser.

Mistakes are often made in connecting the three circuit tuner, preventing it from giving maximum results. For example, connecting wires from the secondary and tickler are often reversed in such a way that the coils are working in opposition to one another.

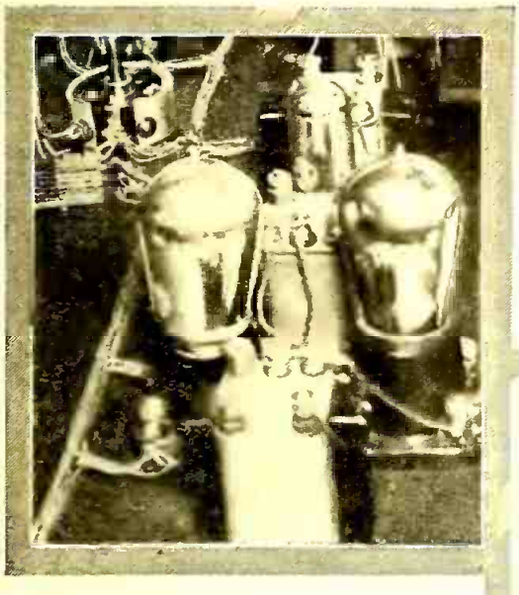
You can rely on this circuit.

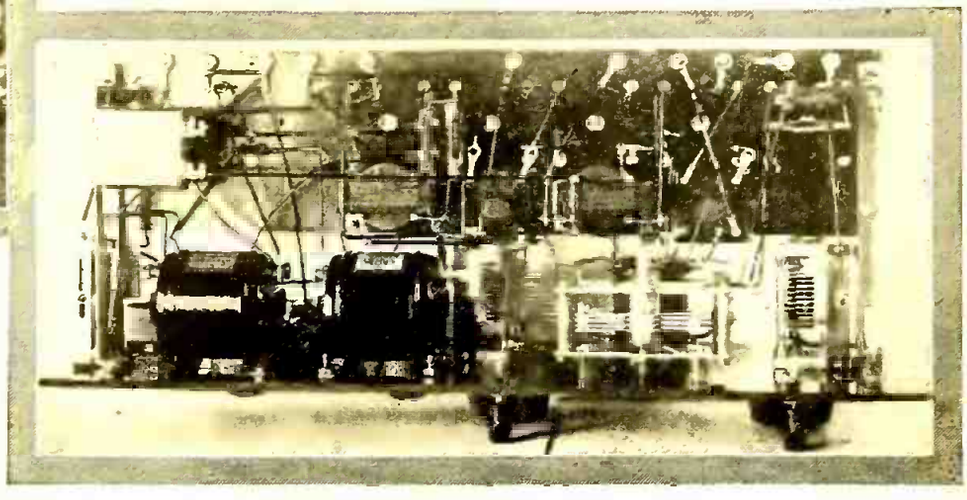


Above is the wiring diagram for the three circuit tuner with three stages of resistance coupled amplification. This method of amplifying gives wonderful, clear tone to the incoming signals.

The Secret of Successful Reception Lies *in* WIRING *your Set* PROPERLY

By C. HAROLD DILLON





Above is a bottom view of a seven-tube super-heterodyne receiver wired according to the most approved manner. Notice the direct manner in which all the connections are made. Soft No. 14 wire was used throughout. At the upper left is a photograph showing the new "cable" method of hooking up the set.

AFTER you have purcnased the various parts that go to make up a radio set and have had the panel drilled and engraved, the problem of wiring the different pieces of apparatus presents itself. To most of us this is disregarded to a great extent. By that I mean that the few fundamental laws governing such things are not strictly adhered to. This is one of the reasons why so many set-builders have so little success with some of the receiving circuits that they have constructed.

Practically all technical articles advise the builder to make his connections in a direct manner; that is, from one terminal to the other. Upon reading this advice we have visions of wires connected from place to place, making the inside of the set resemble a screen. Comparing that vision with many of the high grade manufactured sets that we have seen, whose wires are spaced evenly and all seem to have a definite point at which to terminate, we do not take much stock in the aforementioned advice, "Make connections direct;" and the result is that the finished set has a wonderful appearance, but somehow it just won't do what it is supposed to.

How Not to Proceed

ON THE other hand, some of us who are not very handy with the soldering iron or the pliers too, for that matter, have a sneaking suspicion that so much care is just "space filler," and proceeding to the hardware store they purchase a roll of anunciator wire, which is draped around the instruments in the most convenient manner.

Both these systems are wrong, and a little bit of thought on the part of the builder will enable him to realize just what to do to avoid complications of this nature.

In the first place, when you are advised to make connections direct, it does not mean that you must sacrifice appearance. Certain wires must be connected as directly as possible, while others can be placed in the most convenient or practical place. For example, grid and plate connections should be placed as far from one another as possible, at the same time remembering to keep them as short as you can.

The filament wires, as a general rule, can be placed as convenient. The positive "B" connections should be kept free from any of the other wires, as this lead carries a great deal of the high frequency current, and for that reason complications of a most distressing nature will arise if it is placed in close proximity to other wires in the circuit.

In the foregoing paragraphs I have assumed that the builder is using the ordinary stiff, bus-bar wire. Many fans are under the impression that it is absolutely necessary to use wire of this kind. This is not the case, however. Any wire that is of sufficient size to prevent of high resistance losses being placed in the circuit will suffice, and needless to say, it does not have to be stiff. In fact, better and more direct connections can be made with softer or more flexible wire. There has been placed on the market quite recently a special Number Fourteen, cambric-covered, soft wire that adapts itself to radio set wiring very well. Using wire of this type, the set-builder will save himself considerable time in making connections.

COMING back to the question of appearance, most fans will still insist that the commercial set will present a far neater appearance than the home-made one. This might be true to a certain extent, but have you really noticed how this illusion is accomplished? The next time you have the opportunity of looking at a manufactured set, notice how the sub-panel or base is placed. Practically all the wiring is done on the under side, and what few wires we see on the upper side are probably those to which I have referred in a preceding paragraph as not being necessary to install, in accordance with the theory of short connections; namely, the filament circuit wires. This practice is becoming a general one and also a very good one, as it does make the set look neater, excludes dust and dirt to a large extent, and last but not least, permits of extremely short connections.

For R. F. Wiring

The above advice holds good on any circuit and particularly on circuits of the regenerative type. In wiring circuits of the radio frequency kind it is possible to use another method that greatly facilitates rapid and efficient wiring. This method is quite new, and a large number of commercial companies are rapidly discarding the old bus-bar method for it. It is referred to as the "cable method" and just as the name

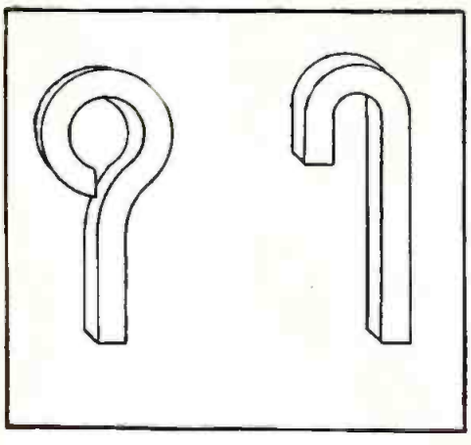
implies, a small cable is used in place of the usual bus.

When wiring a set by this method, the advice concerning the grid and plate wires is adhered to, but the other wires are formed into a cable with the aid of some waxed string and a few nails. The photograph shows this method of wiring quite clearly, and its advantage is of course simplicity. To connect the various instruments in this manner, first decide the most convenient place in which to locate the cable, bring all wires to this point and wrap them together with the waxed string. The nail is used to make bends in the wire. If a sub-panel is not used, but a wooden baseboard is employed, then the nails can be driven into it, (the baseboard) a short distance, and the wires brought around them to be held in place till you are ready to bind them together with the waxed string.

It is best to use the waxed string in an endless fashion, using a series of half hitches about an inch apart to bind the wire. The illustration in another part of this article shows you how to bind the wires together.

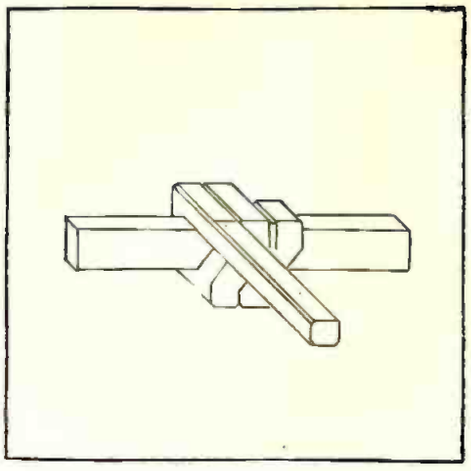
As before stated, this method of wiring can be used to best advantage in circuits that are strictly radio frequency ones. It would be impossible to use it with any degree of success in reflex or regenerative circuits.

Some of us are a little skeptical about using soldering lugs in making connections to binding posts. We simply bend the wire around the bolt, screw down the nut and let it go at that. In about seventy-five per cent of the sets that I have been called to service in the past year, poor results could be traced to this fault. It is bad practice to even use the binding posts at all. Connections should be soldered directly



The drawing of the wire with the looped end at the left of the picture shows the proper method of making connections to binding posts. The one on the right hand side is incorrect. A little extra time on these things and you build a better set.

to them, but many of the set builders do not like to do this, especially those who have never learned to solder properly. For occasionally a drop of solder will fall on a coil or work its way between the plates of a condenser, causing no end of trouble.



The above cut shows the proper method of soldering two wires together. This method is more efficient than the ordinary method of making "butt" joints.

THERE have been recently placed on the market several special kinds of pliers and attachments for the ordinary plier that will enable one to bend the end of the wire in a perfect loop. One of these implements should be acquired by the experimenter who does not like to solder. He will find himself repaid a thousand times for the small amount he will have to invest for this useful article.

Great care must be exercised in making sure that the binding posts nuts are fastened tight, whether a soldering lug or the bent end of wire is used. When bending wire, do not be satisfied with merely bending a small hook on the end to be placed under the binding post. Make the hook a full, round shape and fasten it securely. Then you will be sure of good results. Sets that are not soldered together should be gone over at frequent intervals and all nuts and bolts tightened up. This may seem like foolish advice, but if your set is one of the kind that is not soldered, try it and see. You'll be surprised.

Another thing that sometimes causes untold trouble is the soldering of fixed condensers in a circuit. Occasionally the builder will hold the hot soldering iron on the fixed condenser for too long a time, and the result is that the lead-foil of which the condenser is made will fuse and melt, short circuiting the condenser, whose value in the circuit will be absolutely *nil*. For this reason it is advisable to use a short bolt and nut for fastening these condensers in place. However, if one uses a little care, soldering them in place is much more effective.

If the joints to be soldered are clean and a good flux (non-corrosive) is used, it will only take a touch of the iron to complete the joint. Most experimenters it seems, do not keep the iron hot enough. Keeping it hot is the real secret of successful soldering.

Another thing that often will cause trouble in the soldered connections is butt end joints. It is far better to wind the wire around the one that you are going to solder onto, rather than to simply bend one end "L" shape and connect with solder.

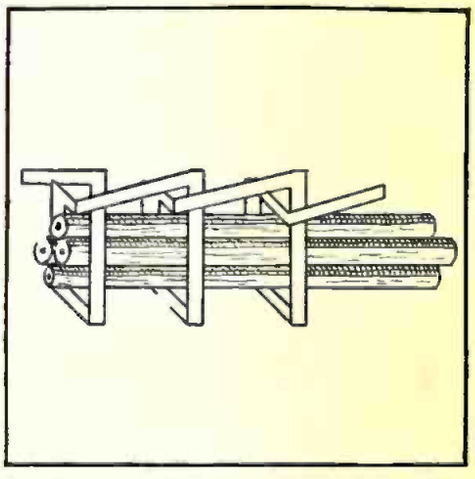
While discussing solder, it might be well to warn the builder against some of the pastes and soldering compounds on the market. They are all right for the tin-smith or sheet metal worker, but are absolutely useless for the radio constructor. There are several pastes manufactured especially for radio work, and guaranteed by the manufacturer which will not corrode. Consult the advertising columns of the radio magazines and select one.

Use a Metal as Protector

CARE should be taken to see that a small, thin piece of metal is placed in such a manner under the joint to be soldered that none of the excess solder will run to places where it should not be. This is especially true when soldering to coils of wire that have silk insulation. Many coils are practically ruined in this manner. Care should also be taken to be sure that none of the solder leaks through joints made on variable condensers. This may strike you as being rather odd, but it happens a great many times with disastrous results. On one occasion it caused a short circuit that ruined eight tubes before the fault was detected. A final caution regarding soldering is to keep the iron well tinned. A sharp file and a piece of salimoniac will enable you to do this.

Never use wire smaller than Number Twelve. In fact, it is well to standardize on Number Fourteen, for in this manner you will eliminate all difficulties from high resistance in the cireuit.

Never use wire that is stranded. By that is meant the kind that is usually referred to as "Litz" wire. There was a time when it was thought that this would prove to be the ideal kind of wire for radio purposes, but experiments have proved that this wire is of no



The above illustration shows the method of binding the wires in the cable together.

practical use. As you know, this wire is composed of several strands of very fine wire which is easily cracked and broken. When it reaches this state, the old "jinx," high resistance, is with us once more and our results are anything but the best. From the foregoing it is obvious that substantial wire having the largest surface possible is the ideal.

Regulating FILAMENT *Energy*

All Sets Function Best When the Tube Emission is Constant

WITH the increasing use of multiple tube sets, the radio fan's troubles are likely to increase unless strict control is had of all the various factors in the circuit. This is especially true of circuits in which local oscillating energy is used, such as in the super-heterodynes.

It goes without saying that any set using vacuum tubes will work better if the filaments are kept at a fairly constant temperature so that the emission will remain constant, and this readily is done if a simple voltmeter is connected across the filament terminals of the tubes. With the modern tendency to group several tubes on one rheostat, this means that one voltmeter will take care of each group of tubes.

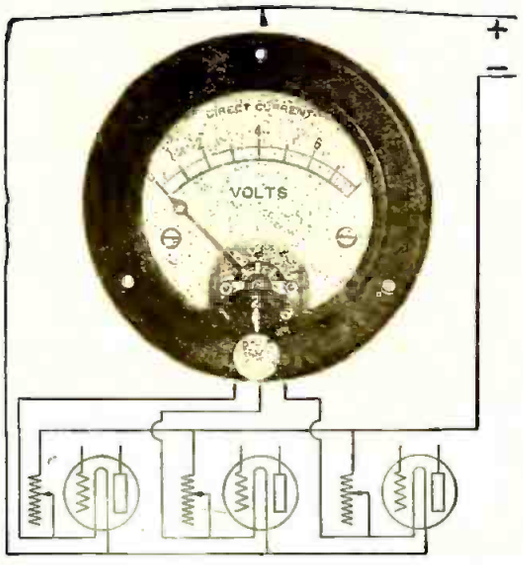
Moreover, if several groups are used, there can be had voltmeters equipped with switching arrangements so that the voltage across any one of several groups of tubes may be read. Such an instrument arranged for three separate groups is shown with the filament wiring to three single tubes.

The most common grouping, of course, consists of placing all of the intermediate frequency amplifiers on one rheostat and the rest of the tubes on the other. If a further split is desired, the oscillator is usually handled by a separate rheostat and perhaps the first detector.

Rheostat Conserves Energy

THE great advantage of controlling the intermediate frequency amplifying tubes lies in the fact that by lowering their filament voltage the volume of the set may be regulated in a somewhat similar fashion to that obtained by the use of a potentiometer, changing their grid bias, but with the result that the rheostat tends to conserve energy, whereas the potentiometer scheme tends to waste it by increasing the "B" battery current.

Thus, with the use of voltage control across the filaments, the detectors and audio frequency tubes can be worked at normal brilliancy, the intermediate frequency tubes can be run below normal for relatively loud signals, as indicated by the filament voltmeter, and if a rheostat control is placed on the filament of the oscillator, it will be found very useful in reducing the amount of oscillating energy produced, allowing weak signals to come through with much better volume and clarity.



The above picture shows a voltmeter arranged to enable one to read the filament voltage on three separate groups of tubes. This is accomplished by means of the small switch located at the bottom of the meter.

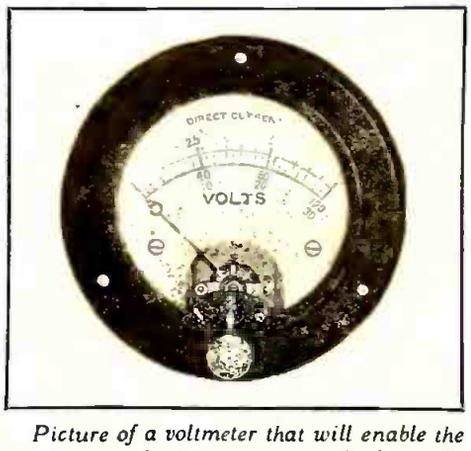
By JOHN MILLER

The above considerations are purely with regard to the operation of the set. The thoriated filaments in common use today are sensitive to overloading, and operating for only a short time at an abnormal filament voltage, will reduce the efficiency of the tube very noticeably.

Tubes rated at five volts should be operated with at least no excess voltage. Usually they may be run at 4.8 volts and no difference in volume can be noticed, although their life is materially lengthened. Operating at lower voltage will usually reduce the signal, so we may say a tube should be operated on from 95% to 100% of its rated filament voltage. This applies to the lower voltage type as well.

How Thoria Boils Off

BUT if the filament is overheated by applying an overvoltage of even a few per cent, the thoria in the filament,



Picture of a voltmeter that will enable the set owner to keep an accurate check on the voltage of both the filament and plate batteries.

Voltage Control in the Super Helps to Prolong Life of Tubes

which is the activating agent, is "boiled off" at an abnormal rate and when it is gone the tube is very, very dead. There is sufficient thoria in the filament for hundreds of hours of operation at normal temperature, but even a slight increase in filament temperature rapidly ages the filament; it lives fast and furiously and dies young.

So in the interest of economy, if nothing else, we should run our tube filaments at the proper potential.

In connection with the control of the intermediate frequency tubes mentioned above, it is an excellent idea to place a milliammeter, say of 50 milliamperes full scale value, in the negative "B" battery lead to measure total "B" battery current. The instrument should be placed in this negative lead so as to measure the total current, and it will be found that very marked variations in this current will be had with variations in filament voltage or with intermediate frequency control of either the potentiometer or the rheostat type.

A high resistance rheostat of 10,000 or 15,000 ohms may be placed in the "B" battery lead to the intermediate frequency amplifiers for controlling the stability of the circuit, and while it does not seem to be satisfactory in some circuits, in others it works fully as well as any other means of control. The usual potentiometer method of stabilizing the tubes simply consists of making the grids of the intermediate amplifiers more positive, which increases the plate current drawn from the "B" battery. This increased current causes increased losses in the tubes as well as in the associated transformers, damping out the oscillations.

But instead of increasing the current draw at a fixed voltage to keep the tubes from oscillating, we can lower the effective voltage across the tubes by a variable series resistance. As stated above, sometimes it works and sometimes it is difficult to find the proper type of variable resistance for best results. The scheme is decidedly worth while, however, and the milliammeter in the negative "B" battery lead will show a materially reduced current draw, perhaps a saving of 50 per cent. With "B" battery energy costing around $30.00 a kilowatt hour, we might as well reduce the battery and pocketbook drain by efficiency methods.

With better methods of control, we

(Turn to page 54)

¶A Word to Wise Radio Fans

After answering more than 4,000 letters from radio fans, the author of this article compiled these Radio Axioms. Save them.

65 *Tried* and *True* Radio *Axioms*

By ROSCOE BUNDY

ALL radio circuits have their advantages and limitations. There is no single circuit which embodies perfection in distance, selectivity, signal strength or clarity of tone. The best all around circuit is one in which intelligent compromises have been made between the conflicting factors that go to make up radio. If we desire distance reception above all else, then we must be prepared to stand for squeals and other noises. If we desire clarity of tone and selectivity, then we must sacrifice our DX ambitions. It is written in "THE BOOK."

After trying out over 1,200 hookups in my own laboratory and reading the results of other experiments until the total of letters answered ran well over 4,000, I have come to the conclusions which led to the following table of "Radio Axioms." If you experiment long enough and study long enough, you will appreciate the truth of these statements.

1. Selectivity is attained at the expense of signal strength.

2. Conversely, signal strength is attained at the expense of selectivity.

3. No detector tube is a good audio amplifier.

4. No good amplifier tube is an ideal detector.

5. The hookup is almost a negligible factor when compared with the materials used, the workmanship and the location or local conditions.

6. A regenerative circuit is more dependent upon the proper proportions of the units used than upon the hookup. If conditions in the circuit are properly maintained it does not matter whether regeneration is obtained by a variometer, coupler, tuned impedance or by capacity.

7. Selectivity is more dependent upon the hookup than distance or signal strength. A hookup in a large measure determines the selectivity.

Regenerative Hookups

8. All regenerative hookups are practically the same in regard to signal strength if properly proportioned units are used.

9. Distance and signal strength increase at a smaller rate than the number of tubes employed. Ten tubes will not give you five times the range or volume given by two tubes.

10. Selectivity is rougnly proportional to the number of tubes because of the greater losses introduced by the greater number of tubes.

11. Tone quality diminishes with amplification and the number of tubes in a given type of circuit.

12. Tone quality decreases as signal strength increases.

13. For every circuit there is a single optimum wavelength at which the best volume is obtained.

14. For every circuit there is a single optimum wavelength at which the best distance is obtained, and this does not necessarily correspond to (13).

15. Selectivity is only attained by introducing losses into the circuit; losses sufficient to render the undesired station inaudible when the circuit is brought into a condition of resonance with the desired station.

Cause of Weak Signals

16. Amplification is largely dependent upon the filament emission of the tubes. Weak filament emission—weak signals.

17. Transformer turn ratios do not necessarily determine amplification either at radio or audio frequencies.

18. Within limits amplification increases with the plate voltage. This is a corollary of (16).

19. Dielectric losses are not of great importance at high radio frequencies or short wavelengths. They are of more importance on long waves or at audio frequency.

20. Skin resistance and eddy current losses in conductors are of more importance at short wavelengths and high frequencies than the dielectric losses.

21. The size of wire is not of great importance so far as the conductivity of radio frequency currents is concerned. A large wire is more likely to cause R.F. losses than a small one as indicated at (20).

22. A resonant circuit is a resonant circuit regardless of the apparatus used to bring about this condition.

23. Squealing and howling circuits are generally indicative of range or distance getting qualities.

24. Radio frequency amplifiers are not at their greatest efficiency when completely neutralized. There must be some tendency toward free oscillation.

25. Radio frequency circuits are at their best when the detector is made regenerative.

26. A detector in a perfectly neutralized circuit can be made regenerative only with difficulty. See (25).

27. All circuits must be at least slightly regenerative to obtain maximum distance and volume.

28. The full amplifying efficiency of the tubes is never realized in a reflex circuit.

29. The "best hookup" found by the amateur experimenter usually earns this reputation from the fact that better proportioned units were used with this circuit than with the other hookups tried out.

Combinations Vital

30. Commercial apparatus of the present day is inaccurate in regard to the rated capacity, inductance, etc.; hence certain combinations of apparatus will give better results than others when used in different hookups. This is of more importance than the hookups themselves.

31. Local conditions are of the greatest importance. With the same receiver, better reception will be had in one neighborhood than in another.

32. A poor aerial and ground are responsible for more trouble than all of the other items put together.

33. Reception in the open country is generally much better than in a city, providing that the country installation is not shielded by trees.

34. A large tree full of sap, and a steel building are about equal in cutting down reception. Both ground the waves. Maples are the worst, with cottonwoods a close second.

35. Weakening of signals and shortening of range in Summer begins with the first appearance of foliage, and ends when the leaves have been shed in the fall.

(Turn to page 58)

Letters *from a* Self-Made Radio Fan *to* His *Son*

In Which Beginners, Young and Old, Are Given Advice, More or Less Amusing and Instructive

By EDMUND H. EITEL

Chicago, Ill., March 1, 1925.

OSCAR Davenport,
Yalevard College,
New Raven, Conn.

Dear Oscar:

Your weekly note with its usual request for funds is here, and I take my lobster-colored pen in hand to make out a check and reply to you.

There is one unusual feature of this last note of yours, and I commend you for it heartily. This is your request for an *extra* twenty-five dollars because you have become interested in radio and want to buy the parts to make a receiving set.

Accordingly, I take you at your word and advise you to confine all your bootleg purchases in the future to bootleg tubes. Son, I never took much stock in that last invitation of yours to send you seventy-five dollars to get "Doc" Eliot's five-foot shelf of champion books in Morocco, because it did not sound sincere. But radio is different. There you strike me where I live, as your radio-widowed mother will inform you.

The Greatest Teacher

TO SPEAK seriously, I hope and believe you will plunge into radio like the old swimmin' hole. Why? First, because you can't help yourself—it is the most interesting thing in the world. And next, because it is this world's greatest teacher, "Doc" Eliot himself not omitted.

Radio can teach you more about the mysteries of nature in one month than you'll get out of that five-foot shelf by working it fifteen minutes a day for the rest of your life. By all means, get your *hands* into radio. The way to learn a lot is to build sets. Build one. Then try to make a better one. Try the different systems. You will get a college education out of it, believe me.

Here are a few of the things building radio sets will teach you:

How to think for yourself (And you certainly need it).

How to buy goods intelligently.

The electrician's trade.

Electrical engineering principles.

The profound electrical secrets of matter and energy.

Insight into the future of this marvelous scientific era.

And besides all this, it will train you in patience and resourcefulness, and will keep you indoors nights! It appears to me that radio has college licked in every way. It does all this for a fellow because the first principle of getting educated is getting vitally interested. I've often told you how quickly we all, old or young, learned soldiering, engineering, aviation and what-not during the war, in the various army schools. When a man knew his life might depend on some bit of information, he seized that information for keeps. One fellow was able to recall some classroom data only once mentioned, several months later, simply because he was so vitally interested in it at the time.

So "please find enclosed" a check for thirty-five instead of twenty-five, and mind you, spend it *all* on radio. Your mother is sending you her love and a pair of mittens which I told her would go well with that big fur coat you college fellahs wear.

Your affectionate parent on your father's side. DAD.

Chicago, Ill., March 5, 1925.

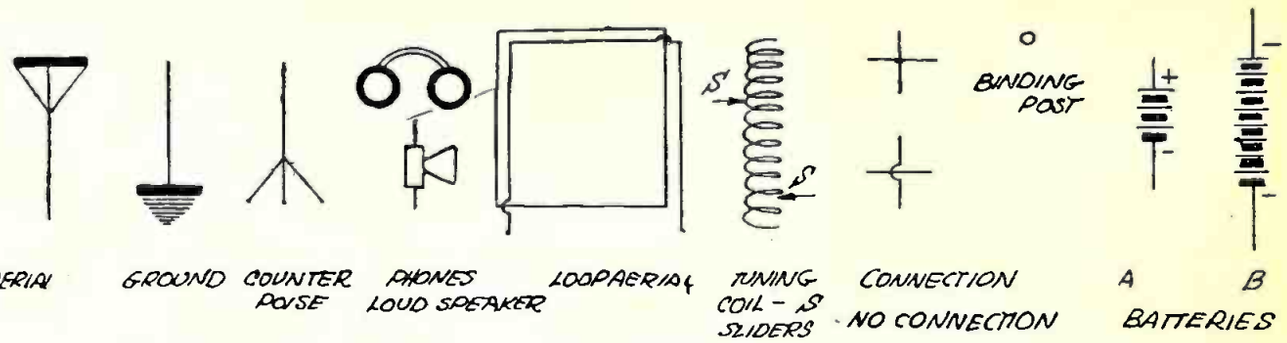
Dear Os:

Your enthusiastic response to my letter and check touched me deeply. No, I would not build a super-heterodyne first. For this reason and another one, I am not sending the money for that particular kit which you say you are so crazy to acquire.

I like your suggestion that I write a few letters of advice, because I certainly ought to be able to give that. If a radio manufacturer himself, with all the experience he gets competing with a couple of hundred other set-makers, isn't full of advice, then he must be full of prunes and dead from his O'Sullivans to his Stetson.

Dad's Experience Helps

I CAN tell you more diseases possessed by such simple things as jacks and rheostats than a professor of therapeutics in Johns Hopkins' Medical School could name for humanity. Our factory has to



give a lot of attention to buying radio and I am going to tell you about it as reflected from our experience.

The first thing you ought to know is exactly what you want and then exactly why you want it. I said a mouthful

Fig. 1.

in laying down this first principle, which after all is a sort of ideal and will take many months to attain.

For a while you can't hope to know as much as the clerk who waits on you, and you'll have to take his word for several things. There are clerks *and* clerks, and when you find a good one, you have made a real friend; so go to a reliable dealer, since he backs up his clerks. The word reliable means dependable. You can return apparatus which does not work to an honest, sincere merchant. If our company makes it a rule to deal only with firms of reputation, it must be a good rule for the individual to follow, even though he buys no more than a single-circuit jack.

The next point is to buy goods of reputation. If I say, "with good will" you will approve at once, but if I say "consistently advertised" you may not follow me. In our factory we have expensive testing instruments and can afford to buy anywhere, and yet we do not. We buy only goods of the best name because that is the only way to keep out of pecks of trouble.

So don't spend my money on unadvertised goods, but learn to discriminate in reading advertisements. Where there's a lot of smoke there's some fire. This is principle number one: but don't follow it too religiously. If you see the article consistently advertised, then read

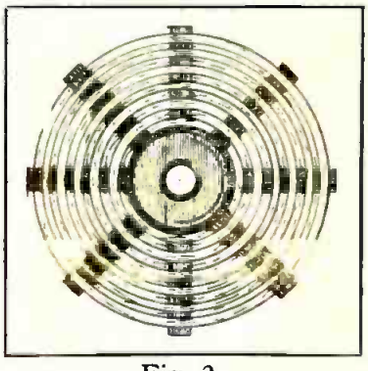


Fig. 2.

the claims made for it and compare them with other claims. This is the test of reason.

You can furthermore make the test of sincerity. If a firm claims for example that its receiver is the best, gets the longest distance, the greatest volume, the purest tone, and still is the simplest to operate, you can be sure that the advertising agency of Ananias & Munchhausen have written that ad. Judge an advertisement exactly as you would any man or boy you meet. It won't take you long to discriminate between sincerity and boasting.

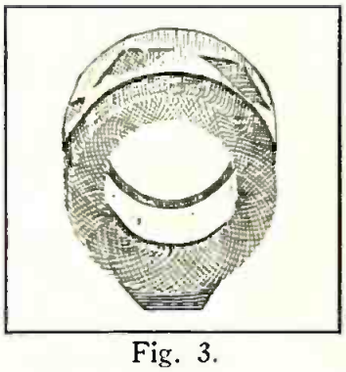


Fig. 3.

"Something for Nothing"

ONE more point about buying—don't waste my money, son, by trying to get something for nothing. You can't do it. Cheap goods are usually cheap performers. You can buy a cheap jack and save fifteen cents and when its insulation fails you can burn out fifteen dollars worth of tubes! Or you can save a couple of dollars on a condenser and make a set which can't reach out over five hundred miles. Do you know that our factory does not try to buy goods at the lowest possible price? We find that in the long run we get *what we pay for* and as we want to make the best, we have to pay the price, and so will you.

This is radio lesson number one, a lesson in business, a lesson in buying. This is surely an important lesson, for you are spending a lot of my money and will one day be reduced to the painful necessity of earning what you spend by the sweat of your own brow.

Good-night, old man, I must now close, as I have a radio engagement with the Kansas City Night-hawks and the wee-small hours are here.

Affectionately,

"Dad."

Chicago, Ill., March 10, 1925.

Dear Old Son:

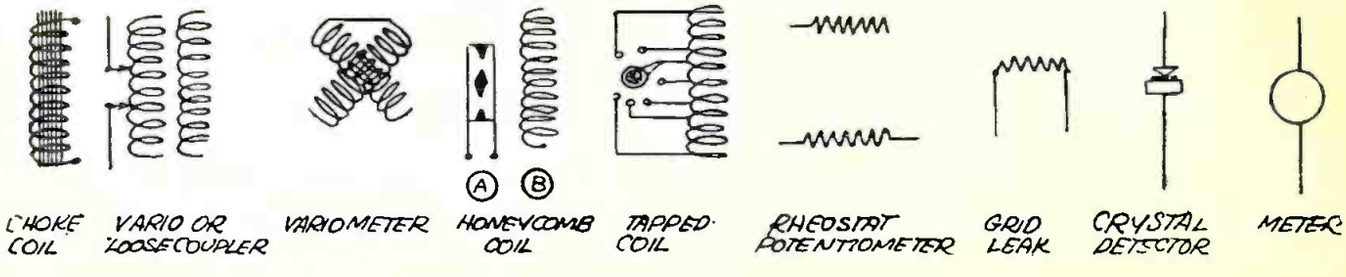
You know how I rest my electric

Fig. 4.

soldering iron on the little old upright ash-tray and smoke while I work at radio! Well, I had just laid down my cigar when your Mother handed me this last letter of yours, and it got me so excited that I picked up the hot soldering iron afterward instead of my cigar. So if you have trouble reading this, you'll know why.

What got me "jumpy" when I read your letter was the way that clerk handed you that old junk inductance of the year 1923. So far as efficient

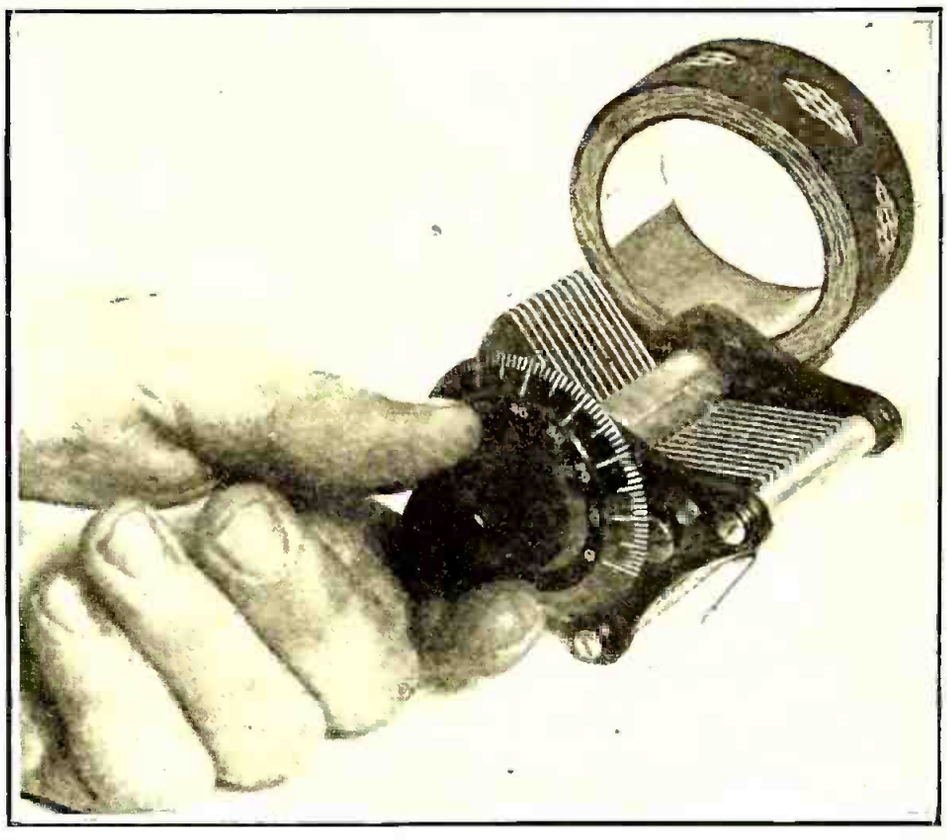
(Turn to page 59)



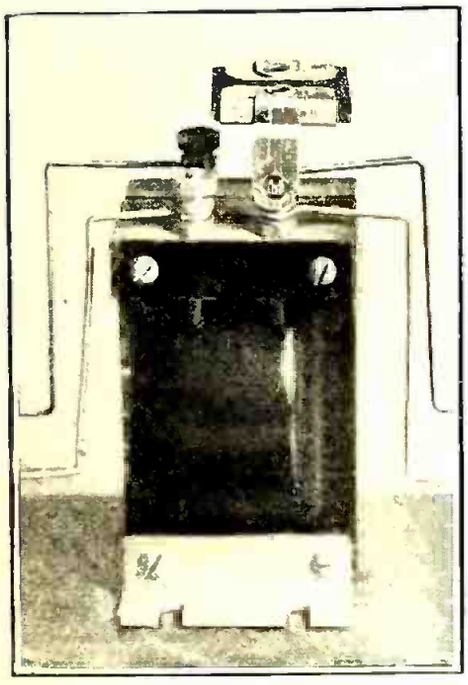
How to Get Rid of SQUEALS *and Interference*

Simple Wave Trap Cuts Out the Strong Locals; Fixed Condenser Helps Clarity

It's the seeming trifles in radio construction that usually cause the most trouble when you start to wonder why the outfit doesn't work as well as it was advertised to do. The chances are that the fault is with the layout or the construction, if the parts are home-made; so if you're inclined to condemn the originator of the circuit, just ask yourself whether you overlooked something that usually is taken for granted. The accompanying photos point out some of the "trifling" details of set operation and construction.

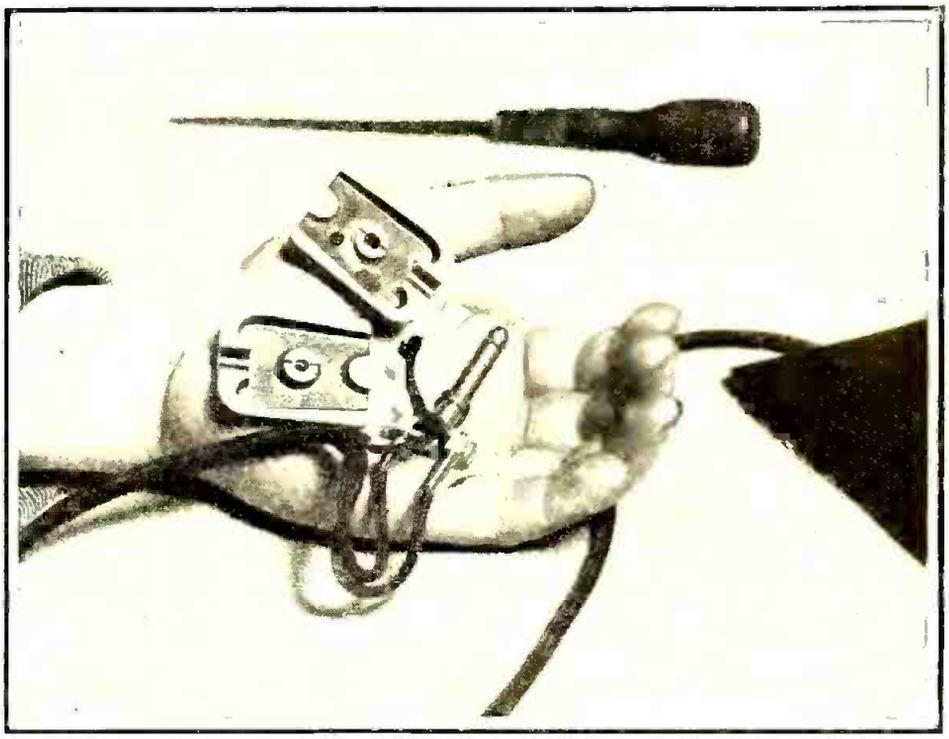


To make an efficient and simple wave trap which will reduce interference and eliminate that troublesome local station near you, a honeycomb coil and a condenser will be all the materials that are required. A 75-turn honeycomb coil connected in parallel with twenty-three 3-plate condenser, will make a very efficient wave trap. After the coil and the condenser have been connected as shown above, the trap should be connected in series with your antenna. If the set fails to cover the higher wavelengths with the trap connected, a coil with a larger number of turns can be substituted.



If you're annoyed by squeals in your set, maybe it's the fault of your amplifier. If so, here's a sure cure. If the second step of your audio amplifier causes a high pitched squeal that doesn't seem logical, eliminate it by placing a .00025 fixed condenser across the secondary of the transformer. This should not only eliminate the squeal, but should improve the quality of your reception as well. The photo shows how to place the condenser on the A. F. transformer.

(Kadel & Herbert Photos)



The tips at the ends of your phone and loud speaker cords are not any too strong, and they come off quite easily when they are jerked out of the jacks by the cords by many radio fans. That extra string between the cords was placed there for a purpose, but only a few fans know why. As a result they cut it off to get it "out of the way." The photo shows how this extra string can be and should be put to use. Tie it to the phone plug as shown, so that all the pull will be on the string when the plug is being jerked out of the jack.

"This is Billy Rumford in camp, Charley," the honeymooner announced. "Tune down to 150. I want to talk to you."

The Sleuths of Honeymoon Camp

The Radio Honeymooners Thought Their Burglar Snare was Complete, But the Two Burglars Laughed Last

By FRANK HONEYWELL

(Continued from March Radio Age)

THEN he shut off the transmitter in order that he might catch the effect of his order on the burglars. A confusion of utterances was distinctly audible. All the campers now listened with the eagerness of an audience at a comic melodrama.

"Now, quiet," Billy continued. "I'm going to give 'em some more."

Over went the switch again, and the next instant he was pouring more "terror" into the burglar-infested room:

"Drop all that silverware and jewelry, or I'll shoot you dead in your tracks. I'm concealed where you can't find me, with an automatic in my hand. I'll count one, two and three, and if you haven't gone by that time without taking anything with you, I'll shoot."

Back went the switch once more in time to catch several coarse utterances through the loud speaker. Then—one—two—three—muffled explosions were heard, like pistol shots in a sealed room, heard on the outside through a heavy door.

Alice uttered a sharp little scream, and every face in camp became a shade or two paler in the head-light illumination.

"What do you suppose that was?" asked Marie, with a shiver.

"They shot at me," Billy replied with the cool nerve of "radio distance." "What shall I do—give a death groan for their benefit into the microphone?"

"No, laugh at them," said Carl. "Tell them you have a charmed life and they can't kill you. Make fun of them."

"Oh, Carl!" exclaimed his wife, laughing hysterically.

"The very idea," complimented Billy. "I'll have 'em going mad for a bug-house." Then into the microphone he called:

"Ha! ha! ha! Those bullets tasted good. I caught every one of them in my mouth. Shoot again. I'll eat all you can send. I won't shoot till you've emptied your pistols. Fire away."

"Bang! bang! bang!" came the answer, as Billy closed the switch, three more shots in succession. Then a few moments of silence, followed by anothe shot.

"Ha, ha, ha, ha!" laughed Billy with "all his lungs," with hand still working the switch, of course. "Oh, but those bullets tasted good. Load up again and fire some more. Oh, what an appetite I have for steel-jacketed bullets! They taste just like Boston baked beans, with lots of red pepper added, only I can't get a mouthful from those pea-shooters of yours. Haven't you got a blunderbuss or a cannon?"

"They'll hit the loud speaker there in its 'throat' next, and then your game'll be up," whispered Jerry in Billy's ear.

Terror Reigns

AS THE switch went back for receiving, a wild scream greeted the campers from the horn, followed by a voice toned with panic:

"Come on, Bimbo; I'm going to get out of here. This is too much fer me."

"Oh, come back, Sam," was the other's reply. "Can't you guess what it is? It's somebody talkin' in the radio. See—I got my flashlight on it now. That's where the voice comes from."

There was silence a few moments, followed by indistinct conversation, the drift of which seemed to be that "Bimbo's" explanation of the mystery was satisfactory to both.

"We better hustle out o' here," one of them said. "Somebody may 'ave heard those shots."

"Not much danger," the other replied. "The nearest house is half a block from here, and every house within a block is dark—nobody home. Let's hunt around and see what more we can find."

"I'm going to see if I can get Charley Patterson on the wireless," said Billy, addressing the "honeymoon campers."

"Let's see; he usually sends at about 160. I'll try that first, both sending and receiving."

His effort was rewarded with success. Charley happened to be listening in on an amateur wavelength slightly below that to which Alice's brothers' outfit was

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What's Gone Before

THREE newly married couples—Billy and Helen Rumford; Jerry and Alice Anderson, and Carl and Marie Frisbee—take a motor trip fifty miles from home and establish a "Honeymoon Camp." They have a radio telephone, the generator of which is operated with an automobile engine. While listening-in on the first evening of the honeymoon, they hear voices, seemingly belonging to two burglars making an inventory of silverware they have found in the home of Alice Rumford's father. This conversation takes place before the microphone of the radiophone of Alice's brother, who has perfected a burglar alarm and automatic switch for sending and receiving and connected it with his outfit. Billy attempts to scare the burglars by calling into his microphone: "Hands up, or I'll shoot!"

Now read the Story

"All right," answered Charley. "Down we go." A few moments later they were conversing on a wavelength that could not be received by Alice's brother's super-heterodyne.

Photo by Drake Studio

CHARMING THE MULTITUDES

Miss Yukona Cameron, shown above in a bewitching pose, has recently come into favor among the fans who listen nightly to WQJ, the Calumet-Rainbo station at Chicago. Miss Cameron often favors her audience with old-time selections, but she receives the most requests when she presents a popular ditty. She's a regular attraction at WQJ now.

What the Broadcasters are Doing

"Roxy" Decides Not to Fight Radio

NEW YORK:—Roxy, the smart showman, hasn't any grudge against radio, for it is rapidly making him one of the most famous men of the country.

Other moving picture impresarios and theater managers are setting up a hullabaloo about the possibility of radio's ruining their business, but Roxy, with foresight, has succeeded in harnessing it to the business office in the most amazing manner.

Instead of advocating that performers keep off the air, he not only takes the opportunity of putting his performers on the air, but actually gives free of charge twice as long a musical program as may be heard in the theater by those attending the performance.

At that, such multitudes seek admission to the moving picture theater, which, by the way, is located in New York and is said to be the largest in the world, that thousands are turned away nightly and enormous lines of standees are the rule.

Roxy's concerts are simultaneously broadcast each Sunday night through stations WEAF, New York City; WCAP, Washington, D. C.; WJAR, Providence, R. I.; WEEI, Boston, Mass.; and WDBH, Worcester, Mass. Also at times through WGR, Buffalo, N. Y.; WFI, Philadelphia, Pa.; and WCAE, Pittsburgh, Pa.

A Night in Roxy's Studio

The musical part of the theater program is put on the air, but when the feature picture comes the program is shifted to the large studio upstairs and here Roxy may be seen at his best.

It is an unusually large room with black walls and heavy gray absorbing draperies hung around, much the same as draperies in a photograph gallery. In addition to the microphone in the corner, there are several other microphones in the ceiling to absorb the volume of sound from the orchestra.

Immaculately attired, Roxy is as he would be if he were actually appearing before his audience, but amid the odd surroundings some of the performers are in evening dress, others in stage costumes and make-up, with a fringe of favored listeners who watch the strange broadcasting with bated breath, for silence is the predominating note everywhere.

To the listeners on the air the performance runs with an almost monotonous continuity at times. However, the nervous strain in the studio in putting on one of these performances of "Roxy and His Gang" is terrific.

New Dramatic Soprano at WSOE

A POPULAR new dramatic soprano has made her advent at Station WSOE, operated by the School of Engineering at Milwaukee, Wis., on a wavelength of 246 meters.

She is Miss Nathalie Unke, and her picture is shown in the inset above. Miss Unke has appeared from WSOE only a few times recently, but her singing of old-time popular numbers as well as operas has made her a favorite.

Movie fans were recently given the chance to "hear" the actual making of a motion picture. Portions of the "audible" scenes of "The Mad Dancer," in which Vincent Lopez, orchestra impresario and Ann Pennington, Follies Dancer, are playing the leads, were broadcast recently from WJZ. The fans not only hear what the actors are saying, but the directors' and technical staffs' instructions as well, thus giving a real insight into movie making. The photo shows Ann Pennington dancing atop a piano in one of the scenes.
(Kadel and Herbert Photo.)

"Cavallera Rusticana" on Air From WGBS

AN EVENT without precedent in the field of radio took place Sunday night, February 8th, when Mascagni's famous opera, "Cavallera Rusticana," was broadcast from Station WGBS, New York, with a full cast of distinguished operatic voices and a complete professional operatic chorus, accompanied by an operatic orchestra.

The broadcasting of this opera, which is in the nature of an experiment and will be followed by other of the best known operas with even more prominent singers, was arranged by *Corrien D' America*, the leading Italian newspaper published in this country, and in particular by Luigi Barzini, its editor. It was a radio treatment of the opera that was heard, especially planned for the listeners-in, and the entire musical score was given together with a libretto and scenic synopsis particularly devised for this unique presentation. This is the first time in the history of radio that an opera has been broadcast in such manner, with such a cast singing the various roles.

Gieseppe Reschiglian, celebrated Italian singer, had the tenor role of *Turridu*. Oaterina Gobbi, soprano, well known in Europe in concert and operatic fields, sang the role of *Santuzza*. Silvio Sideli, famous concert baritone, who has just come to this country after considerable success in London, sang *Alfio*. Maria Wrape, contralto in the role of *Sola*, and Lavinia Puglioli, mezzo-soprano, the role of *Mamma Lucia*. The Conductor was Antonio Dell' Orefice and the opera was given under supervision of Philip F. Ienni, Manager of Puccini Grand Opera Co.

Zuigi Barzini, responsible for the arrangements, declared that the broadcasting of "Cavallera Rusticana" was planned purely as an educational measure.

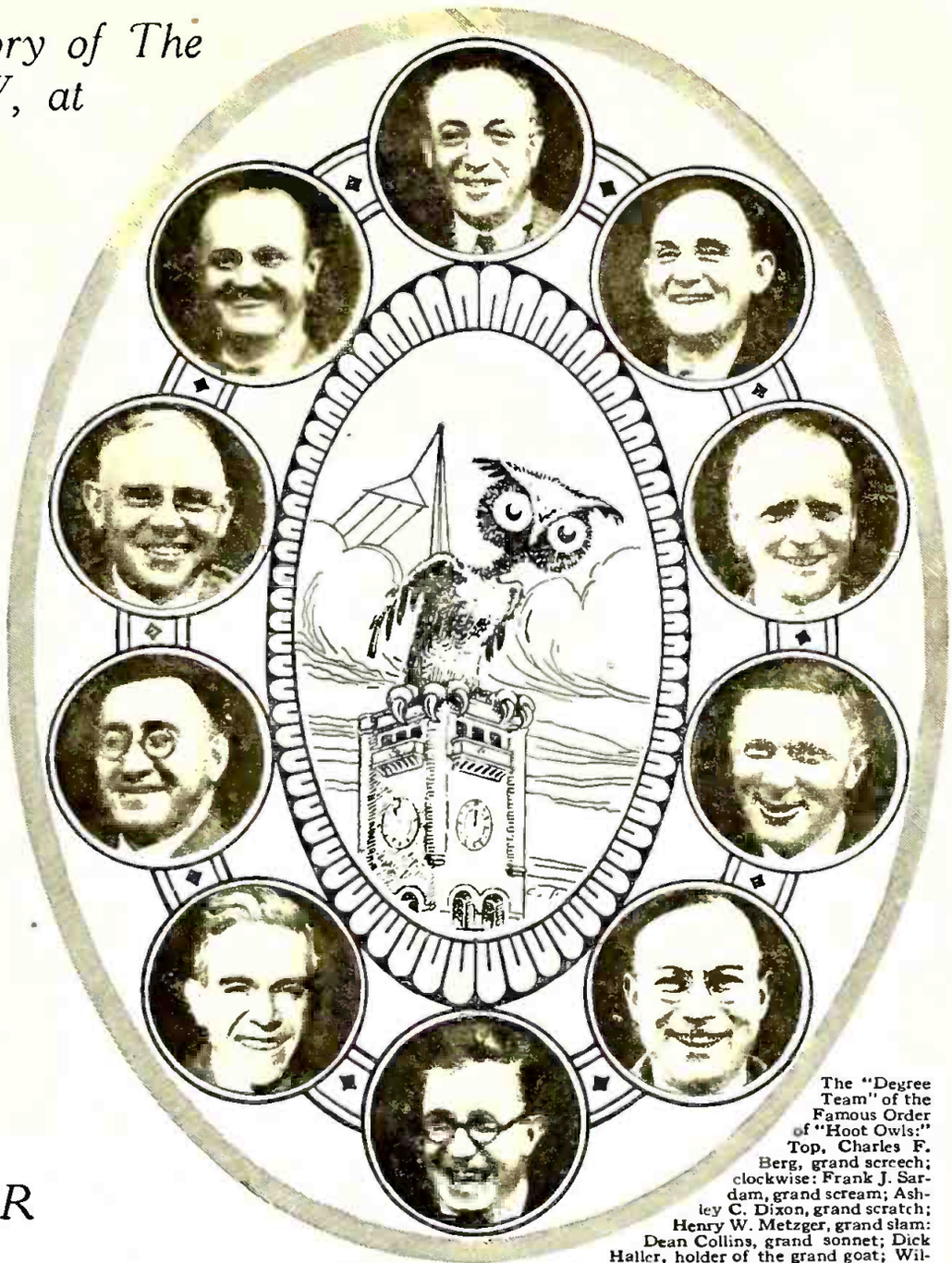
"Statistics show that in New York there are scarcely 8,000 people who are habitual opera-goers," Mr. Barzini said. "And out of all the inhabitants of this huge metropolis there are about 60,000 who see an opera ocasionally. And figures indicating nation-wide attendance are just as low. There are hardly 500,000 of the entire population of the United States, roughly estimated, that have any knowledge whatsoever of opera.

"All the rest of our people do not know what opera is. They keep away, the rest of them, because they are afraid they will not understand it. They don't know opera because they don't go."

The Interesting Story of The Way Station KGW, at Portland, Oregon, Is "Screeching" The Glories of The West to Radioland

Keep *Growing* WISER *with the* "HOOT OWLS"

By
"DICK" HALLER
Director, Station KGW



The "Degree Team" of the Famous Order of "Hoot Owls:" Top, Charles F. Berg, grand screech; clockwise: Frank J. Sardam, grand scream; Ashley C. Dixon, grand scratch; Henry W. Metzger, grand slam: Dean Collins, grand sonnet; Dick Haller, holder of the grand goat; William Robinson Boone, grand skipano; Barnett H. Goldstein, grand schmoos; "Tige" Reynolds, grand sketch; Steve Johasz, grand slumber.

HOOT! HOOT!" Out in Portland, Oregon, where Station KGW, of the *Portland Oregonian* is Lord of the Ether, the foregoing Owl's exclamation is the signal for all the fans to settle down in the old easy chair for the evening and stay awake till the milkman's wagon clatters up the street.

And Friday night, from 10:30 o'clock until the Lord knows when, the "Hoot Owls" climb into their tower in the *Oregonian* building and broadcast a bit of nonsense that has never been duplicated for its originality, cheerfulness and carefree abandon.

Of course, in the East and Middle West the fans have their "Nighthawks," "Insomnia Clubs" and "Mythical Dirigible" organizations, but they are rarely heard out where the West holds sway. In fact, the fans are so absorbed in what the "Hoot Owls" are going to do next that they have little interest in what's going on in the remainder of the broadcasting world outside of Portland.

A Pacific Pioneer

KGW was one of the pioneer radio stations on the Pacific Coast, and now, with KFI, KGO and one or two others, it holds undisputed Pacific Coast leadership for the variety of its programs and the quality of their arrangement. KGW is now operating on a wavelength of 385 meters, which is pretty convenient for the fans in that section of the country.

The idea of the "Hoot Owls" was conceived early in KGW's history, when it became evident that some kind of human interest feature would have to be established to keep the listeners bound together in one, big amiable family. As a result a staff of "Owls" was organized, and today it is known up and down the Pacific coast and even in the East for the efficient and business-like way in which it deals out tom-foolery. Charles F. Berg of the *Oregonian* was appointed "Grand Screech" of the Keep Growing Wiser Order of Hoot Owls, and under him is a galaxy of newspapermen and radio experts who fill the more or less comical roles of Grand Scream; Grand Scratch; Grand Slam; Grand Skipano; Grand Schmoos; Grand Sketch, Grand Slumber and countless others equally crazy.

Every time a new KGW listener is initiated into the "Hoot Owls" club, he must suffer an ethereal bombardment at the hands of the "officials" named above. And what the "Grand boys" devise to create a tingle in the "candidate's" veins can be appreciated only by actually listening in. Needless to say, a radio fan goes around bragging for a week after being duly initiated via the air route.

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The *Original* Night-Hawks *Garner* Some *Votes*

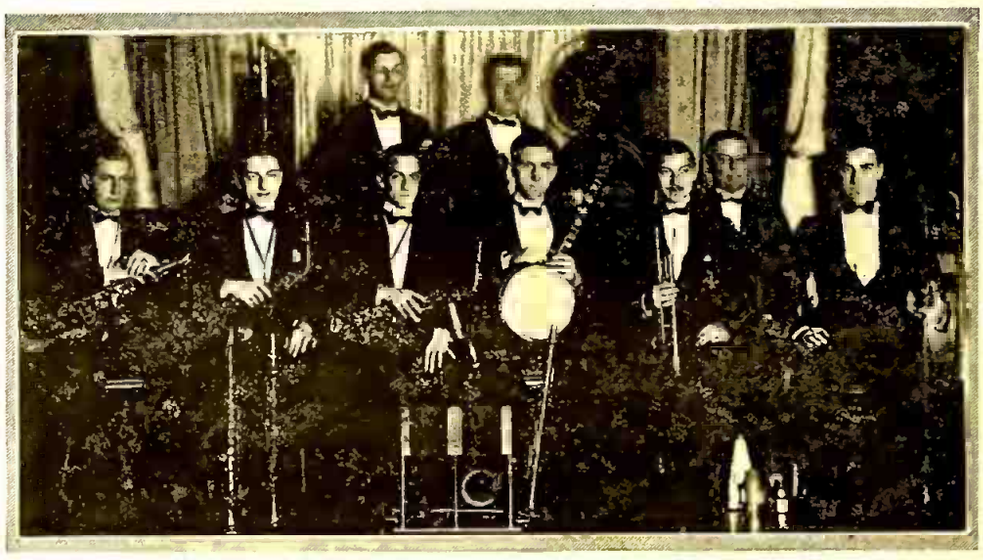
By Harry Aldine

STATION KYW and the Congress Hotel claim distinction in introducing an orchestra as a favorite for the current monthly contest. During the hectic period from December 16 to January 15, when for the first time in four months there came a readjustment of the three leaders, Coon and Sanders' Original Nighthawks not only scored the greatest vote for the month but found a berth in third place of the major contest.

The original "Nighthawks" form what is perhaps the best known radio orchestra in the country. As their name implies, they started their spurt to fame with the famous Kansas City Nighthawks Club from Station WDAF, of the Kansas City *Star*. After several months with that aggregation, the Coon and Sanders' boys decided to branch out for themselves as the "Original Nighthawks."

Under that banner they headed Chicago-ward and capitalized on the reputation earned by radio at several of Chicago's best known cabarets, theaters and other entertainment places. Finally, their name firmly established in that city, they joined the Congress Hotel as the sole furnishers of syncopation in the famous "Balloon Room" of the well-known hostelry.

Almost immediately the "Nighthawks" were hooked up with the Congress Hotel Studio of KYW, and soon their entrancing music was once more on the air for the multitude of fans who "Wondered what had become of the Nighthawks." The Nighthawks went Sally one better and told everybody where they had been.



The serious-visaged young men above compose Coon and Sanders' Original Nighthawk Orchestra, who now contribute largely to the success of the "Insomnia Club" from 1 to 2 a. m. daily at Station KYW, Congress Hotel, Chicago.

A New Radio Club

AFTER several months of broadcasting from the Congress Studio of KYW, Coon and Sanders have introduced a new feature similar to the Nighthawk frolic which they originated at WDAF a few years ago. It is fast gaining in favor among the fans and brings to Chicago its first "Radio Club" such as the "Hoot Owls" of Portland, Ore., the "Red Apple Club" of WCX and the "Mythical Dirgible" Club of WCAE.

KYW's matutinal feature of an hour of dance music and fun from the Balloon Room of the Congress Hotel in Chicago is already an established success judging from the letters, cards and telegrams which have begun to pour in at the Congress Hotel.

This past midnight stunt, originally known as the "Midnight Sons," has been changed to the "Insomnia Club" since the latter name is more in keeping with Coon-Sanders' Original Nighthawks' music from one to two o'clock in the morning, every morning, except Monday and Tuesday.

Heretofore KYW used to pick Coon-Sanders' orchestra at odd times, playing from the Balloon Room of the Congress, but the demand for more of this type of music became so insistent that KYW decided to put on this new feature from 1 to 2 a. m. in order to give listeners-in on both coasts and elsewhere more music and a better opportunity for enjoyment of early morning broadcasting.

Between the dance numbers, which of course are being played for the guests of the Balloon Room at the Congress, Fred A. Hill of the engineering staff of KYW, acts as announcer. Joe L. Sanders, director of the orchestra, and Carleton Coon, the original "Professor" of the Kansas City Nighthawks, together with the announcer manage to pull quite a bit of impromptu entertainment for the benefit of their invisible audience.

Indicative of the popularity of the "Insomnia Club" among fans from coast to coast, is the fact that during the hour each night when it is in session, nearly every dance selection played in the Balloon Room is at the request of some one of the radio listeners.

Especially heavy response from the West Coast has been noted, with a good sprinkling of Canadians and residents of the East Coast.

All aboard for the next Insomnia Special—no Pullmans.

Radio Age Contest to Close on June 15

POPULARITY CONTEST COUPON

Harry Aldine, Contest Editor
RADIO AGE, 500 N. Dearborn St., Chicago.
I wish to cast my vote for:

Name of favorite.....

Classification.....

Station.....Date Heard.....

Name [optional].....

Address [optional].....

THE WINNER FOR FEBRUARY

Coon-Sanders' Orchestra, Entertainers.....KYW, Chicago

WINNERS OF PRECEDING MONTHS

July	Duncan Sisters, KYW
August	Bill Hay, KFKX
September	Karl Bonawitz, WIP
October	H. W. Arlin, KDKA
November	Bert Davis, WQJ
December	Jack Nelson, WJJD
January	Art Linick, KYW

STANDING TO FEBRUARY 15

Name and Classification	Where Heard
Karl Bonawitz, Organist	WIP, Philadelphia
Bill Hay, Announcer	KFKX, Hastings
Coon-Sanders' Nighthawks, Orchestra	KYW, Chicago
H. W. Arlin, Announcer	KDKA, Pittsburgh
Bert Davis, Entertainer	WQJ, Chicago
Harry M. Snodgrass, Entertainer	WOS, Jefferson City
Jack Nelson, Announcer	WJJD, Mooseheart
Art Linick, Entertainer	KYW, Chicago
Duncan Sisters, Entertainers	KYW, Chicago
Ford and Glenn, Entertainers	WLS, Chicago
Lambdin Kay, Announcer	WSB, Atlanta
John S. Dagget, Announcer	KHJ, Los Angeles
J. Remington Welsch, Organist	KYW, Chicago
E. L. Tyson, Announcer	WWJ, Detroit
Hired Hand, Announcer	WBAP, Fort Worth
Fred Smith, Announcer	WLW, Cincinnati
Jerry Sullivan, Announcer-Entertainer	WQJ, Chicago
Nick B. Harris, Entertainer	KFI, Los Angeles
Edward H. Smith, Director-Player	WGY, Schenectady
"Sen" Kaney, Announcer	KYW, Chicago
Wendell Hall, Entertainer	WDAF, Kansas City
Howard Milholland, Announcer	KGO, Oakland
Scottish Rite Orchestra,	KGO, Oakland
Banks Kenney, Entertainer	WEBH, Chicago
S. Hastings, Announcer	KFI, Los Angeles
Robert Boniel, Announcer	WEBH, Chicago

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How One Ambitious Girl Became Famous

Radio's "Leading LADY"

18-Year-Old Rosaline Greene of WGY Players Reaches Pinnacle of Career as America's Premier "Radio Theater" Actress

Hard-Hearted Forest Ranger is Stirred to Tears by Her Realistic Act in Radio Drama

Here is an attractive pose of Miss Greene as she appeared "in costume" for one of WGY's recent radio productions.

IF YOU think you have talent and want a place back of the footlights, don't invite disappointment and perhaps starvation by seeking interviews with a producing manager, casting director, author or agency. Send him a sample of your voice by radio.

This system may not always work. There is always the chance that the manager will not be listening. However, it was successful with Rosaline Greene, the eighteen-year-old leading woman of the WGY Players, the group which is weekly broadcasting a play from the eastern station of the General Electric Company at Schenectady, N. Y.

Early this Fall, Selwyn & Company offered the WGY Players the privilege of producing "Silence," a crook play by Max Marcin. The play was then in rehearsal in New York and the management believed that its production on the air, prior to the premiere on the stage, would give a fair indication of its entertainment value.

It so happened that Rosaline Greene was selected for the leading female role. Max Marcin, the author, listened to the radio performance and found it good. He was particularly charmed by the voice of the young woman playing the lead. A few days later, Miss Greene received an invitation to understudy the lead in the stage production, in spite of the fact that she had never been inside the office of the producing manager.

Her First Real Offer

THE offer was alluring. It would attract any young woman with aspirations for a career on the stage. However, Miss Greene has one more year of work to gain a degree at the New York State College for Teachers, at Albany. She wants that degree and the wider background which education will give her. She declined the offer, assured that she will get her chance when she is ready.

In her college work, Miss Greene is studying modern languages, including French, German and Italian. Her work also includes literature and the history of the drama. Each week she nas a new part to study, for with only one or two exceptions she has appeared in every play produced by the WGY Players in the past year. Her study of the part does not mean memorizing the lines, for the radio player may read his lines. She does, however, study the part and the play, and is thus enabled to give an intelligent interpretation of the character she is playing.

Hers is a liquid voice of such distinctive tone and quality that it can always be identified. One of the greatest difficulties in the presentation of the radio drama is the selection of voices. Each voice must be distinctly different from every

(Turn to page 64)

Court Hits *Radio* Corporation

¶ Radio Corporation is Restrained from Selling Westinghouse Tubes

By Frederick A. Smith

IN THE February issue of RADIO AGE it was revealed to the radio public that the Radio Corporation of America, in replying to the government's charge that the corporation was involved in a trust conspiracy, made the surprising contention that the Radio Corporation had been pushing its radio activities from "patriotic" motives.

In that article it was promised that future issues of this magazine would relate some of the judicial proceedings in which the Radio Corporation has become involved. It was suggested that the courts would not be found holding a very serious view of the patriotic professions of the corporation.

Almost simultaneously with the distribution of the issue of RADIO AGE containing these facts and comments, a federal court decision in Delaware delivered a blow to the Radio Corporation which must have rocked that organization like a Dempsey right-hander.

The court upheld the contention of the DeForest Radio Company that the Radio Corporation was selling tubes which were an infringement upon the patents owned by the DeForest people. The Radio Corporation was not only restrained from further sale of such tubes, but was required to put up a bond to indemnify the DeForest company for damages incurred by any future sales.

Corporation's Statement Asked

ON THE tenth of each month hereafter, the Radio Corporation is required to file a verified statement with the district court in Wilmington, Del., accounting for all tubes manufactured by the Westinghouse Lamp Company, whose tubes the Corporation had been selling.

Inasmuch as the Radio Corporation of America has found time to go into the United States Patent Office at Washington with an objection to the registration of the title, RADIO AGE, under which name this magazine is now entering its fourth year, the publishers of RADIO AGE are taking more than ordinary interest in the other legal activities of the Corporation.

The Corporation owns and controls "Wireless Age" and complains to the Patent Office that the use of the title, RADIO AGE, by this magazine injures the business of Wireless Age, the corporation's organ. Our own attorneys have the matter in hand and we shall not presume to forecast the result except to say that we look forward to a long and pleasant Summer—and cheaper tubes.

Readers of RADIO AGE have written hundreds of letters, some of which offer

Dr. Lee DeForest, whose company scored its initial victory against the Radio Corporation of America.

to contribute to a fund whereby our defense against the astonishing conclusions of the Radio Corporation may be more easily financed. Similar offers have come from manufacturers. To all these we have replied gratefully that fortunately we do not need financial assistance in fighting the $33,000,000 radio gang. All we ask is that readers give us their co-operation by continuing to buy our magazine and that manufacturers show their approval of our stand by continuing to advertise with us. Not even the Four Horsemen of the Apocalypse could win against such a combination as that.

Must Meet Trust Charge

AS THIS April issue of RADIO AGE is going to the news-dealers in the United States, Canada, Cuba, England, Australia, Mexico and various other countries, the Radio Corporation is preparing to defend itself against the charge it is a trust.

Hearings open on March 18, in New York, before the Federal Trade Commission. Seven other corporations, in addition to the patriotic leader of them all, will be required to answer the government's accusation that they have banded together in a CONSPIRACY TO RESTRAIN TRADE.

The circulation of RADIO AGE has grown so large that it is necessary for us to put this magazine together weeks in advance of its distribution date. It is therefore impossible for us to give results of the New York proceedings in this issue. We shall take great pleasure in supplying generous information in a later issue. We hope you will read the

¶ Seven Big Corporations, Including R. C., to Face Charges March 18

report of the proceedings as published in RADIO AGE, as we have a feeling that our report is going to be a bit more complete than those accounts our readers may encounter in other publications.

Mr. Sarnoff, the able general manager of the Corporation, always tells the press, when asked for comment on the result of the Corporation's amazingly large number of judicial adventures, that the Corporation "never discusses its affairs in the public prints."

We are going to take a load from Mr. Sarnoff's shoulders and discuss them for him. While we shall possibly not be as sympathetic in our treatment of the subject as Mr. Sarnoff would be, we assure our readers we shall be as fair as can be and that we shall not be so absurd as to venture an untruth that might give the Corporation cause to grieve over our moral turpitude.

The Radio Corporation last Summer wrote us a letter demanding that we give up the name of our magazine. The Corporation's communication was so arrogant that we were reminded of the famous *lettres de cachet* by which French despots sent honest folk to the Bastile.

Truly, we have nothing but respect for the Federal Trade Commission's courage in bearding such a lion!

Many Features Planned for May Radio Age

A PROMISING group of technical and feature articles is now in the process of preparation for the May RADIO AGE, which will be on the news-stands and in the hands of subscribers by the 15th of April.

Among the technical features will be an article on a practically "squeal-less" regenerative set by that prominent experimenter, Arthur B. McCullah. McCullah has been testing this set for several months.

H. Frank Hopkins has perfected a unit that any fan can build, and which is used to test your tubes before you place them in the set. This device will come in handy on countless occasions and will save you the trouble of going to a radio store every time you think troubles in your set are caused by tubes.

Frank D. Pearne will have an absolutely new hookup, incorporating a new circuit he has developed.

Paul Green will be on hand with a hookup almost as famous as his "Baby Grand," while Ray G. Piety, inventor of the low-loss 3-circuit tuner in the February issue, will be with us again.

C. H. Dillon, Edmund H. Eitel and Brainard Foote are others who are planning surprises. And as usual there will be the blueprints by John B. Rathbun.

Here's the IDEAL *Announcer!*

By S. H. Hawkins

New York Radio Experts Set Up Mythical Demi-God After a Careful Research

Rate of Delivery Given *Prime* Importance in *Tests* by the *Radio Voice Technique Committee;* Quality of *Personality* is *Left* to the *Individuals;* Another Contest to *Decide Who* Resembles *"Ideal"*

THE ideal radio announcer has at last been described and classified. The findings of the Radio Voice Technique Committee at the meeting held in February in the studios of Station WJZ, New York City, have created a "demi-god" at whose feet the fifteen hundred or more members of the new profession of radio announcer may sit with reverence and awe.

Those to whom the creation of this perfect being—the Ideal Radio Announcer—may be attributed include many leading figures of educational, scientific, journalistic, and dramatic circles in New York City. Their decision, as incorporated in the Tabulated Report of the Radio Voice Technique Committee, is as truly representative of the opinion of the Great American Public as could be desired.

The report, based upon the results of research conducted by Richard C. Borden, M. A., Sc. B., and Alvin C. Busse, M. A., co-directors of the National Radio Voice Service, bears the names of Archibald Bouton, Ph. D., Dean of the College of Arts and Pure Sciences, New York University; L. E. Bragdon, Radio Editor, New York Sun; David G. Casem, Radio Editor, New York Telegram and Evening Mail; Capt. Stephen L. Coles, Radio Editor, New York Herald-Tribune; O. E Dunlap, Jr., Radio Editor, New York Times; Dr. Alfred N. Goldsmith, Broadcast Engineer; Henry C. Hathaway, Director of Bureau of Radio Broadcasting, New York University; Reverend A. Edwin Kiegwin, D. D., of the West End Presbyterian Church; James E. Lough, PH. D., Pd. D., Dean of the Extramural Division, New York University; E. Wallace McAdam, M. D., Dean, New York Homeopathic Medical College; Charles B. Popenoe, Manager of Stations WJZ and WJY; Stephen Rathbun, Dramatic Editor, New York Sun; Paul F. Sifton, Radio Editor, Sunday World; and H. F. Wooley, Radio Editor, New York American.

His Seven Qualities

THE necessary characteristics of the Ideal Radio Announcer were found to be seven in number, and the nature of each was determined by the following seven tests. (1) Average Rate Test; (2) Rate Variation Test; (3) Average Pitch Test; (4) Pitch Variation Test; (5) Stress Variation Test; (6) Formality Test; (7) Distinctness Test. The digest of the decisions of the committee members on each test establishes the nature of the Ideal Radio Announcer.

The Ideal Radio Announcer should speak at an average rate of approximately 175 words per minute.

The Ideal Radio Announcer should introduce into his announcements marked changes in rate pace.

The Ideal Radio Announcer should have a voice of low middle range.

The Ideal Radio Announcer should introduce into his announcements marked pitch variations (avoidance of monotone).

The Ideal Radio Announcer should introduce into his announcements marked stress variations.

The Ideal Radio Announcer should speak in a formal, but friendly manner, adapting his style to the general content of the program.

The ideal Radio Announcer should speak with a moderate distinctness.

The committee's decision as to the relative importance of the various characteristics of the ephemereal announce-

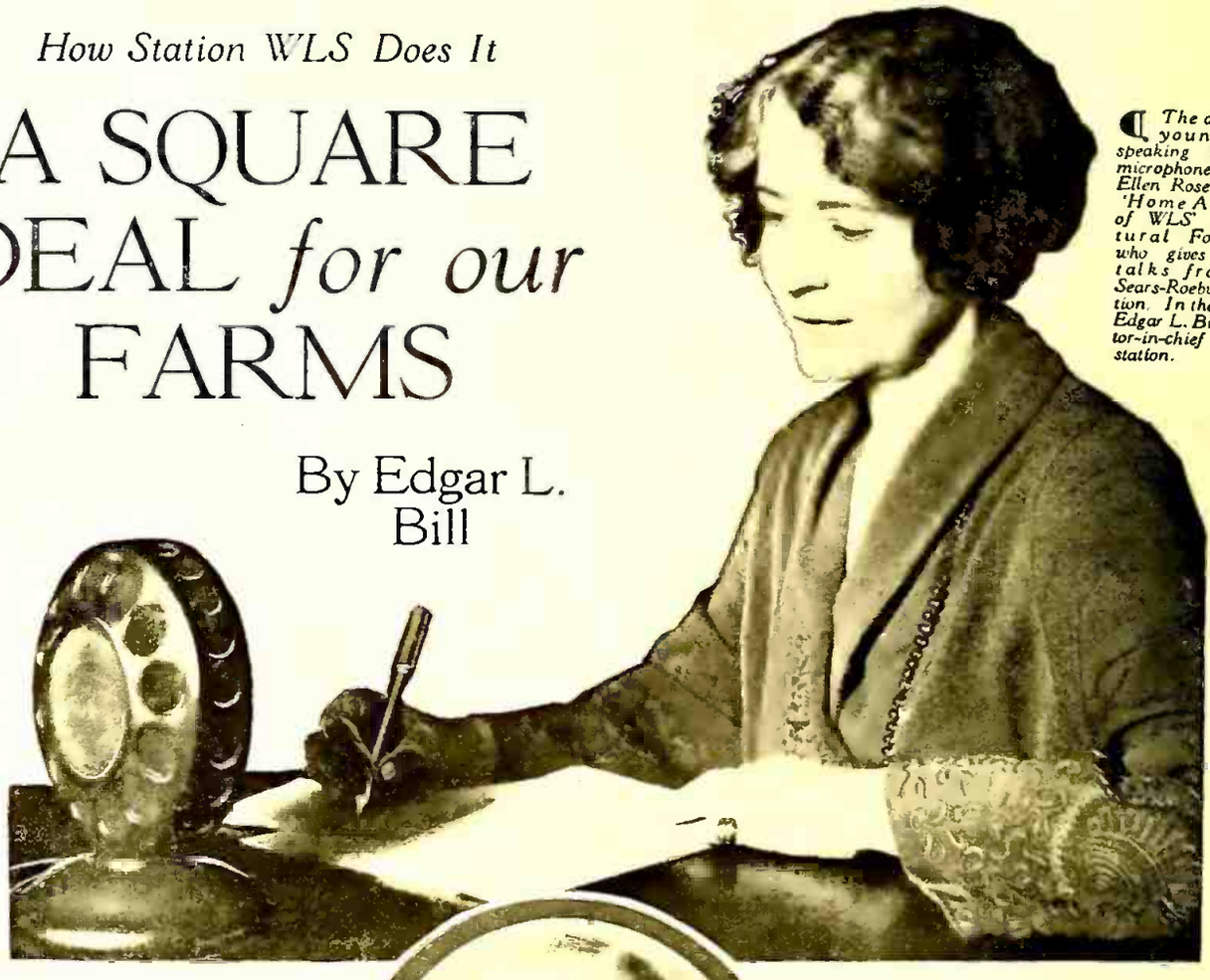
(Turn to page 52)

Guarding *the* Farmer's Money

How Station WLS Does It

A SQUARE DEAL *for our* FARMS

By Edgar L. Bill



The attentive young lady speaking into the microphone is Mrs. Ellen Rose Dickey, 'Home Adviser' of WLS' Agricultural Foundation who gives regular talks from the Sears-Roebuck Station. In the circle is Edgar L. Bill Director-in-chief of the station.

WLS, the farmers' station at Chicago, was built by the Sears-Roebuck Agricultural Foundation to help the farmer make more money. That it has accomplished its purpose and proved its value in terms of dollars and cents to the farmer has been shown time and again during the station's existence.

Farmers working around the barn lot in Maine, or loading their hogs for market in Missouri; farmers in Georgia and Oregon, have taken tips from WLS and saved themselves thousands of dollars. Farm men turn to their radio station for aid as well as entertainment, for WLS is the only strictly agricultural broadcasting station in the world.

The most valuable service given from day to day lies in the market reports which are broadcast at regular intervals from 9 A. M. to 6 P. M. A farmer in Benton County, O. A. Koopman, tells a story to illustrate the practical value of these daily reports, "I went to my son's farm one morning last fall after receiving the nine o'clock report from WLS. As I got there my son and the hog buyer stood among the hogs, and the butcher offered him $10.60. I shook my head, and then the buyer offered a raise if we'd be willing to take the drop. We took him on. I went home, got the truck, hauled them four miles, unloaded, but the buyer had no markets yet. Then we heard

WLS say 20 cents higher and he then paid my son $10.80 instead of $10.60." This letter from Mr. Koopman is typical of thousands of letters from practical farmers who have realized financially on their station.

Radio Affects Prices

MANY farm-minded, and economic-minded men are of the opinion that WLS is helping to stabilize market prices. Large numbers of stockmen living within a 200 mile radius of Chicago formerly shipped their cars to market without a knowledge of the current prices. Now, however, they listen in on the 11 o'clock market reports from WLS, and estimate receipts for the next day before they load their cars. If the market looks good, they ship their stock, but if it indicates heavy receipts, they cancel their cars and await a more favorable time for shipment.

Henry Stabler of Bureau County, Illinois, is one man who had this experience. Last December, his son and some neighbors with teams were hauling hogs to a shipping point. Mr. Stabler happened to pass the Farmers' Elevator office and noted a radio message on the bulletin board which stated that owing to a record run on the Chicago market, the prices had taken a sharp drop from those of the preceding day. Mr. Stabler immediately got in touch with his son by telephone and the wagons with the hogs were turned home. When Mr. Stabler sold his hogs a week later, they brought a dollar a hundred more than he would have received before. He estimates that the radio report saved him $175 on this particular deal.

Most farmers urge that more radio hours be spent each day in explaining Chicago market grades and prices.

"We are interested in grain, butter, eggs, poultry, hogs and cattle," writes O. Gulbrandson of Kirley, South Dakota. Mr. Gulbrandson lives 50 miles from the railroad and fifteen miles from a telephone, and the WLS Market reports are therefore more than double the value for him. Lee Mosher of De Kalb County, Illinois, believes that the radio market reports are worth more than $500 a year to him.

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Harry Cooper

The Popular Syncopating "WIZARD *of* WSB"

By *RUSSELL H. HOPKINS*

ATLANTA:—Down in At-lan-ta, Geor-gia, where the folks look upon Radio Station WSB with the same respect accorded cotton and mint juleps, there are more sleight-of-hand musicians than in any other part of the world, including Scandinavia. Up in Illinois and New York State, the studio directors look high and low for talent in the music schools and song shops, but down in Atlanta, one of America's pioneer radio broadcasting cities, bookkeepers, ex-newspapermen and carpenters are usually sought when a real musical genius is wanted. Even printers have been known to possess an innate ability to coax music out of any kind of instrument!

Take the case of Harry Cooper, for instance. Born in Atlanta, his remotest ambition during his early days did not approach the concert stage. He worked at everything from carpenter and printer to journeyman reporter, finally landing with the *Atlanta Journal*, which owns and operates WSB.

Discovered!

AFTER a while someone discovered that Harry could play the piano. "Just a side-line," he explained when questioned. "Picked it up when I was a kid, and just play when I'm alone, anyway."

Well, his newspaper cohorts asked him to play something when the managing editor was their guest at a tenth anniversary banquet in his honor. That was a couple of years ago, and Harry *did* play something! In fact, he played nearly everything, and before his concert was over the banqueteers forgot there was ever such a thing as a managing editor or that he had announced his tenth anniversary with the paper.

Harry was immediately signed up, and ever since he has been playing the piano and a few other minor instruments on WSB's regular programs.

Strange to say, Cooper doesn't know the difference between *do* and *mi* in the musical scale, but neither do the rest of the ex-newspapermen or printers who are winning fame with their musical prowess throughout America's chain of broadcasting stations. However, this genius has an extraordinary creative ability that has caused nation-wide comment. His unique conception of popular tunes and his beautiful and often-times weird harmonies, are of his own composition and have proved immensely popular because of their originality.

The "Mirthful Pair"

COOPER is not only an accomplished musician, but an actor as well. When he and Announcer Lambdin Kay of the sonorous voice get together at a public broadcast concert, their antics are a source of unalloyed mirth and interest to the onlookers as well as the listeners.

For who is not familiar with Kay's "At—lan—ta, Geor—gia," and his rhythmic sing-song voice, which has made him truly one of the few distinctive announcers in the country? And it was Lambdin Kay who "discovered" Cooper and induced him to leave the anonymity of newspaperdom for the fame of successful broadcasting.

Other stations have their "Kings of the Ivories," "Czars of Jazz" and "Piano Ticklers," but WSB has its "Syncopating Wizard" and is justly proud of him despite the fact that a sheet of music is about twice as hard for him to read as an essay in the original Greek.

News Waves from the Domain of Radio

How Isham Jones Regards Radio

By A. C. E. Schonemann

THE trite old phrase, "Familiarity breeds contempt" probably is the most effective expression that one could use in epitomizing the attitude of Isham Jones in the matter of broadcasting jazz melodies via the ether route.

(Mabel Sykes Photo)

Isham Jones

Jones is not unmindful of the advantages offered by radio. In four years he and his orchestra have become firmly intrenched in the good graces and affections of the great army of dance fans that frequent the College Inn at the Hotel Sherman in Chicago. The last six months have brought a new triumph to Isham Jones, and with it has come a mighty audience—invisible—but enthusiastic and appreciative to the 'nth degree and drawn from all classes of society—men, women and children—from all walks of life and out into every highway and by-way.

"No one can doubt or question the influence of radio," said Jones, pulling out a sheaf of letters from radio fans. "Here is the answer, and with it comes proof that destroys any uncertainty that one may have if he regards radio as a fad or passing fancy. However, radio has come so suddenly and grown so rapidly that nobody seems to know how to handle it so it will serve everybody alike.

"The public ear is sensitive and when our jazz music becomes a part of a varied program it gains in popularity," continued Jones.

"However, the minute we make our music commonplace, we destroy its effectiveness; it must not be over-played, but served with discrimination and not to the point where it occupies the spotlight throughout the entire program.

Good Advertising

THERE are few if any people who entertain who will question the advantages of broadcasting. The advertising obtained in this manner is invaluable to an orchestra; it sells phonograph records, it popularizes song hits and it helps the hotel or institution that is guaranteeing the finances of the various studios; but when we play jazz without any limitations and allow it to monopolize the air, then radio injures rather than helps the cause of popular music."

Isham Jones has entertained radio fans from two Chicago stations—KYW and WLS. His orchestra is one of the best known phonograph recording units in the United States, and in the art of concocting jazz melodies of the foot-teasing type, Isham Jones has to his credit a half dozen or more of the best known and most popular hits turned out in 1924. Consider "Swingin' Down the Lane," "The One I Love," "Spain," "Never Again," and "At the End of a Winding Lane."

"A radio audience is just as responsive as the nightly crowds that fill a ballroom or cabaret," said Jones. "The difference is that radio fans express their appreciation by letters and the others show their interest by applause. In either case it is not a difficult matter to boost a song. The unfortunate part of 'plugging' a song is that many radio artists overplay the number by singing it continually.

"When we began broadcasting, the sales of phonograph records dropped off. We attributed this to the fact that we broadcast off and on for long periods from the College Inn and that the prospective purchasers of phonograph records had only to turn the radio dials to pick up the orchestra, so they were not interested in buying records.

"Now we broadcast from the studio in the Hotel Sherman. Our programs are given on Wednesday, Thursday, Friday and Saturday evenings, and they extend over two periods of about twenty minutes each. We play about five numbers and in presenting them, we consider the matter of variety just as important as an effective and appealing rendition of each selection. Above all, we do not try to overdo our part of the entertainment.

Arrangement is Vital

THE arrangement of an orchestra in the studio is in many respects similar to the plan used in making phonograph records. The violins are placed within a few feet of the microphone; the saxophones six or eight feet; the brass instruments fifteen feet and the drums are eliminated entirely. It is necessary that the orchestra play softly, and care must be used so that a group of instruments

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Station WJJD Opens a Chicago Studio

BY arrangement with the Garod Corporation, the Loyal Order of Moose announces the completion of extensive preparations for maintaining a Chicago studio in the Palmer House, to be known as the Garod Studio of Radio Station WJJD.

Although the task of erecting thirty-seven miles of specially constructed poles, the building of cross-arms, the stringing of over one hundred and fifty miles of broadcasting wires and telephone cables, connecting the new studio with the Mooseheart station has been completed by the Western Union organization, actual broadcasting did not begin until Monday, March 9th. Elaborate preparations were made to celebrate the formal opening with a program of unusual entertainment which was unique in the annals of radio broadcasting.

The event was signalized by a banquet in the Victorian room of the Palmer House on the night of the opening which was attended by about one hundred personages prominent in civic, theatre and radio circles. Jack Nelson, managing director and announcer, officiated as master of ceremonies.

Mr. Nelson had the unique pleasure, on that occasion, of introducing and presenting all of his distinguished contemporaries in Chicago. It was Mr. Nelson's opinion that seldom if ever before have there been assembled so varied and renowned an aggregation of radio luminaries under one roof to be heard through the same microphone on one evening.

The following directors and announcers, and their talented proteges, attended: Charles E. Ebstein, owner-director of WTAS; Bob Boniel, "The Voice of the Great Lakes," i. e., WEBH; George Hay, the solemn old judge of WLS; Wilson J. Wetherby of KYW; Jerry Sullivan of WQJ, "Chi-CAW-go;" Chas. Gabriel and Quin Ryan, the famous WGN team, and last but not least, Miss Judith Waller of WMAQ.

In addition to the radio stars who accepted invitations, Secretary of Labor James J. Davis attended, and many of Chicago's prominent men participated in WJJD'S "open house."

Among those present were: Mayor William E. Dever and his official family, Mr. Potter Palmer, and the leading representatives of the opera and the theater who were in Chicago on Monday, March 9th.

Arrangements were made to film the colorful event and to photograph the artists and other guests of WJJD for the news-reels. Similar arrangements were made to take motion pictures of Charlie Straight's Orchestra at the Rendezvous, together with their entertainers, all of which were broadcast through WJJD by direct wire.

This gala program inaugurated the regular broadcasting of nightly programs.

(Drake Photo)

Glenn Rowell, musical director of Station WLS and an entertainer on RADIO AGE programs from the Sears-Roebuck Station.

RADIO Age Adds Several Noted Stars to Its "Studio Staff"

Some ADDITIONS to Our FAMILY

Listen In and Get Acquainted

GATHER around, folks, and we'll tell you about the wonderful new additions which have been made to the official RADIO AGE family of broadcasters during the past month.

Of course, you're already familiar with such stars as Banks Kennedy, Art Linick, Axel Christensen, Nate Colwell, the Dennis Sisters, Loos Brothers and others who appear on exclusive RADIO AGE programs from KYW and WEBH each month. Their reputations have been assured, so we just mention them to let you know they're still on the map and going strong.

Not to stand still, however, RADIO AGE decided to augment its staff of artists, and accordingly search was made throughout the Chicago broadcasting fraternity for some more "stars" who would twinkle under the RADIO AGE banner, which is now known from coast to coast for the excellence and variety of its programs.

You Know "Little Glenn"

WELL, we can't keep the secret any longer, so here are the latest surprises. To begin with, none other than Glenn Rowell, musical director of Station WLS, the Sears-Roebuck Station at Chicago, has been obtained to appear on RADIO AGE programs from WLS. The first program was Friday, March 6, when Glenn, with his side-kick, Ford Rush, started off RADIO AGE's hour of broadcasting with their "Lullaby Time." Ford and Glenn appeared intermittently during this program under the auspices of this magazine.

On the same program RADIO AGE "sprung" two more surprises that are destined to prove agreeable to the army of reader-listeners possessed by the Magazine of the Hour. The first was Miss Grace Wilson, noted contralto of nation-wide vaudeville fame. She has a deep contralto voice that is almost masculine, and yet it has the tenderness of a woman's vocal expression. Miss Wilson has been termed the "Girl with the perfect radio voice." She sang several popular and character songs for RADIO AGE on this first WLS program. She will appear on many future programs for this magazine.

The circle above shows Miss Mildred Zoller, director of the Mt. Morris College Girls' Quartet, which appeared over WLS and KYW on RADIO AGE programs this month. Below is Lee Sims, nationally known pianist and entertainer, who may be heard on RADIO AGE's KYW programs the first Saturday in every month beginning at midnight.

The biggest surprise next to be uncorked was the Mount Morris, (Ill.) College Girls' Quartet, under the direction of Miss Mildred Zoller, a senior at the College. These girls have appeared consistently from WOC at Davenport, Ia., and plan a tour of Middle Western radio stations this Spring. They were persuaded to start their career over Chicago stations under the direction of RADIO AGE, and they made their debut from WLS on the March 6 program.

The next evening, March 7, from midnight to the wee, sma' hours, they again appeared on a RADIO AGE program from KYW, on our monthly Jazz Carnival from the Little Red Studio on the Congress Hotel. All listeners pronounced their singing of popular and southern melodies as the "best yet" for a girls' group. Their voices are evenly matched, and in addition three of the girls strum ukeleles and banjos while they sing, thus adding a quaint touch to their selections.

And More Surprises!

THE members of the quartet are, besides Miss Mildred Zoller—Florine Redenbo, soprano; Mary Gallagher, alto; and Pauline Zoller, second soprano.

Another important announcement concerns A. W. "Sen" Kaney, KYW's first announcer a few years ago, who has returned to the fold after announcing at WJAZ, WEBH and WGN, all of Chicago.

(Turn to page 57)

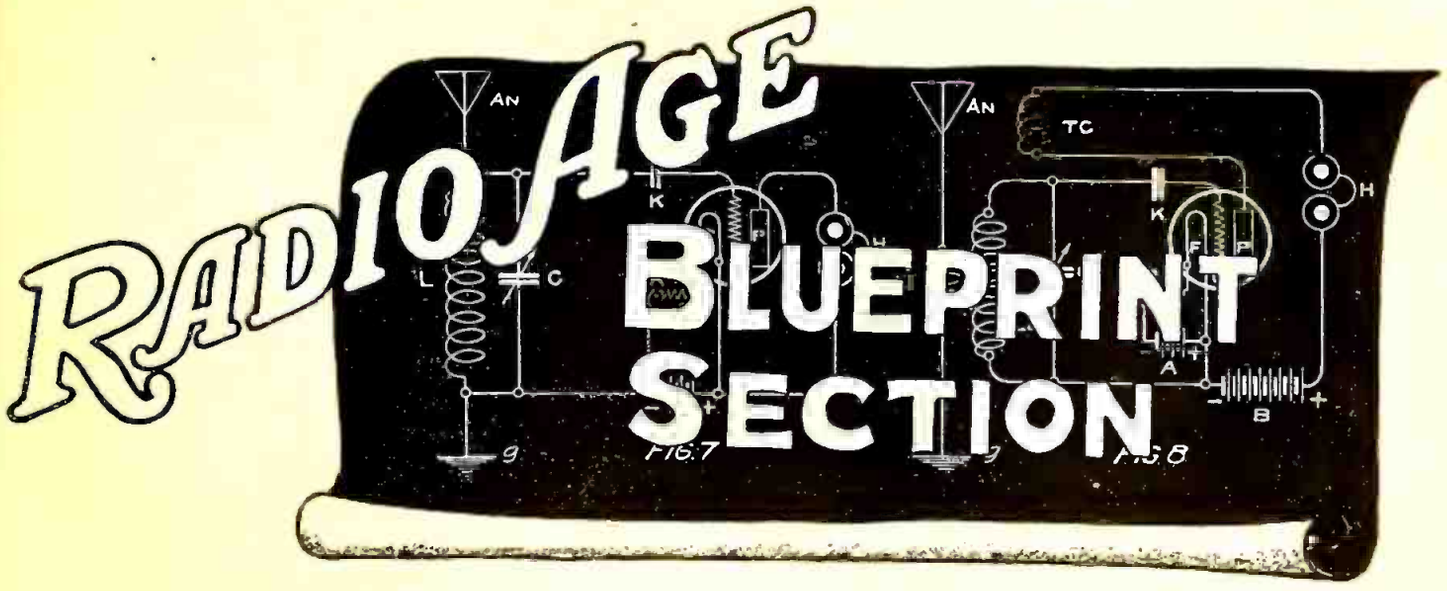
United Photo. (N. Y.

Miss Grace Wilson, contralto, who sang for RADIO AGE from WLS Friday, March 6. She is an experienced vaudeville singer and has a big following among radio fans.

Daguerre Photo

A FAVORITE AMONG THOUSANDS

Such a reputation is enjoyed by Belle Forbes Cutter, who has won friends from several radio stations in the Middle West. Her radio "home" seems to be the studio at WEBH, where she began her radio career. Miss Cutter has one great accomplishment to her credit; that of providing entire programs at radio stations. That's quite a bit of work for one soprano to achieve in one evening, but to Miss Cutter it's a part of her regular routine.



More Volume and Range with

A 5-Tube Radio Frequency Set

By JOHN B. RATHBUN

A Receiver that Will Minimize Distortion

SINCE the introduction of the five-tube neutrodyne about two years ago, we have had an almost endless stream of five-tube radio frequency "dynes" which testify to the popularity of this sort of radio receiver. This neutrodyne was the first really high powered type introduced to the general public for broadcast reception. The fans to this time had been limited to the three-tube regenerative with the conventional detector and two stages of audio frequency. The addition of the two stages of radio frequency to the detector in the neutrodyne not only increased the range enormously, but also very considerably added to the selectivity, and I believe that the selective feature of the tuned radio frequency set had as much to do with its promotion as the increased range and the possibility of coast-to-coast reception on the loud speaker.

Untuned radio frequency reception with untuned radio frequency coupling units had proved somewhat of a fizzle, not only because the maximum range and signal strength were not developed but also for the reason that such receivers were hardly more selective than the regenerative set of that period, and even two years ago the question of interference was becoming a serious proposition. By tuning the transformers between the radio frequency stages, we reach the amplification peak in each stage and also increase the losses at a number of points so that undesired stations could be eliminated with certainty, even through strong local interference. Using three tuning controls made long distance reception possible for the city dweller on every night in the week.

The Typical 5-Tube Set

USUALLY the five-tube outfits consisted of two stages of radio frequency amplification, detector, and two stages of transformer coupled audio stages. There was seldom any attempt at regeneration in the detector tube circuit or any other means of amplification outside of the simple amplifying powers of the tubes themselves. True, the first neutrodyne introduced by Prof. Hazeltine was of the reflex type, but strange to say, little interest was taken in the reflexed neutrodyne until a few months ago. Experimenters seemed content to stick to straight radio frequency amplification without the assistance of either regeneration or reflexed R. F. or audio amplification. In the most part they confined their inventiveness to contriving schemes for the elimination of oscillations in the radio frequency stages.

For a long time the suppression of oscillations in the radio frequency stages was a problem to which many solutions have since been offered. We have the well-known neutralizing system introduced by Prof. Hazeltine, the reversed feed-back system, the potentiometer, and similar devices, and it is in this part of the circuit that most five tube radio frequency circuits differ from each other. It would be almost impossible to say which of these systems has proved the most sensitive and efficient, for each type has its band of adherents who defy any of their opponents to show better reception or greater range.

It has long been the belief of the writer that very marked improvement could be made in the five tube radio frequency receivers by the introduction of regeneration in the detector circuit or by reflexing certain of the stages so that some of the tubes could be made to perform dual duty. Shortly after the introduction of the neutrodyne, I made several experiments in obtaining regeneration in the detector circuit by means of a variometer or tuned impedance in the plate circuit, but while this increased the range and signal strength considerably, it did not meet favor for the reason that it introduced a fourth control, and a rather critical sensitive control at that. Further, regeneration was not always dependable with neutralized grids, and as neutralization held the floor at that time to the exclusion of every other idea, the matter was dropped for the time being.

Rheostats Cause Trouble

TO ELIMINATE the fourth regenerative control, I next tried several

(Turn to page 38)

Blueprints of the Five-Tube Radio Frequency Receiver on Two Pages Following.

RADIO AGE
APRIL 1925

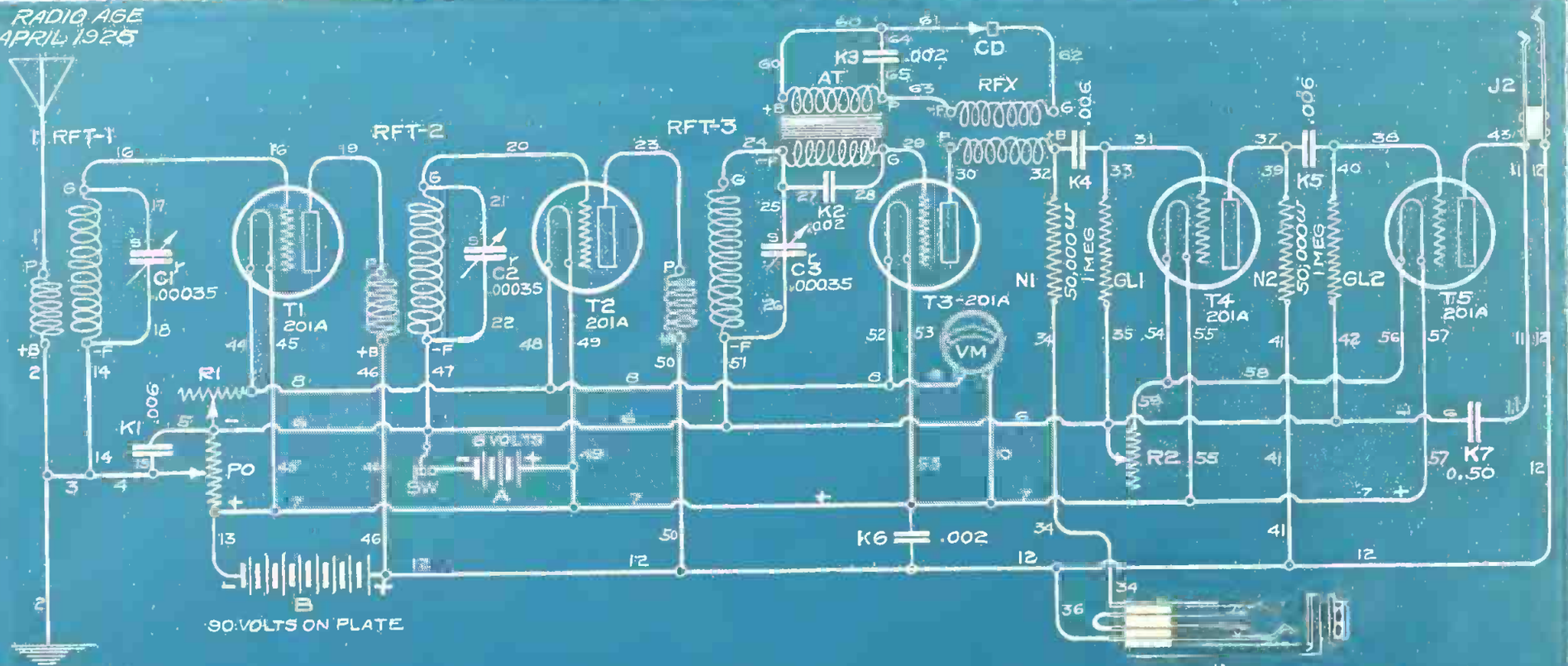


FIG. 1
"AMPLEX"
5 TUBE RADIO FREQUENCY RECEIVER

THREE STAGES OF RADIO AND THREE STAGES OF AUDIO BY REFLEXING THIRD TUBE MARKED (T3) ABOVE.

ALL TUBES ARE OF THE 201A TYPE WITH A FULL 90 VOLTS APPLIED TO PLATE BY "B" BATTERY. A 6 VOLT STORAGE BATTERY WILL BE REQUIRED FOR THE FILAMENTS.

THE AXES OF THE RADIO FREQUENCY TRANSFORMERS AT RFT-1-2-3 ARE TO BE INCLINED AT AN ANGLE OF 60° WITH THE HORIZONTAL TO PREVENT INTERSTAGE COUPLING. CONDENSER CLIPS FOR MOUNTING COILS.

CONNECT STATORS (S) OF THE VARIABLE CONDENSERS C1-C2-C3 TO THE GRID LINES, AND THE ROTORS OR ROTATING PLATES (r) TO THE -F OF THE TRANSFORMERS TO ELIMINATE BODY CAPACITY EFFECTS.

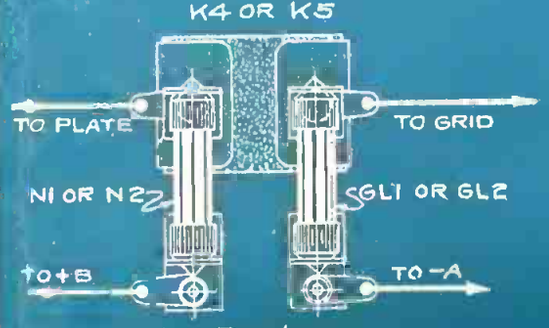


FIG. 1a
DETAIL OF RESISTOR COUPLING UNIT

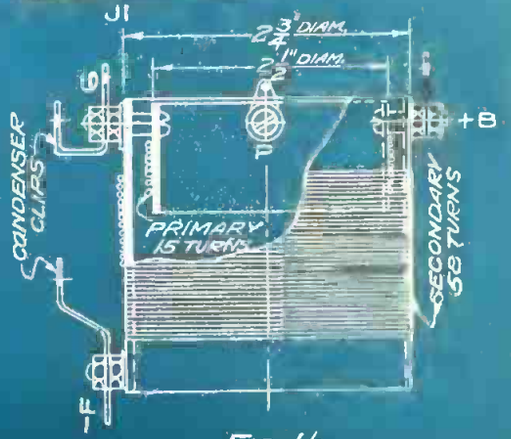


FIG. 1b.
DETAILS OF R.F. TRANSFORMERS MARKED RFT-1-2-3 ON DIAGRAM.

J.B. RATHBUN
RF-700

RADIO AGE
APRIL 1925

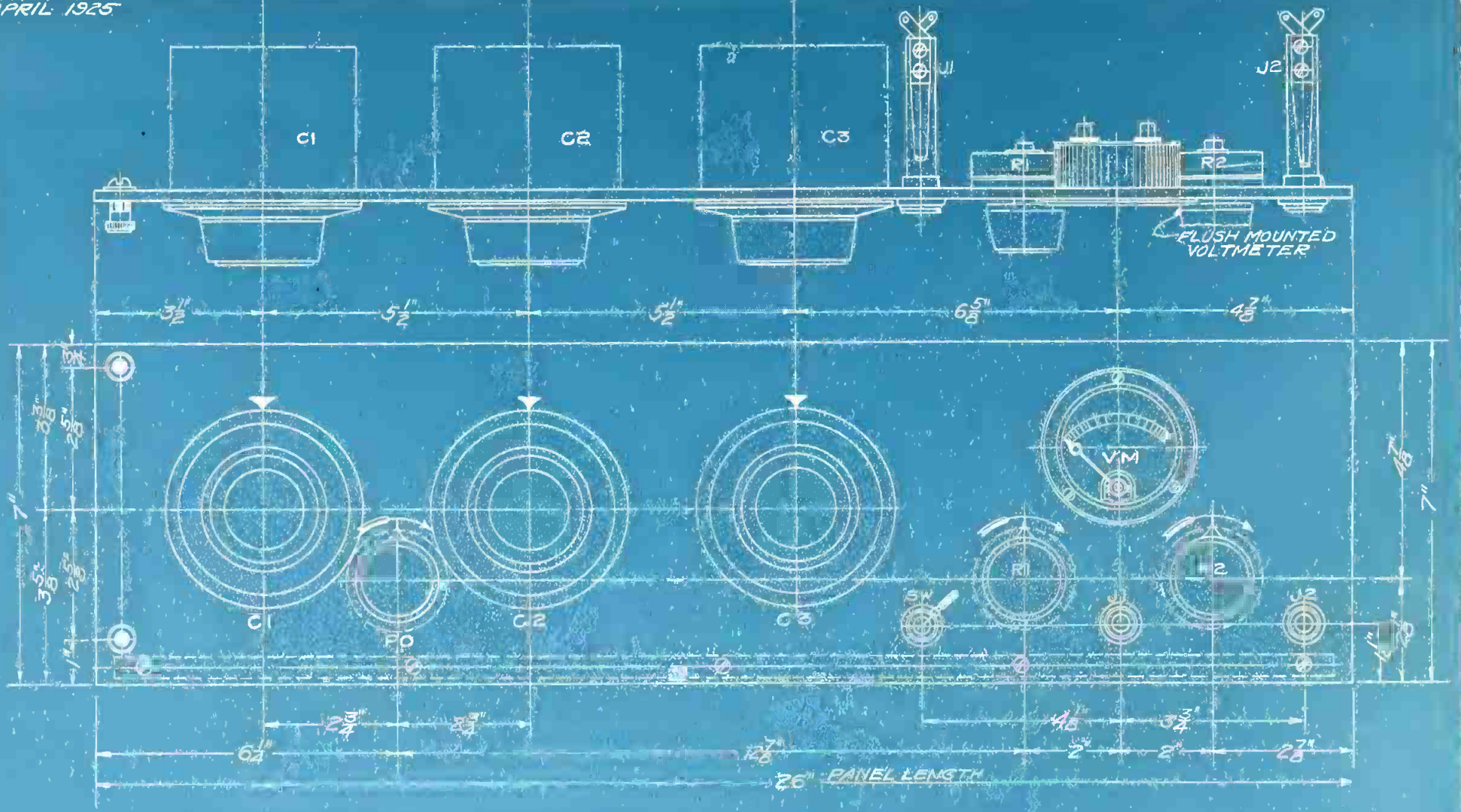


FIG. 3.

AMPLEX PANEL LAYOUT

SHOWING THE GENERAL ARRANGEMENT AND DIMENSIONS OF PANEL AND OF THE APPARATUS MOUNTED ON THE PANEL. SAME LETTERING AS IN FIG. 1.

J.B. RATHBUN
RF-700

Results with a Reflexed Detector

(Continued from page 35)

regenerative stunts in the detector circuit such as the fixed tickler used in the Wizard receiver, and the Ultra-audion single control method, both of which gave strong regeneration and sensitivity but which made the rheostat controls critical and difficult to manage. With such circuits, control of the regeneration is had entirely by the rheostatic or filament emission method, and a vernier rheostat is absolutely essential for the proper adjustment. Unless it was brought just below the oscillating point, the circuit would break out into violent free oscillation with accompanying howls and shrieks. While this gave wonderful results in the hands of an experienced operator, it certainly was not a circuit to install in the home or for the everyday broadcast listener.

It seemed for a while that the only resort was to reflex the detector circuit and this is what I finally accomplished after a number of experiments. The reflexing of the so-called detector stage or third tube both increased the volume and improved the quality of the reception, and from many standpoints was an advance over the regenerative principle or the totally reflexed method by which all of the tubes were reflexed. Reflexing the third tube alone gave us approximately three stages of radio frequency amplification with the same number of tubes ordinarily used to obtain two stages, and in addition it added about 0.8 of an audio stage. Further audio amplification was then obtained by two stages of resistance coupled audio, which gave the total audio volume without the distortion usually introduced by iron core radio frequency transformers.

Summing up the matter, we obtain practically three stages of radio frequency amplification and the equivalent of two audio frequency transformer coupled stages by five tubes, and without distortion or "razzing" even when the tubes are being pushed to the limit. The audio stages consist of one transformer coupled stage and two resistance coupled stages, which give us a volume slightly better than two transformer stages. A crystal detector performs the rectification without introducing the tube noises that ordinarily affect the output. In short, it is just like adding two stages of radio amplification to a single reflex circuit and then increasing the volume by the further application of two resistance coupled stages.

The Circuit Layout

IN FIG. 1 we have the layout shown by a schematic diagram and in Fig. 2 the same circuit is given in "picture" form, which not only shows the wiring in simplified form, but also suggests the arrangement of the apparatus behind the panel. Fig. 3 is the front elevation of the panel with the control dials and knobs located.

Looking at Fig. 1 or Fig. 2 we see the usual first two radio frequency tuoes (T1) and (T2), and the three radio frequency coils or transformers, (RFT-1), (RFT-2) and (RFT-3) connected up in the usual way of radio frequency transformers. The transformers are tuned by the 17 plate (0.00035 mf) variable condensers (C1), (C2) and (C3) connected across the secondary coils of the transformers. There is little to say about the transformers except that they are of the conventional type used in standard radio frequency circuits, and that it is far more desirable to purchase these parts than to attempt making them at home.

BILL OF MATERIALS FOR THE SET

MARK NO. OF (LETTER)	PIECES	NAME OF ITEMS	SIZE
A	1	Filament "A" Battery, Storage type	6 Volts
AT	1	Audio Frequency Transformer	6-1 Ratio
B	2	45 Volt Blocks of "B" Battery	Large.
C1-C2-C3	3	Variable Condensers	0.00035 mf (17 Plt.)
CD	1	Fixed Crystal Detector	
*GL1-GL2	2	Grid Leaks	1-2 Megohms
J1	1	Two circuit Jack	Standard
J2	1	Single Circuit Jack	Standard
K1	1	Fixed Mica Condenser	0.006 Mf.
K2	1	Fixed Mica Condenser	0.002 Mf.
K3	1	Fixed Mica Condenser	0.002 Mf.
*K4	1	Fixed Mica Condenser	0.006 Mf.
*K5	1	Fixed Mica Condenser	0.006 Mf.
K6	1	Fixed Mica Condenser	0.002 Mf.
K7	1	Fixed Mica Condenser	0.500 Mf.
*N1-N2	2	Resistors or Coupling Resistances	50,000 Ohms
PO	1	Potentiometer	400 ohms, or 200 ohms
R1-R2	2	Rheostats for filament Control	6 Ohms
RFT-1-2-3	3	Radio Frequency Transformers, (Tuned)	Standard
RFX	1	Untuned Radio Frequency Transformer	200-600 meters
SW	1	Battery Switch	Standard
S	5	Tube Sockets	Standard
T1-2-3-4-5	5	201A Amplifier Tubes	Standard
VM	1	Battery Voltmeter (Flush Type)	8 to 10 Volts
W	1	Panel	7"x26"x3-16"
Marked	6	Binding Posts	Standard
X	1	Terminal Strip (bakelite)	1"x7"x3-16"
Y	1	Bottom Board (Wood)	6 1-2"x25"x1-2"
Z	1	Radio Cabinet	7"x26"
	30'	Tinned Copper Square Bus Wire	No. 14
	6'	Spaghetti	Standard
	50	Solder Lugs	Standard
D	3	Dials and Knobs	4" Diameter

NOTE! Items marked (*) can be substituted for by complete resistance coupling units.

The three tubes (T1-T2-T3) are controlled by the six ohm rheostat (R1) while the two audio frequency amplifying tubes (T4) and (T5) are regulated by the six ohm rheostat (R2). In giving the resistance of these rheostats, I am assuming that 201A tubes are used, because they give better results than the dry cell type. If 199 tubes are used, then the resistance of the rheostats must be higher, say 15 or 20 ohms. With five tubes, dry cell operation is not recommended, for in the end it will be far more expensive to replace dry cells than to purchase a storage battery and recharge it from time to time. Dry cell tubes do not give the amplification of the storage battery 201A type.

Grid potentials are regulated by the potentiometer (P9). While there are certain objections which can be leveled at this type of control, yet it is the better method for the beginner, especially when it is not known what make or type of apparatus he intends to use. A 400 ohm potentiometer is the best, but a 200 ohm can also be used, and to reduce the radio frequency resistance in the grid return line, a fixed bypass condenser (K1) of 0.0006 mf capacity is connected between the slider and the negative "A" post of the potentiometer resistance coil. The impedance of a wire wound potentiometer is considerable, and unless the bypass condenser is installed, the tuning will be upset at every adjustment of (PO).

Reflexed Third Tube

TUBE (T3) is the tube ordinarily used as the detector tube, but in this case it is the tube of a special reflex circuit, acting both as a radio and audio amplifier at one time. In fact, there is no detector tube in the circuit since the major part of the rectification is performed by the crystal detector (CD). Transformer (RFT-3) connects the radio stages to the reflex stage and the reflex is tuned by the third variable condenser (C3). Note that all of the radio frequency and audio frequency transformers are marked according to the connection posts as at (P), (+B), (G) and —F), to correspond with the markings on the actual coils.

At (RFX) is an untuned radio frequency transformer used for coupling the plate circuit of (T3) with the crystal detector and the audio transformer (AT). The latter is of the usual iron core type, bypassed on both the primary and secondary sides by the fixed bypass condensers (K2) and (K3). Ordinarily the capacity of these condensers is 0.0015 mf to 0.002 mf, but much depends upon the type of audio transformer used. In some cases it will be found advisable to omit (K3) altogether when there is much distributed capacity in the primary winding.

On carefully examining the circuit of tube (T3) you will see that it is a simple single tube reflex circuit giving the equivalent of one stage of radio and one stage of audio amplification, so that up to and including (T3) we have three radio and one audio stage on three tubes. This alone will give good results, but for the proper loud speaker volume under all ordinary conditions, it was considered advisable to add the two resistance coupled stages as shown by tubes (T4) and (T5).

By plugging in at jack (J1) we obtain the output of three radio and one audio stage. By plugging in at the jack (J2) we obtain three radio and about 2.6 audio stages.

A typical resistance audio coupling is made for the tubes (T4) and (T5). The fixed condensers (K4) and (K5) of 0.006 mf capacity are the coupling devices in the grid lines, while the resistors (N1) and (N2) are non-inductive resistances of from 48,000 to 50,000 ohms. Both of the resistors are connected between the positive "B" (+B) and the plate (P) of the tube, and it is

Tubes Do Dual Duty in This Set

the difference of potential established across these resistors that causes the amplification. The grid leaks (GL1) and (GL2) are of one megohm to two megohms capacity and are connected between the grids and (—A) just as with any grid leak. Such resistors introduce no distortion into the circuit, and when worked in connection with one transformer coupled stage as at (AT), we obtain both volume and purity of tone. The ratio of (AT) should be from $\frac{5}{1}$ to $\frac{6}{1}$ but no higher.

The resistors (N1-N2) can be obtained from a number of RADIO AGE advertisers, either as separate units or as assembled units containing the fixed condensers, resistor and leaks all in one compact mounting.

Fig. IA at the bottom of the circuit drawing shows the method of connecting up the resistance coupling units in compact form when the resistors and leaks and condensers are purchased separately and assembled by the builder of the set. Spring clips can be obtained for mounting the resistors and grids just as tubular grid leaks are mounted

Bypass condensers such as (K6) of 0.002 mf capacity and (K7) of 0.5 mf capacity are frequently of advantage in reducing the resistance offered to the radio frequency current by the "B" battery and the impedance of the output circuit, particularly after the "B" batteries become old and dried out. In some cases and using certain materials in the circuit, these bypasses work a great improvement, while under other conditions their effect is unnoticeable. However, the set will perform better and more consistently throughout the life of the "B" batteries when the bypasses are used than when they are not installed.

Materials Used

ALMOST any of the standard materials advertised in RADIO AGE can be used for this circuit, and as it is against our policy to recommend one make of apparatus over another, we cannot specify any particular make in these specifications. The only effect that will be caused by changing parts will be on the values of the bypass condensers, and this is always more or less of an experiment in any case. However, the bypasses are quickly and cheaply shifted about, and this should prove no objection to the user. Experience will show that it is very seldom that any one value of bypass will apply to all conditions in any circuit.

In the accompanying list I have given the number of parts needed and their size, all items being given a letter corresponding to the lettering on the drawings so that their location can be quickly identified.

Assembly of Set

THIS receiver will assemble easily on a 7"x26" panel, and by a little crowding can be put on a 7"x24" bakelite or hard rubber panel. The inside dimension of the cabinet (depth) should be at least seven inches to accommodate the apparatus. Care should be taken not to crowd the radio frequency transformers RFT-1-2-3 too close together and the tubes should be well oustide the magnetic field of the transformers to prevent back coupling between the stages. The panel thickness should be at least 3-16 inch so that it will not be necessary to cut down screws or shorten the shafts.

In arranging the reflexed part of the circuit, see that the untuned transformer (RFX) is placed as close to the tube (T3) as possible, so that the line from the post (G) on the transformer to the (G) post on the socket is very short. This is important. Again, keep (RFX) well away from (RFT-3) and the audio transformer (AT). If these parts are so close that they are coupled by the magnetic flux, there will be trouble. The crystal detector, which is of the fixed or semi-fixed type, can be placed in such a position that it does not complicate the wiring, say near the rear edge of the bottom board. It is not advisable to put the crystal detector on the panel, as it is likely to be knocked out of adjustment every time we handle the dials.

The coupling resistances for the audio stages are small and easily disposed of in the arrangement, and as shown in Fig. 2 these audio coupling units are placed quite close to the two audio-tubes (T4) and (T5). All of the arrangement should be made with an eye to simple wiring and simple connections. You will not go far wrong if you follow the diagrams in every detail.

A voltmeter (VM) is very useful in a five tube set for keeping the potential constant across the filaments as advised by the makers of the tubes. As shown in the diagrams, the voltmeter registers the potential across the filaments of the radio frequency and reflex tubes, as these tubes are the most critical of the series and require the most accurate adjustment for the filament control. Cutting the large hole for the body of the voltmeter is a problem for the home mechanic unless he has some form of "fly-cutter" for the job. However, this can be cut by any machine shop or radio store.

Unless the transformers (RFT) are marked at the connection post by the makers, the builder often has trouble from "bucking" or opposed coils. If you do not think that you are getting the proper volume or the distance, try the effect of reversing the connections to the primary of these coils, one by one. In fact, it is best to connect up the transformers temporarily with small insulated wire until you are certain that the polarities of the transformers are correct.

All crystals do not work equally well when reflexed, and for this reason it is best to get some sort of a crystal detector in which the crystals can be easily changed. With a small stock of crystals, say five or six, experiment until you find the best crystal. Crystals do not cost much and they may be the reason your circuit is not functioning as it should. After the crystal detector is once adjusted, and put in an out-of-the-way place where it is not likely to be disturbed, it will require very little attention.

Use Care in Building

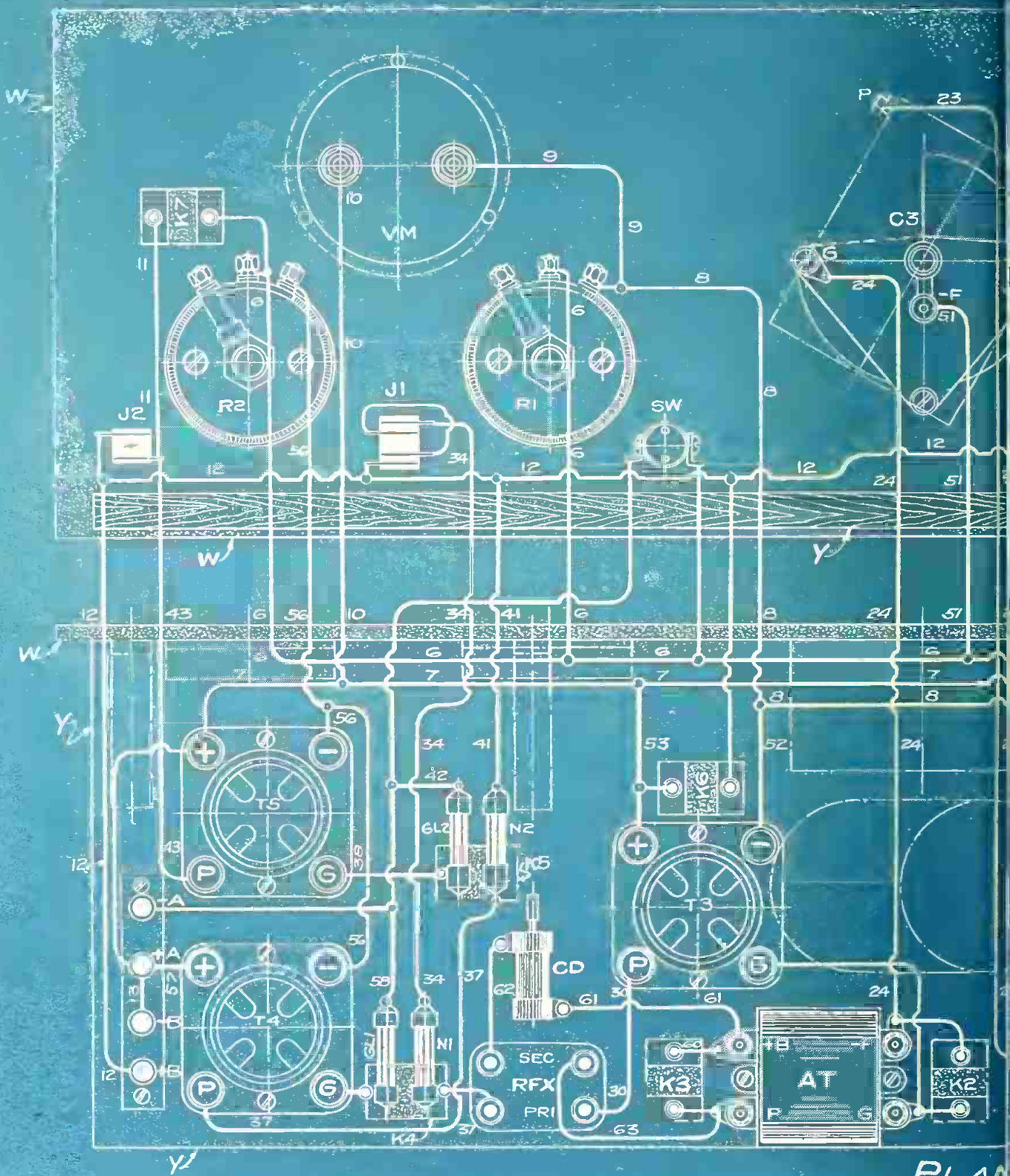
I AM sure that if you construct this receiver with care and use judgment in the operation of it, you will get exceptionally fine results. Its freedom from distortion and extreme sensitiveness are remarkable. Stations from both coasts have been heard repeatedly on the loud speaker from my laboratory here in Chicago.

As I stated before, Professor Hazeltine's original neutrodyne was of the reflexed type, but for some reason little interest was taken in it. Why this should be is hard to explain. I suppose the reason is that most fans were a little bit afraid of the reflex circuits. We really have no reason to fear them, as they are quite simple. It just requires a little patience to get them to operate correctly.

Most of the trouble experienced seems to be in getting fixed and by-pass condensers of the right capacity. However, these are cheap and if the builder will supply himself with a selection of these, he can change the capacities of each in the different parts of the circuit until the best results are obtained.

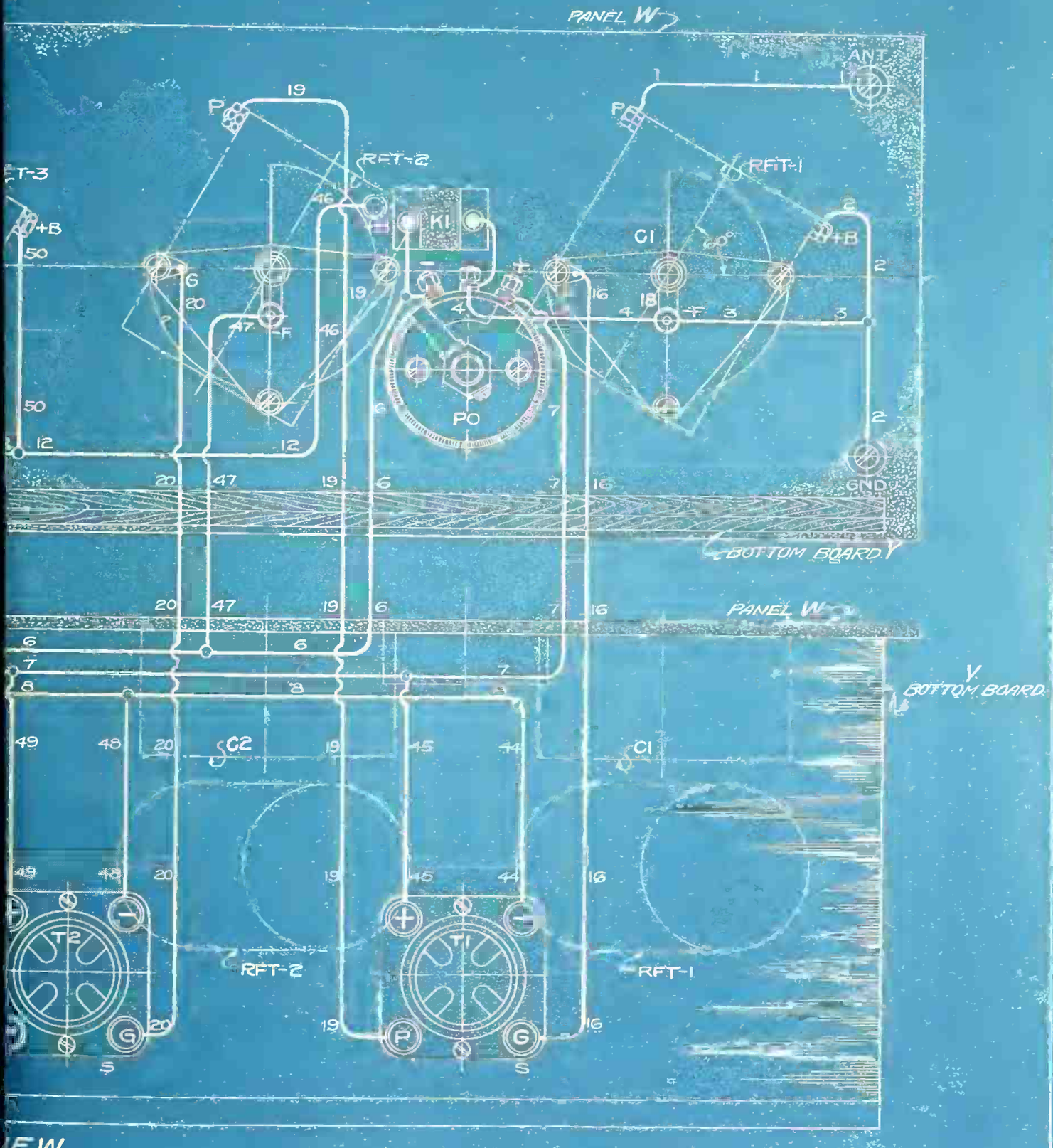
One of the probable reasons for the clear tone of this receiver is the resistance coupled method of amplifying after the detector. To those who have not tried this system of increasing the signal strength to loud speaker volume, this system will be a revelation. All distortion and transformer noises will be eliminated. If you are undecided as to whether or not you shall use resistance coupling, my advice to you is to try it by all means.

REAR ELEVA



PLA

N OF PANEL



EW

FIG. 2

AMPLEX REFLEXED RADIO FREQUENCY SET

TOP VIEW SHOWS REAR ELEVATION OF PANEL WITH PANEL MOUNTED APPARATUS. LOWER VIEW IS A PLAN VIEW LOOKING DOWN ON APPARATUS FASTENED TO BASE-BOARD. LETTERS AS IN FIG. 1.

J.B. RATHBUN
RF-700

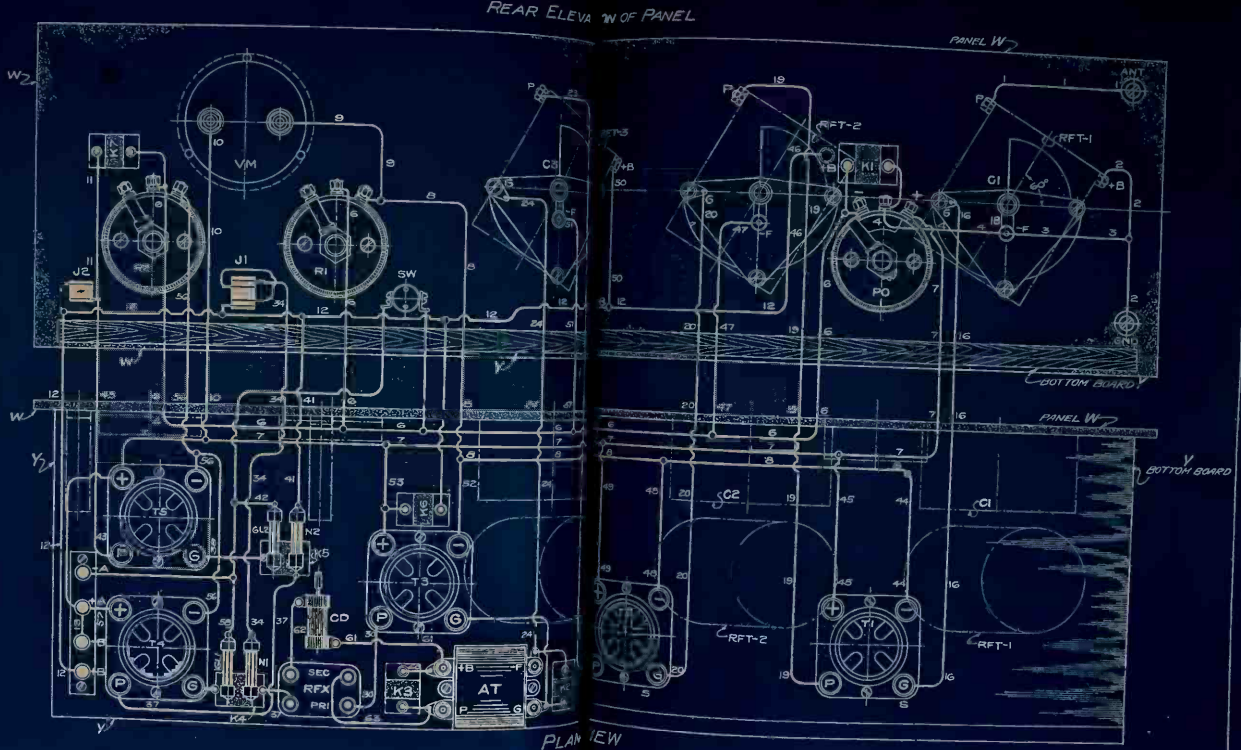


FIG. 2

AMPLEX REFLEXED RADIO FREQUENCY SET

TOP VIEW SHOWS REAR ELEVATION OF PANEL WITH PANEL MOUNTED APPARATUS. LOWER VIEW IS A PLAN VIEW LOOKING DOWN ON APPARATUS FASTENED TO BASE-BOARD. LETTERS AS IN FIG. 1.

J.B. BATTAGLIN
RF-700

Radio Age Institute

Manufacturers' Testing Service

MEMBERS of the staff of RADIO AGE will be pleased to test devices and materials for radio manufacturers with the object of determining their efficiency and worth. All apparatus which meets with the approval of various tests imposed by members of the technical staff of RADIO AGE will be awarded our endorsement, and the seal shown to the right will be furnished free of charge. Materials for testing should be sent to

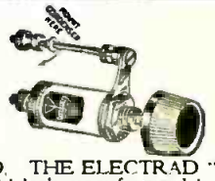
RADIO AGE INSTITUTE
504 N. Dearborn Street, Chicago, Ill.

DEVICES displaying this seal have been tested and approved by the RADIO AGE INSTITUTE.

Apparatus illustrated and described below has successfully passed our tests for April 1925.

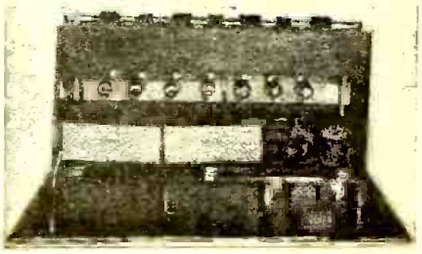
Test No. 37. The DURAD BASE. Submitted by the Duraplate Company, of Philadelphia, Pa. For the experimenter and manufacturer this base will be found to be very convenient. It consists of a moulded base-board with the "A", "B", and "C" battery wires imbedded in it. The large number of holes along the side, with the wires, allows for connections in many places. Special connections, binding posts, panel fittings and brackets are furnished with the base-board. Wiring a set with this base-board is greatly simplified, and the finished job presents a commercial appearance. This baseboard can be secured in various sizes from the manufacturer whose address is given above. Tested and approved by RADIO AGE Institute.

Test No. 38. KEYSTONE INDUCTANCE SWITCH. Submitted by the Keystone Radio Company, Greenville, Penna. Keystone Back Mounting Inductance Switch is constructed of the best materials and is well adapted to the purposes for which it was designed. The switch has ten points, and all tap leads are soldered to solder lugs before mounting on panel. It is furnished with a two-inch black metal dial with large tapered knob. Dial is numbered to coincide with contacts and it is only necessary to drill one 5-16 inch hole in panel to mount. Arrived in excellent condition and satisfactorily passed the tests and requirements of RADIO AGE Institute.



Test No. 39. THE ELECTRAD "VARIOHM." A variable grid leak manufactured by the Electrad Co., 428 Broadway, New York City, N. Y. This grid leak is quite small and takes up but little space either on the panel or inside the set, for base or panel mounting as desired. The instrument covers a complete range of resistance ranging from less than one-quarter to thirty-five megohms. It is non-microphonic, moisture-proof and absolutely guaranteed against wear. Provision is made for the mounting of the grid condenser directly to the leak. This is a very desirable feature. Tested and approved by RADIO AGE Institute.

Test No. 40. HENNINGER AERO-COIL. Manufactured by the Henninger Radio Manufacturing Company, 1772 Wilson Ave., Chicago, Ill. These air-core transformers were tested in our laboratories and found to be very efficient. No. 22 D. C. C. wire is used in winding both the primary and the secondary. This reduces the high frequency resistance to a minimum. Exactly the correct air spacing between turns. Tested and approved by RADIO AGE Institute.

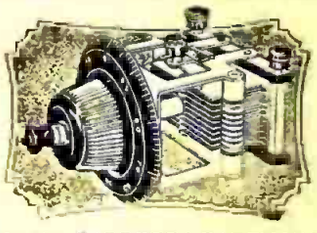


Test No. 41. TELOS RADIO. A kit manufactured by the Danziger-Jones Co., of 25 Waverly Place, New York, N. Y. The manufacturers advertise this kit as "The Kit of a Thousand Possibilities," and we must say that they are absolutely correct. For selectivity and clarity of tone this receiver cannot be excelled. The kit is the most complete one on the market, everything necessary being included. The circuit has three stages of tuned radio frequency and super-imposed (reflex) resistance coupled audio frequency amplification. A crystal detector can be used if the builder so desires, thus making for economy of operation. By means of an adjustment known as the uni-control, it is possible to adjust all tuning controls simultaneously. Arrived in excellent packing and satisfactorily passed the tests and requirements of RADIO AGE Institute.

Test No. 42. BREMER TULLY LOW LOSS TUNER. One of the most efficient three-circuit tuners on the market. This unit may be used to tune practically any radio circuit. It consists of an untuned primary, a main or secondary inductance, and a tickler or "feed back" coil. All these coils are brought to separate taps and may be connected in any combination. The method of winding and support of the secondary coil offers a most selective tuning unit, and also the greatest wavelength range without taps. With a variable condenser of 250 M. M. F, the entire broadcast wavelengths are covered in a very efficient manner. (200 to 565 Meters). The untuned primary is of adjustable coupling, and may be adjusted for volume and selectivity to suit any antenna. Pigtail connections to rotor, insure reliable service. The tuning unit was submitted by the manufacturers, The Bremer Tully Co., 532 South Canal St., Chicago, Illinois. Arrived in excellent condition, and satisfactorily passed the tests and requirements of RADIO AGE Institute.

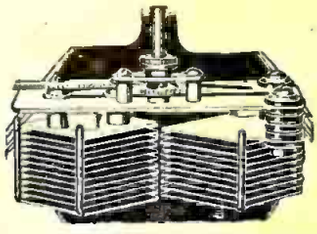
Test No. 43. THE AMPL-TONE HEADSET. Manufactured by the Union Fabric Company, of Derby, Conn. This headset is of the conventional type, with metal shells. A leather covered wire head-band is used. The instrument works well throughout the entire audio frequency range and responds with maximum efficiency in a neighborhood of 2,400 cycles. Arrived in excellent condition and satisfactorily passed the tests and requirements of RADIO AGE Institute.

Test No. 44. BALL-GRIP SOCKET. Manufactured by the Quality Molded Products, Inc., 1 Exchange Place, Jersey City, N. J. There are several outstanding features about this socket that will recommend it to the radio set builder. It is constructed of a high grade dielectric, which places the losses at a minimum. Contact on the tube prongs is made with the aid of a sterling silver ball. As all the contact parts are completely insulated, one from the other, there is no possibility of internal short circuiting. Only the terminal set screws are exposed, offering the minimum of metal parts to the danger of short circuits. The terminals on the socket are both novel and efficient. No soldering lugs are necessary. The wire is inserted and tightened by means of the set screws provided for that purpose. All metal parts are silvered. Arrived in good packing and satisfactorily passed the tests and requirements of RADIO AGE Institute.



Test No. 45. BARRETT & PADEN VARIABLE CONDENSER. Practically no other condenser on the market gives the fine vernier tuning that it is possible to obtain with this condenser. It has an absolute straight-line wavelength curve, and this, coupled with the micrometer adjusting feature, makes it possible to separate wavelengths that could not be separated with the ordinary type of condenser.

The losses in this condenser were practically not measureable, being only equivalent to a series resistance of Two Hundred Ohms. The condenser was submitted by the Barrett & Paden Co., of 1314 Seedwich St., Chicago, Ill. Arrived in excellent condition and passed the tests and requirements of RADIO AGE Institute.



Test No. 46. ENSIGN VARIABLE CONDENSER. Submitted by the Carleton Sanders Mfg. Co., Mishawaka, Ind. This condenser is a radical departure from the ordinary type, of mtary plate design, both the fixed and movable plates being square, as the illustration shows. The movable plates are meshed with the stationary by means of a rack and pinion arrangement, making use of the entire 360 degrees of the dial. The minimum capacity of this condenser is 5.99 mmf. and the maximum capacity is 539.06 mmf. The dielectric absorption losses at 1,000 cycles with the instrument set at maximum capacity are equivalent to a series resistance of 50 ohms. Arrived in excellent packing. Tested and approved by RADIO AGE Institute.

Pick-ups and Hook-ups by our Readers

THE material appearing under the title "Pickups and Hookups by Our Readers" in RADIO AGE, is contributed by our readers. It is a department wherein our readers exchange views on various circuits and the construction and operation thereof. Many times our readers disagree on technical points, and it should be understood that RADIO AGE is not responsible for the views presented herein by contributors, but publishes the letters and drawings merely as a means of permitting the fans to know what the other fellow is doing and thinking.

BY the time this issue reaches you, several things will have happened, and several more will be scheduled to happen that will please all of us mightily.

For one thing, Spring will be with us. After Spring, Summer will be but a short way off, and it might be wise for us to prepare for it now.

When we think of Summer, we immediately dream of the many pleasant camping trips, fishing trips, auto tours, and other diversions too numerous to mention.

Radio has by this time become a very necessary part of our lives, and steps must be taken now to see that we are not denied any of its advantages and privileges on any of the expeditions that I mentioned before. Think how much more wonderful will be the evenings spent around the camp fires, listening to wonderful dance and concert music from stations hundreds of miles away! Although the very thought of the camp fires, without the radio receiving set is a most pleasant one now, I am sure that if we have not our "trusty radio" set with us when the time arrives, that we shall be very much disappointed.

For that reason I think it is about time that most of us were beginning to either rebuild the old set, and convert it into a portable, or build the portable receiver. If we start now, we can be sure of having it functioning perfectly when the time arrives for its use.

So "come on", you Dial Twisters and experimenters, and let the brother fans have all the "dope" you have on these portable outfits.

As you are no doubt aware, the ideal receiver will be one that uses dry cells as a source of filament current, operates on a loop, and last but not least, is small enough in size to be practical. These specifications are not impossible, and I am sure that by the time the next issue of RADIO AGE is ready for the press, we will have had a number of good circuits submitted to us.

Another thing that comes with Summer will be our old friend "static." Now is the time to prepare for his advance and to take means to prevent him from spoiling our reception. We do not expect quite as much interference from him this year as we had in previous years as a large number of circuits have been perfected that practically eliminate him from our troubles. A few reports from the fans who have been using these circuits will be appreciated.

Well, fellows, that's about all for this month, except to remark that we have had some dandy DX lists submitted, and I am sure you will have plenty of marks to shoot at. And as the time is drawing rapidly to a close when we can prowl around for extremely long distance reception, let's go!

THE PICK-UPS EDITOR.

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J. Hinchliffe	610 Birch St.	Fall River, Mass.
L. A. Lynch	469 Chenango St.	Binghamton, N. Y.
Willie Jones	1233 Reynold St.	Shreveport, La.
Gordon Sullivan	1319 Third Ave.	San Francisco, Calif.
F. G. Orton	15914 Lasher Rd.	Detroit, Mich.
L. Bennett Knouff	2001 Tremont Rd.	Columbus, Ohio
T. E. Kingston	Gate City Hotel	Atlanta, Ga.
Lee W. Burton		Parkman, Ohio
Fred Gruenee	672 Seventh St.	Milwaukee, Wis.

Some time ago RADIO AGE discontinued its policy of printing lists of "Stations heard" by readers, due to lack of space. However, a new system has been devised whereby we shall be able to revert to this popular policy, and as a result the best DX records received during March will be compiled and printed in the May issue of RADIO AGE.

This ought to serve as an incentive to those fans who have been growing lax with their DX stunts lately. (Turn the page.)

A Novel Radio Frequency Receiver

Chauncy De Pew, of Alpena, Mich., has given us an interesting circuit, that employs radio frequency amplification in quite a novel manner. A variometer and condenser are used to tune the circuit. His letter is as follows:

RADIO AGE,
Gentlemen:

For the past year I have been using the circuit described herein, and have had very good results with it. I have never seen it in print, and for that reason I do not think that there are many of the fans who have ever heard of it. It was originally given to me by an "old time" radio man, and as he still uses it I think it might be worth while to pass it along to the readers of the Dial Twisters' columns.

The apparatus needed for construction, can usually be found in any radio experimenter's workshop. The set is very easy to construct and once you get "the hang" of operating it, you will find that it is a regular DX receiver. Many of the so-called DX circuits can in no manner compare with my little two-tube "nameless."

The variometer is of the series type, and should be of the best kind obtainable. The radio frequency transformer consists of two honey-comb coils, the primary side being a coil having fifty turns, and secondary having but thirty-five turns. Across the primary coil is a condenser having a capacity of .0005 mfd. The coils can be mounted on a double coil mounting, so the coupling between them can be varied until the best setting has been found.

There is not much more to be said regarding this circuit, except that I might tell you of some of the distant stations that I receive with quite a little bit of regularity. WOC, KDKA, KFKX, KTHS, KYW, WGN, WBAP, and WBS are stations that I can get at will. On WOC, KDKA, or KFKX, I can rest the headset on the table and hear the stations plainly at a distance of fifteen feet.

Yours very turly,
CHAUNCEY DE PEW
Alpena, Mich.

The same receiver as described by Mr. De Pew should be quite selective, and he seems to be a little bit proud and a little bashful about disclosing his DX list. Perhaps the circuit is as efficient as he says. There is no doubt but what the set can be constructed easily, and for that reason we are going to pass it along to some of our brothers who "crave" DX.

William Vreeland, of 67 Union street, Montclair, N. J., wishes us to pass this circuit along to the readers of the D. T. columns. He has found this set very effective, and would like to hear from any of you who will experiment with it. His letter is as follows:

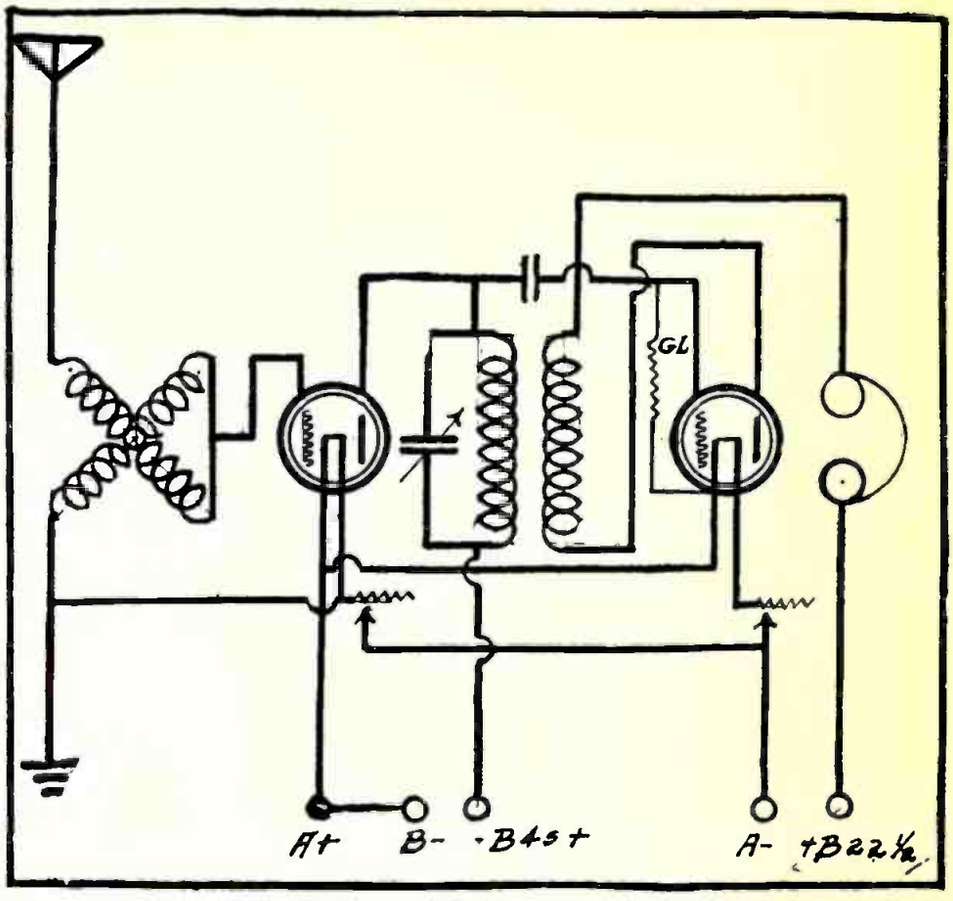
RADIO AGE,
Gentlemen:

I am sending you a diagram of a small receiver which I find to have good tone, volume and DX qualities.

You will also find enclosed a list of stations that I heard one evening from 9:00 p. m. to 10:15 p. m. They are as follows: WDAR, WIP, WTAS, KDKA, WSAI, WEBH, WREO, WPO, WGY, WMH, WBZ, WJAR, WLS, WEBH, WEAN, KFKX, WEAO, WSAD, WQAM, WRK, WOAW, KYW, KSD, KFKB, and WOC.

Not so bad for an hour and a quarter on a one tube set. I wish you would publish this circuit for the benefit of the fans who want a sensitive yet low priced set.

William Vreeland.
67 Union Street, Montclair, N. J.



Chauncey De Pew's Radio Frequency Receiver, given to him by an "old timer," and RADIO AGE passes it on to you.

Mr. Vreeland calls his circuit the "Audiodyne." The tuning inductance is wound on a four inch tube, the primary consists of ten turns of No. 22 D. C. C. wire and the secondary consists of fifty turns of the same size wire. A variable vernier condenser is placed across the secondary. The grid condenser should have a capacity of .00025 and the grid leak will be about two megohms. A variometer is placed in the plate circuit for regeneration.

Any of you fellows who want a good, sensitive circuit and do not care to "sink" a lot of money in new apparatus are advised to try the circuit contributed by Bill.

Another one of our contributors this month is Ernest H. Jones of 315 Wheeling Ave., Muncie, Ind. The outfit he describes is a simple one, and from all reports a good one.

Using this circuit he has heard the following stations: WOS, WBZ, WDAF, WHB, WOAW, WAHG, WGY, WBAP, WEAF, WMC, WCCO, WGR, KFDM, KFNF, WOQ, WJY, KFNG, WSB, WJZ, WNAC, KGO, WOR, WOC, WJAR, CNRO, WJAD, WCAL, WLBL, WBBF, WAAW, WEEI, KFI, WCK, WFAA, WIP, KSD, KFKX, CKAC, KFKB, CFCA, WHAR, WHAA, WCAY, WCAP, WHO, and WNYC.

Here is his letter:

RADIO AGE.
Gentlemen:

For a long time I have been reading your magazine, or, *our* magazine, since it is for all radio fans. I enjoy reading your technical articles and the D. T. section.

I have been afraid to send in a list of stations heard, but I can't hold out on the fans any longer. I am using a single tube set which I made myself. It is simplicity itself, "radiofied." I am enclosing a sketch of the circuit for the benefit of anyone who wants a receiver that always works and works well. Almost all kinds of apparatus will do, as long as they are electrically sound. However, any fan should not hesitate to use the best he can get. I have found that this policy always pays, in quantity and quality of reception.

I have built several sets for my friends, using this circuit. One of them "copped" a prize offered for the best list of stations heard.

The prize was a pair of well-known "phones."

If any of the fans who try this circuit fail to make it work, I wish they would let me know about it. I would be glad to answer my letters relative to it. However, I might add that I do not expect to hear from any one from this cause. I would like to say that in more than two years of experimenting with tuning units and single-tube sets, I have never found one better than this one.

Very truly yours,
ERNEST H. JONES.
315 Wheeling Ave., Muncie, Ind.

Well, fellows, that's his letter, and it seems as though Ernest is mighty proud of his circuit. As he states, the circuit is simplicity itself; anyone can see that when he consults the wiring diagram. The tuning coil is wound on a tube four inches in diameter and consists of eighty turns of number twenty-two, D. C. C. wire, tapped at the 15th, 32nd, 45th, 60th, and 80th turns. The wiring diagram is self-explanatory and for that reason

we will not go into detail. The by-pass condenser across the "B" negative and the phone connection of the variometer should have a capacity of .0005. It might or might not be necessary to use this, and the experimenter is advised to try the circuit both ways to determine which is the more effective.

As Mr. Jones was kind enough to offer his services to the fans, we wish one or two of you would drop him a line and let him know just what results you are having with his "pet circuit."

We received the following letter from one of the RADIO AGE fans in Havana, Cuba:

RADIO AGE,
Editor, Pick-Ups and Hook-Ups Section,
Dear Sir:

I am a radio fan and also one great reader of RADIO AGE because I think it is the best radio magazine ever published.

Everything has a consequence, and my consequence of being one of the many readers of RADIO AGE is that I find in its columns a great quantity of hook-ups, all of them of the first rate.

I have proved some of them, always with excellent results, and lastly I have make the "Tuned Plate Regenerative" which appears in the blueprint section of January's issue, and, "by jingo," it gives excellent DX, so "I'm satisfied."

I have received a great quantity in United States and also Mexico and Porto Rico; some of them are: KFDM, WGY, WMC, WLW, WOO, KDKA, WOR, WQAM, WEBH, WEAF, and some others. I live near Station PWX, which comes in very loud in the phones, and can operate a loud speaker with medium volume, and excellent musical tone.

I have an antenna of two wires, 80 feet long, and I use low-loss parts.

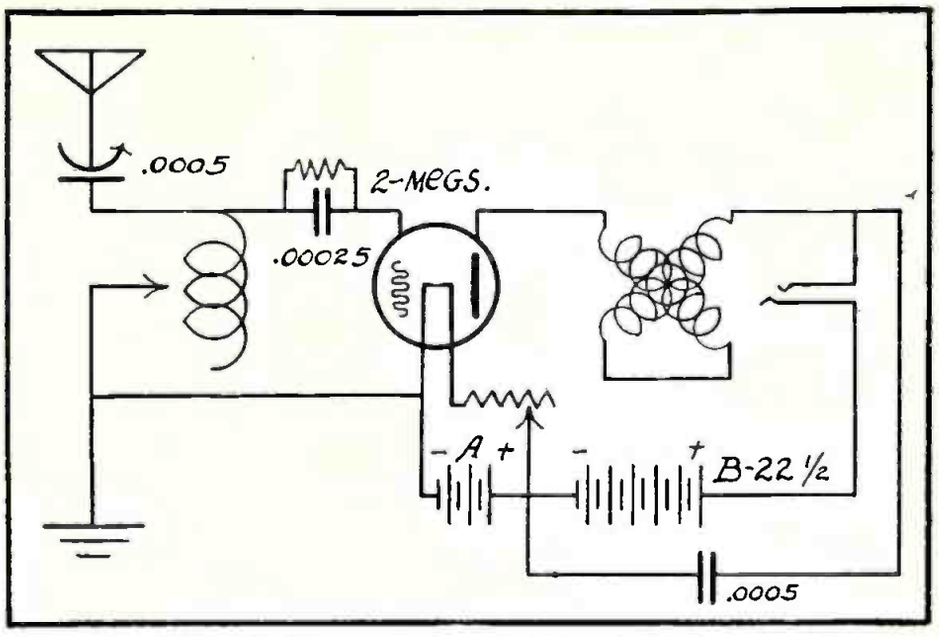
The only thing that I need now to be happy is to be one "Dial Twister." "What I'll do" in the mean time?, "Experiment" is the best policy.

Very truly yours,
GASPAR A. CARVAJAL.
Calle, Infanta & San Miguel, No. 18,
Havana, Cuba.

It is with a feeling of pride that we publish the above letter, as it gives us great pleasure to know with what results our efforts are being received by people on the other end of the line. Letters containing compliments are a source of pleasure; not that those of a constructive, critical nature, are not welcome. We want to receive them at any cost, as they enable us to give the fans just what they want. But nevertheless, a compliment is a compliment, and although we might blush, there are times when we like to blush.

Gaspar wants to become a member of the Dial Twisters. He states that it is the only thing he "now needs to be happy." Are we going to deny him this happiness? Most emphatically, NO. We welcome him to the "fraternity "with the proverbial open arms. Don't you think he deserves it, fellows? He does? Let him enter.

We want to correct a mistake that was made in the blueprint section in the February issue. The draftsman, in making the drawing, connected the "A" positive wire to the "A" negative wire on the vacuum tube socket "T3." If you will omit this connection, everything will work out correctly. Those of you who follow the wiring diagram, (Fig, 1), will not experience any inconvenience, as that drawing is correct. The mistake was made only on the isometric drawing.



The circuit used by E. H. Jones and from which he has had some excellent results. The coil is tapped at the 15th, 32nd, 45th, 60th and 80th turns.

Arthur Cantrell, a new dial twister, gives us the following list of stations that he has listened to on his single tube "Baby Heterodyne." His letter and list of stations are as follows:

RADIO AGE,
Gentlemen:

I have a one tube "Baby Heterodyne" set made from RADIO AGE specifications. I think it is a great set, and I am having wonderful results with it.

Enclosed you will find a list of stations that I have received. Do you think it will admit me to the Dial Twisters? I have been trying hard to obtain a button. KDKA, WGR, WSAI, WGY, WBZ, WAAM, WEAN, WCBD, WTAM, WHAM, WEBH, WHN, WLS, KFKX, WGN, WLW, WTAS, WHAZ, WSB, WDAF, WEEI, WGAZ, WREO, WGBS, CNRO, CFCA, WFBI, WFFA, CKAC, WOC, WCAE, WEAO, WEAF, WJDD, WEAP, WOR, WEAR and WSP.

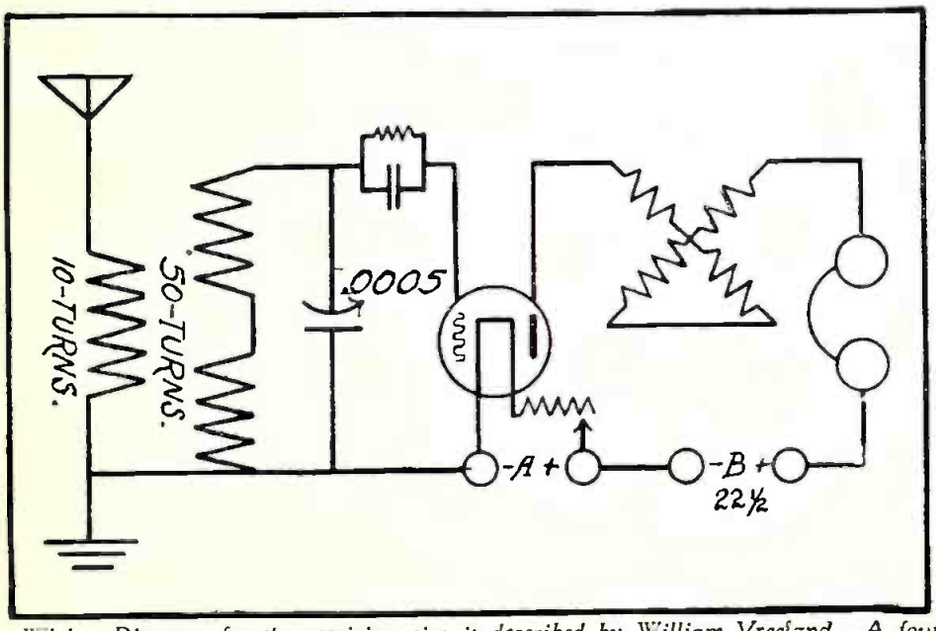
Not so very many, but then I think it is pretty good for a single tube set.

Yours very truly,
ARTHUR CANTRELL,
20 Orchard St.,
Auburn, N. Y.

What say, fellows? Does his list merit a D. T. button? We think it does, so consider yourself admitted to the order, Art.

In the Pick-Ups and Hook-Ups section of the March issue, in the wiring diagram of the reflex circuit contributed by Mr. Dolan, of Aurora, Ill., we have shown the negative terminal of the "B" battery connected to the negative and positive terminal of the "A" battery. This is a mistake. And we wish to apologize for any trouble we might have caused you.

The negative terminal of the "B" battery should have been connected to the negative terminal only of the "A"



Wiring Diagram for the receiving circuit described by William Vreeland. A four inch tube is used to wind the tuning inductance. Mr. Vreeland has had very good success with this circuit, and for that reason we are passing it along.

Leslie Gould, pioneer radio enthusiast of Bridgeport,, Conn., has invented the "dial-less" radio set after three years of experimental work. The new invention is self-tuning and worked by an electric switch controlled by the hand. In place of the dials is a long piece of ground glass with the station letters marked on it. In the rear of the glass is a six volt battery light, as shown in the illustration. When the light reaches the desired station the music begins. This outfit is hooked up to work off a 110 volt alternating electric light circuit. No antenna or ground wires are needed in Gould's machine.

battery. The positive connection of the "A" battery goes directly to the tube socket.

A number of our readers have asked us to furnish them with circuit diagrams of sets using honey-comb coils as a tuning medium, and one or two stages of radio frequency amplification. This is not an unusual stunt, but rather one that has never received much consideration from the average fan.

During the past month we have had several letters from fans in the different parts of the country who have used this system with more or less success. Two of them in particular gave us very good circuits, but we are unable to use them this month due to the lack of additional space. However, as some of you might like to write them on this subject, I am taking the liberty of furnishing you their names and addresses, which are, Felix Frederiksen, Delmar, Iowa, and Joseph A. Gillem, Piqua, Ohio.

From H. A. Cassin, of 2292 B. St., Hubert, Montreal, Ont., Canada, we receive a request urging all Canadian fans to send in their DX lists. Mr. Cassin believes our Northern neighbors can show the rest of us a thing or two when it comes to pulling in the distant broadcasts. Mr. Cassin also wants to hear from some of the Old Reliable Reinartz fans. His list of stations enclosed with his letter wins him a DT button.

Some fans report trouble in neutralizing the reflexed neutrodyne published in the January RADIO AGE. Other report noises while tuning. The majority however, have reported excellent results For the benefit of those who have had trouble, a sure way to neutralize this receiver is as follows:

Disconnect lead "G" from tube socket "M4."

Disconnect lead "G" from transformer "T."

Connect a temporary lead from "G" on transformer "T" to "G" on tube "M4." This will make a regular four-tube neutrodyne circuit and should be very simple to neutralize. When the set is balanced, replace the leads that you disconnected and remove the temporary lead. Your set will then be neutralized.

For those who have had trouble with noises—look to your wiring and see whether you have run your leads parallel. If so, change them and also see that your parts are mounted so they do not "fight" or oppose one another. It has been shown that if the parts are not spaced properly and the wiring is not done correctly, that the set will be noisy and the only remedy will be to move the parts around until their correct location has been found.

Reflex Fans, Take Notice!

From Los Angeles, Calif., comes a letter telling us all about a reflex set that is sweeping the West Coast like wild-fire. This is a variation of the well known "Harkness" circuit. Elmer Kenealy, who submitted the article, says that he will answer all letters that the fans care to mail him, providing they enclose a stamped, self-addressed envelope for reply. We are very sorry, Elmer, that we cannot print your article this month, but we will try to use it in the future.

His address, by the way, is 505 East 68th St., Los Angeles, Calif.

Here is a Hot One

Our request for humorous incidents has not fallen on deaf ears. Take heed of the following:

This incident was submitted by Alfred La Cascio, Jr., of Brighton, Mass. It seems that during the International Test Week he was tuning for some of the European stations for about an hour and a half, one evening, and couldn't get a peep out of his set. Then his sister reminded him that it might be a good thing if he would hook on his "B" battery. Must be pretty nice to have to thank one for giving out such nice information. What say, boys; what say?

A Real Dial Twister

C. J. Ahern, Jr., of Dwight, Ill., says: "I have been a reader of RADIO AGE for about two years and during that time I have been very much interested in the 'Dial Twisters,' although I have never tried to become a member. This is my first attempt.

"Using a neutrodyne, I have tuned in the enclosed list of stations in a single evening. I have heard stations in thirty-eight states, six in Provinces of Canada and Mexico, two in Cuba, one in Porto Rico, and during the International Tests, PTT at Paris, France.

"I also have heard forty-two stations before six p. m."

Sounds like a real DX "hound" doesn't he, fellows? And the list of stations he submitted caused us to raise the eyebrows a little. He certainly deserves reward for his perseverence, so here goes a DT button.

Another Interesting Letter

We also are in receipt of a good letter from F. Timoney, of 428 Arctic St., Bridgeport, Conn. In part he says: "I read RADIO AGE every month and obtain all data needed. With your easily-read blueprints anybody with a pair of hands and necessary tools could construct anything from a crystal set to a super-het.

"I noticed in your January number that the lists of stations a reader should submit to become a dial twister should be stations located at least 500 miles away from the receiver. I am sending in a list of stations 500 miles or more from Bridgeport, Conn.

"I think the list should entitle me to a fair chance at the Dial Twister button. At present I am still using the "Old Reliable" single circuit type of receiver, although I have tried many other types of hook-ups, but it seems to me that I get the best results from the type I am at present using."

Radio Age on the Air

Any of our readers who hear RADIO AGE programs broadcast from Chicago, both technical and popular, are requested to write us and let us know whether you like them. Our technical talks are broadcast every Wednesday night from WTAY, and our popular programs from WEBH or KYW, on nights specified in another part of this month's RADIO AGE.

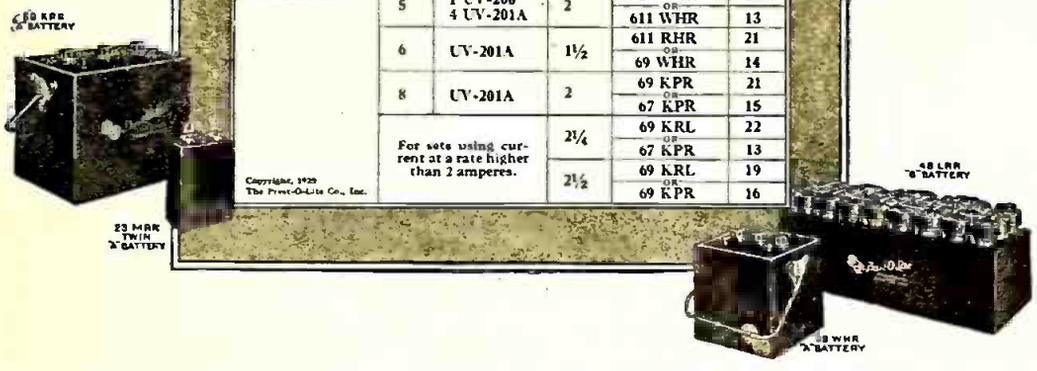
R. C. Remington, a RADIO AGE fan from Mt. Morris, Ill., built the DX regenerator described in this magazine some months back, and reports unusual results. Using Paul Thorne's home-made loud speaker as described in the December RADIO AGE, Mr. Remington listens to the Coast stations nightly without interference, although he is located half way between the strong stations of Chicago and Davenport. Atta boy, Rem.

(Turn to page 48)

Prest-O-Lite

RADIO CHART

Voltage of Tubes	No. of Tubes	Type of Tubes (see foot-note)	Total Rated Ampere Drain	Recommended Prest-O-Lite "A" Batteries: Order by following Types	Recommended Prest-O-Lite "A" Batteries: Days between Chargings
5-Volt Tubes C-300 and UV-200 are interchangeable C-301A, DV-2 and UV-201A are interchangeable	1	UV-200	1	69 WHR —OR— 67 WHR	22 16
	2	UV-201A	½	67 WHR	33
	2	1 UV-200 1 UV-201A	1¼	611 WHR —OR— 69 WHR	22 17
	3	UV-201A	¾	69 WHR —OR— 67 WHR	29 22
	3	1 UV-200 2 UV-201A	1½	611 RHR —OR— 69 WHR	21 14
	4	UV-201A	1	69 WHR —OR— 67 WHR	22 16
	4	1 UV-200 3 UV-201A	1¾	613 RHR —OR— 611 WHR	22 15
	5	UV-201A	1¼	611 WHR —OR— 69 WHR	22 17
	5	1 UV-200 4 UV-201A	2	613 RHR —OR— 611 WHR	19 13
	6	UV-201A	1½	611 RHR —OR— 69 WHR	21 14
	8	UV-201A	2	69 KPR —OR— 67 KPR	21 15
	For sets using current at a rate higher than 2 amperes.		2¼	69 KRL —OR— 67 KPR	22 13
			2½	69 KRL —OR— 69 KPR	19 16



How to select batteries that run your set for weeks without recharging

WHY select storage batteries by guesswork and risk getting one that requires charging every few days? Buy wisely. Let the Prest-O-Lite Radio Chart guarantee you batteries that fit your set—of ample capacity to bring weeks of fine reception without too frequent recharging.

The above section of the master chart selects Prest-O-Lite "A" Batteries to fit all 5-volt sets. It recommends two sizes for each set, depending upon the days of service you wish between chargings (based on the average use of your set of three hours a day). The larger capacity battery will be found more desirable unless facilities for frequent and easy recharging are provided. Consult the complete chart at your dealer's for data on "B" Batteries and also "A" Batteries for low voltage tubes.

In every detail of construction—special structure plates, highly porous separators and superior internal design—these batteries are made to get the best out of your set. To supply the dependable, unvarying current essential to fine tuning, efficient tube operation and clarity of reception.

Prest-O-Lite Batteries offer you truly remarkable savings. Though standard in every respect they are priced as low as $4.75 and up. They last for years and are all easily rechargeable. See them at your dealer's or write for our booklet, "How to fit a storage battery to your set—and how to charge it."

THE PREST-O-LITE CO., INC., INDIANAPOLIS, IND.
New York San Francisco
In Canada: Prest-O-Lite Company of Canada, Ltd., Toronto, Ont.

Write today for this free booklet

Whether you have a one-tube set or most advanced multi-tube outfit, you'll find a fund of interesting information in our booklet, "How to fit a storage battery to your set—and how to charge it."

This booklet gives you the complete Prest-O-Lite Radio Chart—technically accurate recommendations covering both "A" and "B" storage batteries for every type of set.

In addition, there is much vitally important data on battery care and upkeep—information that any radio fan will find of real value in keeping his set at its maximum efficiency. Write us at Indianapolis, Ind., for your copy right now.

Prest-O-Lite

Hugh W. Patterson, of 516 South 2nd St., McAlister, Okla., tells us of the good results he is having with his circuit. He has received "plenty" DX stations. Stick to it Hugh; stick to it.

Received a letter the other day from an English amateur, who describes one of the favorite pastimes "over there." As they have not as many broadcasting stations in England, Germany, France, and Holland as we have over here, they have not the opportunity of tuning in as many stations in an evening as we have. For that reason, they have devised other means of demonstrating the selectivity of their circuits. One of the most popular methods, at present is to see how many stations they can log in a given length of time.

For example, a certain fan who lives in London, will tune in the time signals from 2LO, listen to them for fifteen seconds, switch over to the French station on the Eiffel tower, hold them for the allotted fifteen seconds, drop back to the station at Glasgow for fifteen seconds, and top it all off by bringing in the powerful German station at Berlin. As these four stations broadcast the time signals simultaneously, it is possible for him to do this stunt. But just the same, we are willing to bet it took quite a little bit of patience to learn to tune them in and not miss a "dit."

Using a loop antenna, J. B. Thompson, 1741 New England Ave., Los Angeles, Calif., is able to do some mighty fine DX work. He certainly earned the DT button we are going to give him.

James Smith of 587 Sibley Street, Hammond, Ind., is very anxious to correspond with radio fans, along the general lines. Some of you fellows are requested to drop him a line.

John R. Dell tells us about the good results and useful information he gets out of the pages of RADIO AGE.

We also received a very interesting letter from Harry Dean, Auburn, Ind., who is loud in praise of the receiver described by Mr. Pearne in the December issue of RADIO AGE. From his reports nothing can be any better than this hookup.

Willie R. Jones, of 1233 Reynolds St., Shreveport, La., says he is making a three-tube neutrodyne from RADIO AGE blueprints and expects wonderful things from it, as the parts he is using are the best obtainable. His present set is one built according to RADIO AGE information, and judging from the results he gets it would be hard to beat. Some of the stations he has logged are KFNF, WDAF, WJJD, WOC, KFAF, WSB, WWJ, KYW, WWAE, WGN, WREO, KFKX, WLW, WJAX, WOAW, WIP, and KDKA. The list is so long that it would be impossible to print all of it.

Richard Skidmore, of Upland, Calif., has a list of stations that would make many a Western fan jealous. Practically all of the East Coast stations have been heard by him.

Thomas J. Kindel, Carlsbad, N. Mex., Radio 5ARR, submits a nice list of stations, from the land where the static "grows." He has received PWX a number of times, and most of the Middle Western stations come very regular.

From Baltimore, Md., comes a list of stations received on a single circuit outfit, using a 199 tube as a detector. J. C. Dunn, who submits the list, says his set is very selective. Maybe he could help out some of you fans who are not having good results with the single circuit type of receiver. His address is 2518 Greenmount Ave. He has also listened in on quite a few 6's; that is, amateur stations in the sixth district.

D. O. Easton, of Shreveport, La., is having great success with the "tuned plate" circuit, as described by our Mr. Rathbun. He attributes all his success to our careful description of the circuit. But then, we know that he must have exercised quite a little care in construction or his results would not have been so good.

Robert Zurlinden, of Canton, Ohio, tells us of the wonderful success he is having with his "Ultra Audion" circuit. We would like to print his instructions for building it, but our space will not permit. Maybe we will be able to use it at some future date.

COME ON, YOU DX HOUNDS!

Beginning in this issue, more space will be devoted to the "Pickups and Hookups" section than ever before. We want to give readers of RADIO AGE a chance to compare notes and to "swap" stories of their DX-fishing experiences during the past few months.

So let's go, fans! Send in your station lists and other data now, and we'll see who gets the title of the Chief Dial Twister. Come one, come all—sit down NOW and address your communications to

—THE PICKUPS EDITOR.

We have "Howdy" songs over the radio. And now comes Wilbur Reinhard, with a "Howdy" to RADIO AGE, to thank us for the many good bits of information we furnished him during the past year. You're welcome, Wilbur; come again.

Tom Winn, 4219 Marcys St., Omaha, Nebr., sends a very good list of stations received by himself in one week. He shows that he tried hard to become a DT, so we are going to welcome him into the "Institution."

A. Lalonde, of Winnipeg, Man., Canada, must have a very good set, judging from the list of stations he submits for his DT button.

J. Homer McNeely, 5036 Monzall Ave., Kansas City, Mo. Has a very efficient five-tube neutrodyne, on which he has heard stations from coast to coast, ranging in power from ten watts to 1,000 watts.

Jerome Davis, Binghamton, N. Y., compliments us on our "Pick-ups and Hook-ups" section, and tells us of the good results he is getting with a set built from RADIO AGE blueprints. "Let Our Hook-Ups be Your Guide," and everything will come out all right. He also submits a list of dandy DX work.

Paul Di Marzo, of Washington, D. C., submits a fine list of DX stations received, and wants to know if he is eligible for a DT button. Well, Paul, judging from the list you submit, the only thing that will keep you out of the DT roster is the loss of the emblem in the mail.

Willard Zahalka, Racine, Wis., must be quite a hand for reaching out at the distant stations. Over fifty stations were received by him in a little less than a week. He also is going to have a DT button as a reward for his perseverance.

We received quite a little bit of useful information from a fan in California, but as he did not enclose all of the article he had written, we could not use it this month. He also failed to give his name and address, so we were not able to get in touch with him and request him to forward the missing part of the article. If he will supply us with the missing parts, we will use them next month.

A Real DX List

Stanley H. Cox of Fulton, Kans., submits a list of DX stations that puts him in the DT column. It must be quite nice to live in a location such as his. In his letter he states that he brings in both the East and West coast with ease. His list of verified stations easily proves his claim. So the little DT button certainly does go out to him.

Another Fan From Little Falls, N. J.

We have another list of DX stations received by a fan back in Little Falls, N. J., who is knocking 'em dead with his single circuit receiver. The list of stations that he turns in would knock your eyes out if we should print all of it. However, we will mention a few of the "choice" ones and leave it go at that. WOS, KYW, WOAW, WLS, KFKX CKY and a "raft" of others. Yes, he gets his button.

The Wizard Circuit

J. N. Bacon, of Oshkosh, Wis., comes along with some praise for the "Wizard" circuit as described in RADIO AGE a few months back. He has built a number of sets, but likes the "Wizard" the best of any. Some of the stations he has received are WBAP, KFKB, WEAO, KLZ, and last but not least, KFI. As he did not spend a lot of money in assembling this set, he is very much surprised at the results he has had so far. Just another case of "Let Our Hook-Ups be Your Guide."

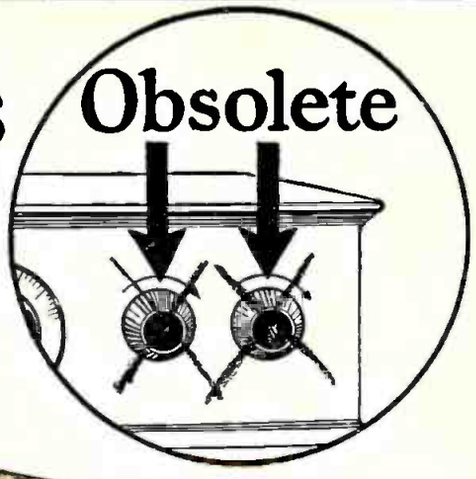
A 200 type of tube is used as a detector by him, with 22 1-2 volts on the plate. His antenna is 100 feet long (continuous) from the outer end down to the set. He uses a 1½ volt "C" battery, with a .00025 by-pass condenser across the secondary of the transformer. One stage of audio frequency amplification is used to permit of loud speaker reception. Any of the fans who want information on this circuit are asked to drop him a line, with a stamped self addressed envelope for reply.

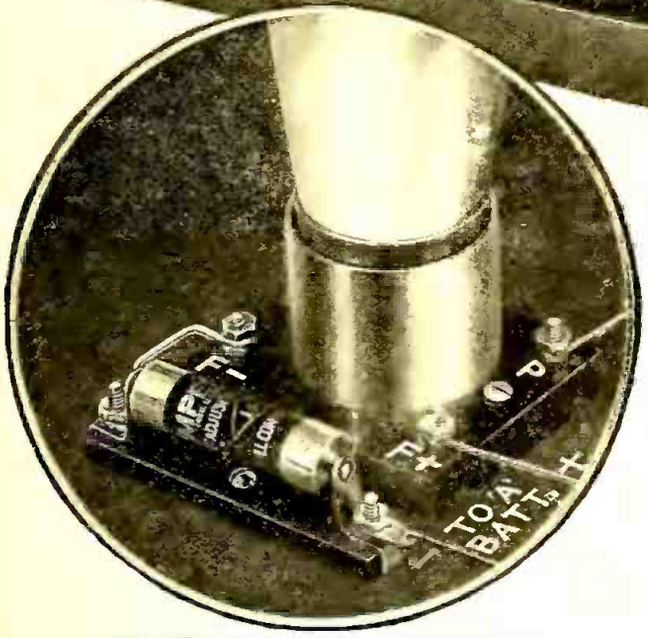
That Old Reliable Circuit

A letter from Lynn Sherk, of Peoria, Ill., tells us of the success he is having with his three-circuit outfit. This is the type of circuit that is usually referred

(Turn to page 50)

8 improvements at ONE stroke





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to as the "Old Reliable." And judging by the list he submits, it certainly is worthy of the name. KDKA, WGY, KGO, KFI and numerous others. Keep it up, Lynn, keep it up. You're right; no one need be ashamed of the list you submit.

Increased Power

Before we go any farther, we would like to ask the fans if they have noticed anything here of late, regarding the manner in which KFI and KGO are coming in these last few weeks. Letters from a number of DT's in the eastern part of the country telling us how strong those stations are received by them, certainly warrants comment in these columns. In Chicago these two stations come pounding through the locals with such volume that it seems as though they were being relayed through some of the near-by stations. This is not the case, however, as increased power does the trick.

Edmonton, Alberta, Canada

Chas. Lawson of Edmonton, Alberta, Canada, sends us a letter telling us of the fine reception he is getting. He wants to become a DT and on the strength of his list we are going to admit him to the organization.

A very peculiar thing happened to him while he was repairing a set for a friend. Everything in the set he was repairing, seemed to be right, no short circuits, tubes burning, etc. After experimenting for some time he arrived at the conclusion that the tubes were at fault. Substituting new ones, the set functioned perfectly. Now, the most surprising thing about this is that although the tubes would not work in one set, they worked perfectly in another. He is at a loss to account for this, and suggests that perhaps the tickler coil was at fault. He wants to know if any of the other fans have experienced trouble along this line. Well, Charles, tubes are funny things and perhaps the tickler was at fault, to some extent. But did you notice if the plate connection from prong on tube, to spring on socket was at fault? The fact that no connection is made at this point on the detector tube, will not permit the set to function.

Nice DX

Turner H. McBaine, of Columbia, Mo., reports that he has heard, among other stations, a station in Mexico, whose call letters he did not get plainly, but heard the announcer say "The department of education, Mexico City, Mo." He would like to know, if possible, what the call letters of this station were. On December 17th he also received WKAQ at San Juan, Porto Rico.

Mighty fine DX, Turner. The station you heard was probably CYL as they are "on the air" quite a little bit. I'll bet you had quite a little thrill when the announcer said WKAQ. Did you?

A Stranger Within Our Gates

We are in receipt of a communication from Clifton M. Beaty, of Chino, Calif., who after a five year absence from the United States, returns and is quite a little surprised at the progress radio has made in his absence. He purchased a super-heterodyne and is enjoying concerts from all the high power stations in the country. It really must be amazing to a person who has not been associated with radio for the past four years to listen in on some of the good things that have become a part of our every day life.

At Last! The Perfect Announcer!

(*Continued from page 29*)

contains some unexpected features. Rate of delivery is most important, stress variations are second, distinctness is third, average pitch is fourth, pitch variations are fifth, changes in rate pace are sixth, and degree of formality is least important of all.

It would seem from the comments made by various members of the committee that perfect co-ordination between mind and vocal muscles is greatly to be desired in any radio announcer, and absolutely essential to the Ideal Impresario of the Air.

"Vowel elongation is very bad" is one terse comment. Provincialisms are not objectionable in certain cases, but the majority seem to feel that provincialisms from only one part of the country—the South—are desirable. "Foreign dialects are entirely out of place" is another brief statement. "Nasal tone quality and harsh tone quality are unsuitable because the effect is unpleasantly amplified in the majority of loud speakers" would indicate that the loudspeaker has supplanted the earphone in the American home and is a considerable factor in any judgment on radio announcing technique. "Neurotic mannerisms and lapses are particularly distressing" is the unanimous opinion of the entire committee.

Lacks One Thing!

THE committee explains further that this Ideal Radio Announcer lacks one most vital factor, which they are unable to give him; namely, Personality. The committee presents the Ideal Radio Announcer to the entire announcing profession as a technically correct and perfect being; but to the individual announcers it must remain to imbue him with the spark of Personality.

It is the earnest hope of the committee that radio announcers throughout the country will be able to utilize findings to advantage, eliminating those technical faults which are at present detracting from their "Radio Personalities."

As yet the Radio Voice Technique Committee has dealt with the art of radio announcing only in the abstract. It has been essential to determine what characteristics constitute perfection in the art before any judgment can be made as to which of the more than fifteen hundred "radio voices" in the country most nearly approach that perfection.

The committee intends to crystallize their opinions in more concrete form by voting on the best of present-day announcers in the future. Whether or not it will be possible to make such a decision in more than a local sense remains to be determined by the committee.

DO YOU CRAVE JAZZ?

Then you will get plenty of it and then some if you listen in on RADIO AGE'S Jazz Carnival from KYW's Congress Hotel Studio, Saturday, April 4, beginning at midnight.

A Four-Tube Regenerative Receiver that Goes Lightly on the Squeals! You may think it can't be done, but Arthur B. McCullah has devised a new hookup of the regenerative type that shows some consideration for your neighbors. He has written it for RADIO AGE readers and it will appear in our May issue—on stands April 15.

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How to Regulate Your Filament Energy

(Continued from page 17)

should include some means of knowing the condition of the several batteries supplying the energy to the set. Nothing is so exasperating as to "shoot trouble" on a set and find later that the batteries are low; it is like looking for engine trouble and finding the gas tank empty. Consequently, the logical thing to do is to have an indicator of the battery condition on the panel. Since there are two or three sets of batteries in use, a multiple reading voltmeter with scales for the "A" battery, detector "B" and amplifier "B" batteries is desirable. Such an instrument with a self-contained switch is shown. Much trouble due to lack of knowledge of the condition of the batteries may be avoided if a voltmeter of this type is mounted directly on the panel of the set! Being convenient, it becomes second nature to check the batteries each time the set is used and if low, they can be replaced or recharged before failing entirely.

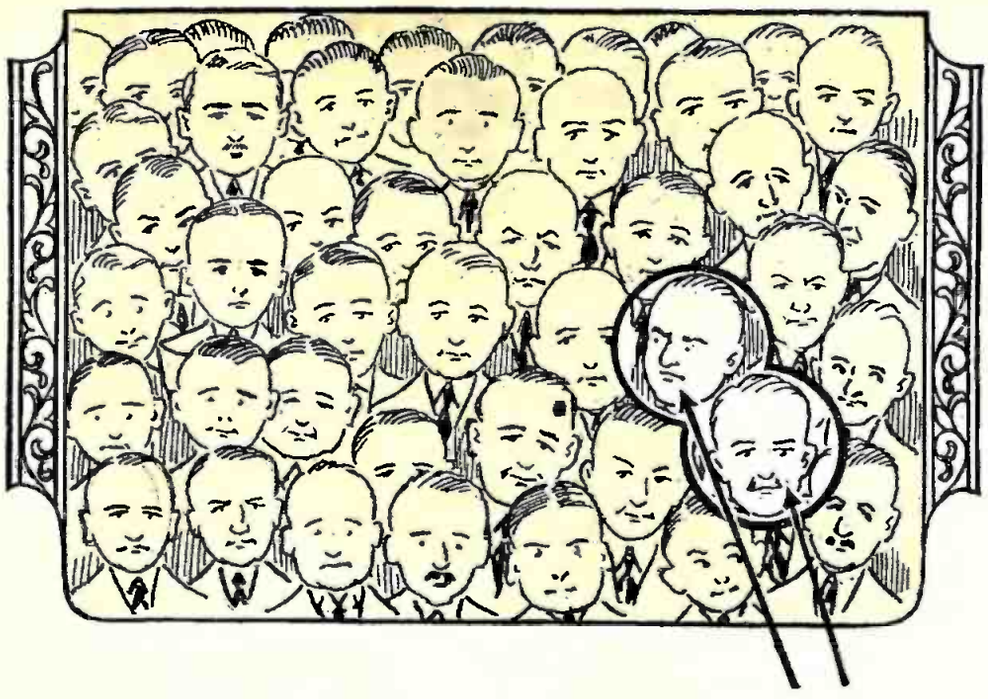
Watch the Oscillator

ONE source of considerable trouble in many super-heterodynes is the absolute blanketing of some of the weak incoming signals by a too powerful oscillator. In general, oscillators are run at far too high a plate voltage and the coupling between them and the tuned input circuit to the first detector is too great. Many good super-heterodynes have been built with no other arrangement for the pickup of oscillating energy than the wiring of the set itself. In the helix of the oscillator there is a current thousands and perhaps millions of times stronger than that in the input circuit, due to the incoming signal, and we only need to pick up a very little bit of the energy of the oscillator to give us proper heterodyne action for passing an intermediate frequency on to the amplifier.

Many prominent experimenters and builders of de luxe super-heterodynes have recognized this fact, and are equipping such sets with a current squared galvanometer in the oscillating circuit, which shows the relative amount of energy with different values of battery, etc.

According to theory, every signal will be found to have a best value of oscillator energy with which it will give the best response, and by using an instrument to actually read the energy in the oscillating circuit, this energy can be varied with perfect control and results can be duplicated because the instrument is available to read this energy. As to methods of control of the oscillator energy, a separate filament rheostat on the oscillator tube, or varying the "B" battery voltage, or both should give satisfactory control.

Thus the complicated set becomes responsive to control, energy is conserved, replacements made when necessary and operation becomes far more exact and reliable.



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Giving the Farmers a Square Deal

(Continued from page 30)

From Dubuque County, Iowa, comes a comment from H. F. Hefferman. It shows the value of the radio in building up a co-operative community spirit which is doing much to put agriculture on a profitable business basis in America.

"We have a radio in a small country store and post office here," he says. "And it has come to my notice that farmers are taking advantage of the service that we post in a great many ways. There is hardly a day that we do not get phone calls from the country on the hog and cattle markets. Farmers like the leftover each day as it gives them a good chance to figure the next day's market."

In addition to the influence of WLS on the strings of the farmer's money bags, this radio service is also putting money indirectly in the producer's pockets by giving talks on various phases and improved methods of agriculture. Dan Meade, near Harvard, Illinois, listened in on a talk on hays last spring, and as a result he planted soy beans along with his red clover and alfalfa. Later he found that when he put the soy bean hay, loaded with rich soy beans, into his dairy ration, the cows responded with increased milk production. Mr. Meade wrote in to W L S, asking that the food value of soy bean hay as compared with the two other hays be broadcast over the radio. In a few days he listened in to a scientific statement on the feed value of soy bean hay. Thousands of farmers over America listened in at the same time with Mr. Meade, and they too, acquired a new dea or a new standard for a more scientific system of agriculture.

"RFD" Programs Started

WITH the idea of drawing the agricultural men of the nation into a closer union for the benefit of the country, WLS recently organized a national farm radio club called the Radio Farmer's Democracy—"RFD." What the men to whom it is directed think of the "RFD" is told in a letter from Lawrence G. Kiesling, who has a farm near Mason City, Illinois: "We surely enjoy your RFD program over our radio. I am at the radio every noon hour and I would rather miss my dinner than miss your noon-day programs. I like to eat pretty well, too!"

Since farmers must eat, and farm wives must cook, as well as direct certain other important activities about the farm business, WLS has instituted the Homemaker's Hour. From 3:45 to 4:45, five days a week from Monday to Friday, millions of farm women over the country listen in on talks by recognized home economics specialists, poultry experts, designers, club women and other specialists in all kinds of women's activities.

Other programs of WLS reflect the play side of life.

Everybody everywhere looks to the Saturday night barn dances held in thousands of communities regularly, with the orchestra broadcasting from WLS in Chicago.

Have You Met the Latest Radio Age Stars?

(Continued from page 33)

He will share honors with Eddie Borroff in announcing RADIO AGE programs from the Congress Hotel Studio of KYW the first Saturday in every month, beginning at midnight. "Sen" also has a few entertaining tricks which he performs before the "Mike."

It will interest many followers of RADIO AGE programs to know that Banks Kennedy, organist and concert pianist at Balaban & Katz' Tivoli Theater, Chicago, is now a regular member of this magazine's studio staff.

He appears at WEBH every Tuesday, Thursday and Saturday evening after 11 o'clock, and at KYW once a month, exclusively under the auspices of RADIO AGE. Banks has several new numbers that will amuse you. Listen in and write him or RADIO AGE on how you like his original compositions.

Banks, you will remember, originated the famous "Arrange It" song.

Lee Sims Joins KYW Staff

THE KYW staff, at Chicago, has another member in its fold. Lee Sims, the jolly tickler of the keys, formerly musical director of WTAS, is now the presiding factor at the piano at all KYW programs in Hearst Square studio. He made his debut with that station on Tuesday, February 10, amidst an avalanche of greetings, verbal, telephonic and telegraphic.

Since his advent into the radio world, in February, 1924, when C. E. Erbstein, owner of station WTAS, signed up Lee as his musical director, his medley and jazz renditions have placed Lee in the fore among radio pianists, and he has often been ascribed as the "King of them all." As a symbol of his popularity, his first appearance on a KYW program was the signal for a rush of telegrams from far and near; telegrams sent in by regular followers of KYW, welcoming Lee Sims into the big family and asking him to dish out some of his novel pianologues. The radio artist does not hear applause, but a greeting of this kind is always a thriller and is the only token to indicate an enthused world of listeners-in.

RADIO AGE'S program over KYW, on February 7, which was broadcast from the "Little Red Studio" atop the Congress Hotel, included Lee Sims in its repertoire. Seated at the piano he very forcefully made the "piano like it." He will be heard again on RADIO AGE'S monthly donations to ether entertainment. This will give the radio night-prowlers, whose tentacles reach to KYW, an opportunity to listen in on medleys unheard before.

RADIO AGE'S SCHEDULE ON THE AIR

WEBH (370) 11 to 12 p. m., Tuesday, March 24—Popular and semi-classical program.

KYW (535) 11:45 p. m. to 1 a. m. Saturday, April 4—"Congress Hotel Jazz Carnival."

WTAY (283) Every Wednesday, 9:45 p. m.—Technical talk by RADIO AGE staff member.

65 *Proven* Radio *Axioms for the* Fan

(Continued from page 18)

36. Sunlight cuts down the reception distance by at least one-half and sometimes more.

37. Apparatus with large diameter coils is generally better than that with coils of smaller diameter but of the same inductive value. This applies to audio frequency inductances and transformers as well as to radio frequency types.

38. Thick insulation on coiled wire gives less loss through distributed capacity than thin insulation. Enameled wire is not the best for radio frequency currents for this reason.

39. Giving the proper negative biasing voltage to a tube increases its sensitivity and gives better tone value.

40. The proper bias on the tubes of a reflex circuit will stop annoying audio frequency oscillations in the tubes.

41. Regeneration can be controlled either by the rheostat or by varying the magnetic feedback between the tickler and secondary coil. By using both methods at one time, one acts as a vernier to the other and better results are had.

42. All detector tubes have a sharply critical rheostat position where maximum reception is had. This point varies with the plate voltage.

43. The greater the plate voltage on the detector, the greater the current that can be fed to the filament without "spilling," and the louder will be the signals.

44. Increased volume due to increased plate voltage is not due directly to the voltage but to the fact that greater filament emission can be maintained without "spilling" of the tube.

45. Increasing the plate voltage makes the tube and reostat adjustment more critical and hence adds some to the selectivity.

46. When the plate voltage is increased the bias should also be increased in order to reduce the demand for current on the "B" batteries.

47. With plate voltage above 67.5 volts, most circuits become noisy with the tubes now in use.

48. With a plate voltage of from 67.5 to 90 volts, the volume of a detector is increased on local stations, but is not much greater than with 22.5 volts on stations more than 50 miles distant.

49. A soft detector tube cannot be used with voltages greater than 24 volts.

50. The use of a detector tube in place of a crystal in a reflex circuit is a good investment. The crystal cannot amplify but the tube will increase the signal strength.

51. Two amplifier tubes reflexed with a three element detector tube will usually give better distance than three amplifier tubes reflexed with a crystal detector.

52. For minimum battery consumption with a given amplification, two tube reflex with a regenerative detector tube in place of a crystal detector is the most effective.

53. The value of the by-pass condensers in a reflex circuit depends upon the make of audio transformers used. The impedance of some transformers is so low and the distributed capacity of the windings is so great that by-pass condensers (fixed) are sometimes best eliminated.

54. Reflex circuits with tuned radio frequency transformers are far the best.

55. Dry cell tubes are not such good amplifiers as power tubes designed for storage cells, and their effectiveness varies roughly as the filament voltage. A 3.0 volt tube is better than a 1.5 volt tube, and a 5.0 volt tube is better than either of them. Maximum with 8.0 volt (202).

56. Biasing is most effective above 45 volts plate current.

57. Most detector tubes are sensitive to the resistance of the grid leak; hence this should be variable.

58. Grid leaks should be adjusted on distant stations or weak signals for DX work, and require higher resistance than local.

59. For local reception, grid leaks are adjusted for maximum volume and freedom from noise.

60. Unbalanced circuits of the Ultraaudion type give the best results with variable grid condensers.

61. Aperiodic type couplers and transformers give the greatest selectivity with a minimum number of tuning controls.

62. A crystal detector circuit is less selective than a tube circuit of same type and with the same tuning units.

63. Detector crystals may be divided into two classes: (1) Those crystals which are sensitive on weak signals and distance, and (2) Those which give the greatest volume on strong local stations. The former are to be used with simple crystal sets, while the latter are best for reflex detectors.

64. Galena is probably about the best crystal for crystal detector sets, but silicon, perikon, and the numerous trademarked synthetic crystals are best for reflex detectors.

65. Resistance has nothing to do directly with the sensitivity of phones. A headset may have a high resistance and yet not be sensitive.

May is the month that you start building that portable set for your summer trips. In this issue RADIO AGE begins the publication of a series of portable receiver articles, and in the next issue this subject will be continued on a larger scale than ever. The outdoor radio fan should by all means get this "Portable" issue of RADIO AGE, "The Magazine with Blueprints."

* *Tested and Approved by* RADIO AGE *

Letters of a Radio Fan to His Son

(Continued from page 20)

inductances and condensers are concerned, 1923 is the early stone age of radio, and that's pretty rocky.

Now, there are a few general principles about inductances which the old man can hand on to you as the result of conversations with such scientifically minded inventors as Carl Pfanstiehl, etc.

He once showed me the several ways coils are wound and the consequences in each case.

Fig. 1. Solenoid Winding

Here is an old-style solenoid winding where the insulated wires are placed side by side and in contact. In the first place, your solenoid or drum is a beautiful absorber of the energy which is thrown out from the coil. That is loss number one. Next, the wires, being parallel and close, act like condensers and produce what is called distributed capacity. This acts like a load across the coil and constitutes loss number two. And worst of all, such a coil disperses energy in the form of a magnetic field all around the set, because the spread-cut position of the wires occasions a spread-out field. You know that when a magnetic field cuts across a wire or metal surface it sets up a current there. Well, this not only constitutes loss number three, but has the effect of causing howls and whistles in your set. Therefore, this old Rameses winding isn't low loss. Avoid it.

Fig. 2. Spiderweb of the old style

You can wind the wires straight up and down, as shown in my second masterly drawing, on a "spider" or frame. Everything I said about the first winding applies against waste of energy by dielectric absorption, distributed capacity losses and finally waste through producing a spread-out field of force which, as explained, puts rats into your radio.

Fig. 3. Honeycomb Winding

Thirdly, you have the famous old honey-comb winding, which isn't so bad. It does have a core which absorbs energy, but it gives practically no distributed capacity loss. Originally designed for high wavelengths, its cross section was square and it did not give a dispersed field. When these coils were adapted to the DX wavelengths instead of to the original long waves, the coil was cut down, but the width was left the same. The result is that you have a spread-out winding, which disperses the magnetic field around the set. This gives you those cute little cat calls which set your teeth on edge.

Fig. 4. The Stagger-wound Coil

HERE is a self-supporting stagger wound coil which has none of the disadvantages of the three others. There is no dielectric in the field to absorb the energy. The wires are surrounded by air everywhere, except at a few points, and therefore the distributed capacity is *nil*. Naturally, the shape of the coil

(Turn to next page, column 2)

(Continued from preceding page)

is such as to make a flat magnetic field which does not spread out and stir up howls and whistles in the receiver. Therefore, this is a truly low loss coil.

Some of these low-loss windings do not use self-supporting cement. This gains the advantage of avoiding a slight waste of energy by absorption. But a good radio stiffener made of cellulose proves in the laboratory to give practically no absorption loss, and furthermore it hermetically seals the wire and prevents losses due to moisture effects.

You can find a winding of this type in a 3-circuit tuner, shown at the left. It comprises a primary for the antenna circuit, a secondary for the grid circuit, and a tickler for the plate circuit. This is the low loss inductance for your first regenerative set. A unit like this will prevent radiation; in other words will prevent your feeding-back energy into your antenna and broadcasting howls and squeals all over the neighborhood.

In this way you solve one of the disadvantages of regenerative sets. The means by which you do so is by having a separate primary (or antenna winding) in your unit. This arrangement also increases selectivity greatly and helps solve the second disadvantage of the regenerative circuit.

I am enclosing some more money and want you to buy real apparatus this time, as your expenses have been very heavy this month.

Your patient and affectionate
"Dad."

Eby Cuts Prices on Ensign Posts

When the radio business first started about five years ago there were very few manufacturers who were far sighted and courageous enough to build quality products. Many firms were eager to sell large quantities of their goods at the very beginning, but owing to many firms entering the manufacturing field, they were not able to secure the volume of business at prices which were necessary for them to ask. Therefore, many manufacturers cheapened their products and began to compete on a strictly price basis.

Others, believing in the future of the radio industry and anticipating the present demand for quality merchandise, stuck to their price guns. The result of this policy is now reflected in an interesting reversal of the whole situation. The manufacturers of quality products, on account of the large volume which they have inevitably built up, are now in a position to offer their products at a price at least equal to and in some cases below, the price of inferior goods.

The H. H. Eby Mfg. Co. were among the first to make an insulated Binding Post with a knob or top which would not come off. This design of post made it impossible to either lose the tops or make wrong connections. They were also the first concern to conveniently package their complete line of posts.

They have consistently maintained the high quality of their product and at the present time nearly 500 jobbers handle and catalog them. They are also standard equipment with nearly 240 manufacturers of radio sets, electrical instruments and appliances. The large volume of business which they have succeeded in building up together with their modern methods of manufacture is offered as an explanation of their recent announcement of a price reduction on their popular Ensign insulated posts, formerly listing at 20c and now listing at 15c.

New Quarters for Station WCCO

MINNEAPOLIS, Minn.—Construction of a building has begun on top of the new Nicollet Hotel to house the new broadcasting studio for the Gold Medal Station, Saint Paul—Minneapolis, WCCO. The owners of the station announced that this studio will be completed late in March, simultaneously with the completion of the new 5,000 watt superpower broadcasting station which is being constructed 18 miles northwest of Saint Paul and Minneapolis.

Minneapolis executive offices of WCCO will be opened at the same time on the Twelfth Floor of the new Nicollet.

A one story building, constructed on the roof of the Nicollet Hotel between the penthouses and on its two wings, will be used to house the studios, and studios themselves will be of a design unusual among American broadcast stations.

Similar studios are to be installed soon at a new location in St. Paul, officers announced, in a place to be selected by Foster Hannaford, Saint Paul member of the station's Board of Control.

Studios will be entirely soundproof and literally will be "hung in the air." They will be built on a three inch bed of cork, with double walls throughout and felt padding between the walls, while the ceiling will be suspended four feet below the roof and the floor will be separated from the hotel proper by a four foot "dead air" space.

Ceiling and walls, extending downward for four feet, will be insulated with felt, covered with strips of cloth, and the remaining ten feet of the walls will be covered with heavy curtians. Windows will consist of double panels of glass, set in felt. Studios will be venitlated by a noiseless artificial ventilation system.

The floor space will be charted, with each space numbered. Broadcasters will be tested, and floor space numbers assigned according to the timber of their voice.

Entrance to the studios will be gained by a stairway from the 12th floor corridor. An electric hoist has been installed and will be used to lift three 2½ ton steel girders, pianos for the new studios, and other material and equipment.

Cost of erecting the Minneapolis and St. Paul studios will be met by the Washburn Crosby Company under their agreement with the Minneapolis Civic and Commerce Association and St. Paul Association, by which Minneapolis business men pledged $30,000 annually for three years, and St. Paul firms $20,000 annually toward an annual operating budget of $100,000.

"B" Voltage from an A.C. Rectifying System

(Continued from page 12)

Passing now to receiving sets requiring more than three and up to five tubes, the rectifier system may be increased in power in a simple manner. Fig. 3 is practically the same in principle, with the exception that two input transformers and two rectifier tubes are adopted. In Fig. 2 we rectified only one half of the 60 cycle supply, since current in the reverse direction simply could not pass and therefore had no effect. But in Fig. 3 we take advantage of this half of the cycle that is not used in Fig. 2. Another transformer and tube is rigged up to function when the current is in one direction, while the other tube operates when it flows in the other. It's like a push-pull amplifier, where one tube works while the other one rests, and vice versa.

Transformer Connections

IT IS very important to observe the exact connections of the two input transformers. These must be of the same type and make and connected with their primary windings in parallel, but with their secondaries in series. In case one of the secondary windings should be reversed in wiring, the tubes would then operate both at once instead of alternately. A push-pull input transformer could also be used, but it has the disadvantage of supplying a lower voltage and is therefore not quite as satisfactory. The same type of bell transformer is employed as previously and the filter system is likewise the same.

Both tubes should be the same in amplifying characteristics to operate with uniformity. The cost of operating either of these "B" voltage rectifier units is so very slight as to be negligible.

The unit with two tubes may be run for ten hours at an expense of less than one tenth of a cent for both illumination and the supply of "B" voltage! And coupled with its fool-proof qualities and its unfailing reliability, the A. C. rectifier system bids fair to gain wide-spread recognition.

WLS To Build New Radio Station

Erection of a new 5000-watt superpower radio broadcasting station, to replace the 500-watt equipment now in use by WLS, Chicago, was announced recently by Charles M. Kittle, President of Sears, Roebuck and Company. The new station is to be built in the open country to avoid interference with other Chicago broadcasters, but the exact location of the antennae has not been decided. The sending towers will probably be erected within 50 miles of Chicago.

Service from the new station will start within three months, according to the present plans of Edgar L. Bill, director of WLS. At the time of inaugurating the new plant, it is hoped to have the twin studios now in preparation in the downtown district of Chicago ready for use. The new station will reach out two and one-half times the distance touched now, and it is expected that every state in the union will be able to listen in on the programs every day.

The Burglars Laugh Last at "Honeymoon Camp"

(Continued from page 22)

tuned. Of course, there were a good many other amateurs in the air, and they were manifesting not a little curiosity as to the meaning of the "radio tilt" with the burglars.

"This is Billy Rumford in camp, Charley," the honeymooner announced. "Tune down to 150; I want to get away from this interference and talk to you."

"All right," said Charley. "Down we go."

A few moments later they were conversing on a wavelength that could not possibly be received by Alice's brother's super-hetrodyne, tuned to 162.

"There are burglars in Ray Harrison's home," Billy began. "He's in Washington now perfecting a patent on an automatic switch and consulting with government officials regarding some kind of deal on his invention. Meanwhile, the very best possible test of his invention is now taking place. He hooked it up with a burglar alarm in his home. The burglars who entered the place tonight threw the switch into sending by opening a door or window, and have been broadcasting, unwittingly, their conversation while opening the safe and taking out the valuables. The automatic switch works both ways.

"I've been talking to them and I've got them mystified. They don't know whether to go or leave. Now, I want you to call the police on the telephone and surround the house as soon as possible. Meanwhile, I'll do all I can to keep them there. Tell the police not to enter the house, but to conceal themselves outside and grab them when they come out. I may work up some kind of scheme to make the capture easy. I'll call you again in a few minutes to learn what success you've had. Keep on this wave."

CHAPTER III.

Radio "Raspberry"

BILLY now tuned back for the home of Alice's parents and received speedy evidence that the burglars were engaged in a lively discussion of the radio mystery.

"Do you know anything about radio, Sam?" was the first utterance that came clearly to the "ethereal eavesdroppers."

"Not a thing, Bimbo," Sam replied. "That's the reason I got scared so stiff."

"I don't know much either," said Bimbo. "But I know enough to be dead sure there's a big mystery here. Somebody, I'm afraid, knows we're in this house."

"Then we'd better get out of here mighty quick."

"No, I don't think we need to be scared right away. The guy that's on to us may be a thousand miles from this burg."

"You don't say!"

"Yes, I do. And I've heard it said some radio men can pull off some awful stunts with their machines. I read something in a paper about 'em being able to kill a guy just like a stroke of lightning a long way off. It struck me like a fake, but this makes me ready to believe most anything."

"Great guns, Bimbo! That guy may kill us right here."

"No, not here. It might set the house on fire. Let's wait here till that radio guy gets tired an' quits. Then we c'n sneak out an' skin off."

"How do you suppose he got onto us here? You don't think he can *see* by radio, do you?"

"Hanged if I know. Biggest mystery ever struck me. I feel just as if somebody was lookin' at me right through the darkness."

"I'm feelin' spooky, Bim. Wish I never come here. Let's look out of the windows an' see if anybody's stalkin' about."

There was silence in the campers' loud speaker for a minute or two; then the awed conversation continued:

"No, I don't see nobody. Do you?"

"Not a sign. Everything's as dead as a graveyard. Say, Sam, I wish I could talk to that guy in the radio; I'd try to find out what his game is."

"Talk to him," said Billy, throwing over the switch and then throwing it back.

"Hear that?" exclaimed one of the burglars. "He seems to hear everything we say."

"He hears everything you say," Billy echoed solemnly.

"And—and—can you see us?" inquired a voice that Billy took to be Bimbo's.

"I don't need to see you; I can *feel* you."

"Oh-h-h-h!" screamed a duet of voices in the camp loud speaker.

"I touched them, or they imagined I did," said Billy for the benefit of his fellow campers.

"What do you want?" demanded Bimbo, rather weakly.

"An even split-up of your swag," Billy replied with measured slowness.

A string of mild expletives met this announcement.

"You'd better be good and come across," Billy advised. "I can either kill you or hand you over to the police. I have the power of lightning in my hands. Don't try to leave that place without my permission."

"Where are you?" was the burglar's next question.

The Plot Thickens

"I AM in an automobile, driving toward Evansville, and have a radio outfit sending and receiving, with me," Billy replied. "I am a burglar myself; a radio burglar, if you please, and I want to make a bargain with you fellows. If we can come to an agreement, I won't demand a share of the swag you took tonight. With my radio I can test any

house supplied with a radio and find out from a safe distance if there is anybody home and if it would be safe to break in. I was testing that house among others in Evansville when I overheard your conversation. I probably would have broken in there myself if I hadn't found you there. On second thought, I don't believe I'll demand a split-up of your swag tonight. You guys talk as if you had some brains, and I'd like to form a partnership with you. I'll prepare the way for every job and make sure that it is safe; then you'll do the work, and we'll split even. How does that strike you?"

"Sounds all right," answered Bimbo, "Where'll we meet you?"

"You stay right where you are. I'll drive up to the house in a few minutes. You come out with your swag, and I'll drive you away anywhere you want to go, and then we'll talk business."

"How do you know where we are? How can you find this house?" asked Bimbo.

"Oh that's easy. I've got a radio compass, and I can locate any radio station with that. Will you stay there till I arrive?"

"Yes, we'll stay," Bimbo assured.

Billy now tuned for Charley Patterson's station again and found him waiting for the call.

"The sheriff and three armed men are here at the house waiting for instructions to move," Charley said. "We're all going to drive over there in my car. You're some radio honeymoon detective, Billy. Unless there's a slip-up somewhere, we're going to make a famous catch."

"Good!" exclaimed Billy.

Then he gave his friend a hurried account of what had taken place since their last "conference" by radio and continued:

"Drive up in front of the house and then get out and walk around the car. I'll tell them that will be a sign by which they will know I've arrived. Have the sheriff and his men hidden in the back of the car, and when the burglars come out and approach the machine, they can shove their guns into the faces of the scamps. Be careful and don't get in the way of any bullets. You can't swallow them the way I did, you know."

"Oh, I'm sworn in already as a deputy for this occasion," Charley replied; "and I'm likely to do some shooting myself, if any is done."

Billy now tuned back for the burglars.

"I'm only a few blocks away," he announced. "I'll be there in a few minutes. Keep a lookout at the front window. You'll know it's me when I get out and walk around the car."

"All right," responded both burglars eagerly.

"It looks as if we've got them trapped," remarked Billy, throwing the switch over. "I wish I'd asked Charley to go into the house and tell us about it after it's all over."

"Maybe he will anyway," Alice suggested. "It would be the natural thing for anybody to do. Throw the switch back, Billy, and let's listen in. We may hear something.

"All right," said Billy.

(Turn to next page)

IF readers wish to show their approval of the stand taken by RADIO AGE against the Radio Corporation of America, they can do it in the most practical way by sending $2.50 for a year's subscription to our magazine, or if they are already subscribers, urge a friend to subscribe. We believe the fans are with us. Address Radio Age, Inc., 500 N. Dearborn St., Chicago, Ill.

(Continued from preceding page)

For several minutes they listened to a low hum of conversation between the burglars; then Bimbo said:

"I hear a machine outside, Sam. I guess he's come."

They moved away from the vicinity of the microphone, apparently, for the listening campers heard no more for the time being. For fifteen minutes longer they listened with hopes and doubts. Then their hopes were realized:

"Hello, Honeymoon Camp."

It was the voice of Charley Patterson.

"Hello, Charley," Billy returned.

"We caught 'em hands down," came the announcement, which everybody in camp drank in eagerly. "We brought them back into the house, and I want to introduce them to you by radio. Are you all there?"

"Yes, we're all here."

"Well, burglars, these are six very arrogant and opinoniated honeymoon campers. Ever since they were married they've turned their noses up at all their friends in town. They were the life of all our social events, and our 'crowd' just went to pieces since they went and got married. In order to accommodate us, you burglars, Sam and Bimbo, broke into the home of the parents of one of the brides and helped us get our revenge. We planned this revenge several weeks ago, dropping hints to the honeymooners that they ought to go camping and take a complete radio outfit with them.

"We planned to repeat this burglary stunt night after night until success crowned our efforts. We had several schemes whereby we hoped to catch them if they proved difficult to entrap. We were going to use every wavelength alloted to amateurs. But they fell easy prey the very first night early in the evening, and, my! what ingenuity they exercised to remain in our clutches.

"Honeymoon campers, allow me to present to you the burglars whom you so kindly and industriously aided us to capture. First, here is Bimbo, an elongation of Bim, which is made up of three letters, the initials of one of the friends you deserted, Burt Iverson Morris. Second, here is Sam, a name made up of the initials of another of your deserted society friends, Stephen Appomatox Mayfair. Like all the rest of us, they are lonesome for you and demand that you make your honeymoon complete once for all, so that when you return, there will be no more nonsense, and you will resume the places society long ago allotted to you and now demands that you fill.

"Early in the development of our society plot, we got Ray Harrison's consent to use his radio station at home; we also broadcast our plan to the amateur world on two evenings when we knew none of you were listening in. Most of them, no doubt, for hundreds of miles around, are now eagerly listening for the denouncement of this drama of the ether and we will now turn the ether over to them in order that they may give this affair its proper artistic finish.

"Now, Hams, ready, all; give them the raz—razberry with a Z, a string of Z's. Split the ether like——"

The last word was never heard. The ether sure was split as it never was split before and may never be split again—howls, yowls, spark spits, cat calls, screams, whistling, wheezing, and a regular firmament of "manufactured static." "Blue ether" was no longer a mere figure of speech.

* * *

It is needless to say that when the honeymooners returned home they bowed gracefully, though blushingly, to the social inevitable.

THE END.

How Radio's "Leading Lady" Rose to Theatrical Fame

(Continued from page 27)

other voice: otherwise the listener becomes confused. Characters are identified solely by sound. For this reason the small cast play is more effective via radio than a play requiring ten or twelve people.

Radio "Made" Her

BEFORE attending the Teachers' College, Miss Greene was a student at the New York University and, in her freshman year, she was associated with the Washington Square Players. It was then she gained the only experience in dramatic work she had before joining the WGY players.

Miss Greene's success as a radio player is partly due to the fact that she has not had much experience on the stage. The professional, when acting before the microphone, is handicapped by the absence of a visual audience; he misses the inspiration to be derived from a responsive group of people; he has only someone's word for it that his voice is going outside the room.

Miss Greene knows that her voice is going over hundreds of miles into thousands of homes to the ears of all conditions of people. She has trained herself to live the part she is playing without thought of the effect her work may be having on the listeners at the time.

The letters which follow in a day or two gratify the love of the artist for applause. When a Canadian guide writes that for a time he wanted to kill the villain who was torturing her, Miss Greene feels that she gave a convincing performance. When a forest ranger brushed tears from his eyes during an emotional piece of work by Miss Greene, no further applause is necessary.

What will be next? A millinery show over the radio is the latest radio twist adopted by an Eastern broadcasting station. Read about it in the May RADIO AGE.

Growing Wiser with the "Hoot Owls"

(Continued from page 25)

They "Ride the Goat"

APPROPRIATE emblems, with the insignia of the Pet Hoot Owl to be seen on Page 25 of this issue, are sent to each newly initiated member of the Hoot Owls, as ample proof he has travelled on "the goat" at the hands of Dick Haller, holder of the Grand Goat, which, by the way, is the mythical animal used to "torment" the candidates.

Miss Louise Jacobsen

KGW does not confine its activities to the Hoot Owls. Weather reports, bedtime stories, classical and popular programs, and syncopating dance music from the Hotel Multnomah "Strollers" all help to vary the program. Church services, broadcasts of municipal concerts

from the public auditorium of Portland, lectures from the University of Oregon and market reports are other features which are carefully prepared each week.

Louise Jacobsen, a comely young Oregonian, is KGW's most popular concert pianist. She is an acknowledged artist on the concert platform, but she is even more exceptional when it comes to radio broadcasting.

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Do you want to make more money in your spare time? See page 57.

"Nighthawks" Win Contest for February

(Continued from page 26)

Each month seems to pull a heavier vote than that preceeding, and while Karl Bonawitz still leads, it will be noticed that Bill Hay has strengthened his own position by advancing from third to second place. Coon-Sanders' Nighthawks spring the surprise this month by taking the position vacated by Bill Hay, although not previously indicated in the monthly tabulations shown in RADIO AGE.

Some Advances

Jack Nelson, Ford and Glenn and "Sen" Kaney all made slight advances during the month. New names to appear in the list this issue are Banks Kennedy, S. Hasting and Bob Boniel.

Last month, through an error, the final day of the contest was indicated as midnight, June 5. The apology is all ours in correcting this to June 15.

The end is rapidly approaching. What are you doing to see that your favorite carries away the grand prize for the 1924-25 season?

GET YOUR 1925 ANNUAL WHILE THEY LAST!

THE RADIO AGE BUYERS' SERVICE

What do you want to purchase in the radio line? Let the staff of RADIO AGE save you time and money by sending in the coupon below. Enter the number of the article you would like to know more about in the spaces provided in the coupon.

1 "A" Batteries
2 Aerial protectors
3 Aerial insulators
4 Aerials
5 Aerials, loop
6 Amplifiers
7 Amplifying units
8 Ammeters
9 "B" batteries
10 Batteries (state voltage)
11 Batteries, dry cell
12 Batteries, storage
13 Battery chargers
14 Battery clips
15 Battery plates
16 Battery substitutes
17 Bezels
18 Binding posts
19 Binding posts, insulated
20 Books
21 Boxes, battery
22 Boxes, grounding
23 Bridges, wheatstone
24 Broadcasting equipment
25 Bushings
26 Buzzers
27 Cabinets
28 Cabinets, battery
29 Cabinets, loud speaker
30 Carbons, battery
31 Cat whiskers
32 Code practicers
33 Coils
34 Coils, choke
35 Coils, coupling
36 Coils, filter
37 Coils, grid
38 Coils, honeycomb
39 Coils, inductance
40 Coils, Reinartz
41 Coils, stabilizer
42 Coils, tuning
43 Condenser parts
44 Condenser plates
45 Condensers, antenna coupling
46 Condensers, by-pass
47 Condensers, coupling
48 Condensers, filter
49 Condensers, fixed (paper, grid, or phone)
50 Condensers, variable grid
51 Condensers, variable mica
52 Condensers, vernier
53 Contact points
54 Contacts, switch
55 Cord tips
56 Cords, for head sets
57 Couplers, loose
58 Couplers, molded
59 Couplers, vario
60 Crystal alloy
61 Crystal holders
62 Crystals, rough
63 Crystals, mineral
64 Crystals, synthetic
65 Crystals, unmounted
66 Crystals, mounted
67 Desks, radio
68 Detector units
69 Detectors, crystal
70 Detectors, fixed crystal
71 Dial, adjusters
72 Dials, composition
73 Dials, hard rubber
74 Dials, rheostat
75 Dials, metal
76 Dials, vernier
77 Dials with knobs
78 Dies
79 Drills, electric
80 Dry cells
81 Earth grounds
82 Electrolyte
83 Enamels, battery
84 Enamels, metal
85 End stops
86 Eyelets
87 Experimental work
88 Fibre sheet, vulcanized
89 Filter reactors
90 Fixtures
91 Fuse cut outs
92 Fuses, tube
93 Generators, high frequency
94 Grid choppers, rotary
95 Grid leak holders
96 Grid, transmitting leaks
97 Grid leaks, tube
98 Grid leaks, variable
99 Grinders, electric
100 Ground clamps
101 Ground rods
102 Handles, switch
103 Head bands
104 Head phones
105 Head sets
106 Honeycomb coil adapters
107 Hook ups
108 Horns, composition
109 Horns, fibre
110 Horns, mache
111 Horns, metal
112 Horns, wooden
113 Hydrometers
114 Indicators, polarity
115 Inductances, C. W.
116 Insulation, molded
117 Insulation material
118 Insulators, aerial
119 Insulators, composition
120 Insulators, fibre
121 Insulators, high voltage
122 Insulators, cloth
123 Insulators, glass
124 Insulators, hard rubber
125 Insulators, porcelain
126 Irons, soldering
127 Jacks
128 Filament control
129 Jars, battery
130 Keys, transmitting
131 Knobs
132 Knock-down panel units
133 Laboratories, testing
134 Lever, switch
135 Lightning arresters
136 Loosecouplers
137 Loud speakers
138 Loud speaker units
139 Lugs, battery
140 Lugs, terminal
141 Measuring instruments
142 Megohmeters
143 Meters, A. C.
144 Meters, D. C.
145 Mica
146 Mica sheets
147 Milliammeters
148 Minerals
149 Molded insulation
150 Molybdenum
151 Mountings, coil
152 Mountings, condenser leak
153 Mountings, end
154 Mountings, grid leak
155 Mountings, honeycomb coil
156 Mountings, inductance switch
157 Name plates
158 Neutrodyne set parts
159 Nuts
160 Ohmeters
161 Oscillators
162 Panel cutting and drilling
163 Panels, drilled and undrilled
164 Panels, fibre
165 Panels, hard rubber
166 Parts
167 Paste, soldering
168 Patent attorneys
169 Phone connectors, multiple
170 Phonograph adapters
171 Plates, condenser
172 Plugs, coil
173 Plugs, telephone
174 Pointers, dial and knob
175 Poles, aerial
176 Potentiometers
177 Punching machines
178 Reinartz set parts
179 Regenerative set parts
180 Receiver caps
181 Rectifiers, battery
182 Resistance leaks
183 Resistance units
184 Rheostat bases
185 Rheostat strips
186 Rheostats, automatic
187 Rheostats, battery
188 Rheostats, dial
189 Rheostats, filament
190 Rheostats, potentiometer
191 Rheostats, power
192 Rheostats, vernier
193 Rods, ground
194 Rotors
195 Scrapers, wire
196 Screw drivers
197 Screws
198 Schools, radio
199 Sets, receiving—cabinet
200 Sets, receiving—crystal
201 Sets, receiving—knock-down
202 Sets, receiving — Neutrodyne
203 Sets, receiving—portable
204 Sets, receiving—radio frequency
205 Sets, receiving—reflex
206 Sets, receiving—regenerative
207 Sets, receiving—Reinartz
208 Sets, receiving—sectional
209 Sets, receiving—short wave
210 Sets, receiving—super-regenerative
211 Sets, transmitting
212 Slate
213 Shellac
214 Sliders
215 Socket adapters
216 Sockets.
217 Solder
218 Soldering irons, electric
219 Soldering paste
220 Solder flux
221 Solder salts
222 Solder solution
223 Spaghetti tubing
224 Spark coils
225 Spark gaps
226 Stampings
227 Stators
228 Stop points
229 Switch arms
230 Switch levers
231 Switch points
232 Switch stops
233 Switches, aerial
234 Switches, battery
235 Switches, filament
236 Switches, ground
237 Switches, inductance
238 Switches, panel
239 Switches, single and double throw
240 Tone wheels
241 Towers, aerial
242 Transformers, audio frequency
243 Transformers, filament
244 Transformers, modulation
245 Transformers, power
246 Transformers, push-pull
247 Transformers, radio frequency
248 Transformers, variable
249 Transmitters
250 Tubes, vacuum—peanut
251 Tubes, vacuum—two element
252 Tubes, vacuum—three element
253 Tuners
254 Variocouplers, hard rubber
255 Variocouplers, molded
256 Variocouplers, wooden
257 Variometers, hard rubber
258 Variometers, molded
259 Variometers, wooden
260 Varnish, insulating
261 Voltmeters
262 Washers
263 Wave meters
264 Wave traps
265 Wire, aerial
266 Wire, braided and stranded
267 Wire, copper
268 Wire, insulated
269 Wire, Litz
270 Wire, magnet
271 Wire, platinum
272 Wire, tungsten

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A 3-Tube Portable Set for Your Vacation

(Continued from page 10)

make the set so that it can be used in a cabinet at home when it is not desired to keep it in a case such as a portable set requires.

The two binding posts (A and G) will be mounted on the panel at the upper right corner. These binding posts are for the antenna and ground respectively, and should be big and sturdy so as to take the large wire to be used. The five binding posts for battery supply will be mounted on the panel also; two at the lower right corner and three at the lower left corner. Those at the right are for the "A" or filament battery. They will be marked (A— and A+). The three at the left are for the "B" or plate battery and will be marked (B—, BB and BD).

A Neat Mounting Job

TO MAKE a neat looking job of mounting the instruments, it would be well to use number six, flat head, blued machine screws and counter sink the panel so that they will be flush.

THE PARTS NECESSARY TO BUILD THE SET

2 Small, well-shielded audio transformers (A1, A2.)
1 Variable condenser, 23 plate—tuning unit.
1 Eighteen-turn spider web coil—tuning unit.
1 Sixty-eight-turn spider web coil—tuning unit.
1 Tube control rheostat, sixteen ohms. (R1.)
2 Tube control Amperites. (R2, R3.)
1 Grid leak and condenser for WD12 type tubes. (GL.)
1 Single circuit phone jack. (P)
1 Fixed condenser .00025 mf. (B)
1 Fixed condenser .005 mf. (C)
3 201 type tube sockets. (D, T1, T2)
3 WD-12 tubes.
1 Phone cord, six or eight inches long.
1 Phone plug.
1 Battery switch. (S)
7 Binding posts. (A, G, A—, A+, B—, BD, BB)
1 Loud speaker of the reflected tone type.
4 Small 22½ volt "B" batteries.
3 Standard dry cells for "A" battery. (To be connected "multiple.")
50 Feet of antenna wire.
2 Insulators for antenna.
15 Feet of insulated wire for ground and antenna connections.
1 Metal rod or pipe for ground.

The terminal screws on the sockets may be removed and put in so that the terminal side or side with the nut is on the lower side of the socket.

In wiring the set, be sure to solder all of the connections well, as the vibration and jolts a portable set is subjected to will soon loosen up a poorly soldered connection and put the set out of operation. The leads should all be as short as possible and no two leads run parallel to one another. Number fourteen, bare tinned wire or the usual tinned bus wire is recommended.

The loud speaker neednot be included in the panel layout if it is desired to use one you may already have, or perhaps you would rather use head phones. The single circuit jack (P) is put into the circuit so as to enable the operator to use either at will. It is much more

A Unit for Testing Your Tubes—and How to Make it—will be an Unusual Feature of the May RADIO AGE. On the stands April 15.

RADIO AGE ON THE AIR!

Hear one of RADIO AGE's unusual broadcast programs from KYW, beginning at 11:45 p. m., Saturday, April 4, from the "Little Red Studio" in the Congress Hotel. Jazz galore. Also, a program of popular and semi-classical numbers from WEBH, 11 to 12 p. m., Tuesday, March 24. Tune in, fans!

handy than binding posts on the panel and presents a more neat appearance.

When the set has been completely wired and tested out, you will be ready to mount it into the case. This will be done by use of six brackets shown in figure three as detail two. The panel should be placed about one half an inch below the edge of the case so as to allow the cover to close down over the dials and binding posts. Next, cut two pieces of wood, about three-sixteenths of an inch in thickness, to fit under each side of the panel and to entirely close the space between the panel and the back of the case. The space thus formed will be used for the "A" and "B" batteries. These pieces should be securely fastened in place, as it is protection against the batteries coming loose and damaging the wiring of the set.

Two straps should be secured and cut, so as to have one piece complete with a buckle about five inches in length, one piece complete with buckle about six inches in length, one piece with buckle holes, ten inches long and one piece five inches long. These straps are for holding the batteries in place in the case and will be made fast to the case, as shown in figure two.

Carrying the Antenna

TWO clips may be made fast to the cover of the case to carry the antenna wire when not in use. This wire will then be rolled into a coil when it is taken down and placed in the set, keeping it ready for use without the usual patience-trying job of untangling it from the bottom of everything where things like that are usually found.

To put the set into operation, first select a spot about fifty feet from a tree in a clearing, fasten one end of the antenna to this tree as high up as convenient, bring the other end to a place near the set and make it fast to a point about six feet or more above the ground. The tent pole will do very nicely. Connect this end of the antenna to the binding post (A). The metal rod will then be hammered into the ground in a damp spot or in a stream or other water and connected to the binding post (G). Insert the three tubes into their respective sockets and operate the switch to the ON position. Adjust the detector rheostat so that the tube will glow and proceed to tune with the dial (T).

All of the tuning will be accomplished by the dial (T) and the detector rheostat and you will be surprised at the clear tone and sharp tuning you will be able to get.

This set has shown some good DX reception and unless one wants to go into the multi-tube super-heterodyne receivers, it is a good, all around circuit for the use it is intended.

FREE SUBSCRIPTIONS!

Do you want a free subscription to RADIO AGE—or your present subscription renewed free of charge? Read our special offer on page 52.

The First Real Radio Inauguration

WASHINGTON, D. C.—No imposing parade, no immense bodies of troops, no triumphant marching clubs wearing ribbon-bedecked hats, no distinguished citizens from elsewhere in moth ball odored frock coats and ancient and modern silk hats, no civilians riding resurrected but frequently capricious and invariably rented livery-stable horses, no incessant booming of drum corps, no miles of shaky temporary reviewing stands.

No lodging-house windows selling at $25.00 a look, no ham sandwiches, no hot dogs, no bottles of soda pop, no balloons breaking away from their moorings, no crowds of persons fighting for hours to keep their places, no crying and terribly tormented babies in arms, no courts of honor, no fireworks, no ambulances, no overworked policemen. Such was the order of the day in the inauguration of President Coolidge on Wednesday, March 4.

President Wilson really sounded the death knell of the old country-fair style inaugurals. Up to that time the Capital was demoralized for a week before and a week after the celebration. So many visitors descended upon the city that Government employes from cabinet officers to clerks were able to do little or no work.

President Harding fell into step with the reform and President Coolidge is going both of them one better. His first reason is that of economy; his second, preference for simplicity.

In the old days the inaugural address was the *piece de resistance*, although it took days, weeks, and even months through slow methods of transportation and less highly developed newspapers to get it to the people. It was thought revolutionary when President Harding, at the last inauguration, by means of loud speakers was heard by a crowd of upwards of 100,000 persons in and around the Capitol grounds. It was suggested that by telephone wires the Harding address could be carried to the

Marion High School, so that Mr. Harding's sister, who was the principal of the school, might be able to hear it, but in the excitement of the occasion, this plan was not carried out. There was no broadcasting being done at that time to speak of. What then seemed like a wild dream is now a reality.

By the most gigantic of all hook-ups in the history of radio, the inaugural address was carried by a chain of radio stations to 17,500,000 people. This is as many persons as there were in the entire United States in 1840, three years before the first telegraph line in the country was built connecting Washington and Baltimore; seventeen years before the laying of the Atlantic cable, and twenty-six years before the telephone was invented.

Feeling the importance of getting the text of the inaugural address to the citizens of the country, President Coolidge welcomed the opportunity which radio affords the present-day American man who may sit in his office or in his home and hear the speech as it is made. Another problem of the newspapers in the old days was to secure photographs of the ceremony. On previous occasions enter-publications have gone so far as to charter special trains, and later airplanes for this purpose. In this inauguration radio photographs were flashed across the country and over the ocean as well.

Isham Jones On Radio

(Continued from page 32)

does not over-balance the work of the entire unit."

Jones contends that one of the great problems to be worked out for the radio is the matter of broadcasting programs that are attractive, well balanced and educational. He does not favor the indiscriminate methods sometimes employed. Isham Jones is opposed to a censor for radio, his position being that eventually some sort of arrangement will be worked out to guarantee programs of the highest order as well as solve many of the questions that are irksome at the present time.

"That the radio has possibilities I think no one will deny," said Mr. Jones. "The advertising value alone is sufficient to assure the continued success of radio. It is impossible to venture a prediction as to its future. In its relationship to jazz music, radio seems destined to be an ally and when such a condition is brought about, jazz will only be one of many features for an evening's entertainment rather than occupying the spotlight most of the time as it does now."

IF readers wish to show their approval of RADIO AGE'S stand against the Radio Corporation of America, they can do it in the most practical way by sending in $2.50 for a year's subscription or if they are already subscribers, urge a friend to subscribe. We believe the fans are with us. Address Radio Age, Inc., 500 N. Dearborn St., Chicago, Ill.

Radio Technique Now Comes to Fore

By Wilson J. Wetherbee, Director, Westinghouse Station KYW

NOW comes radio technique. Rather an awe-inspiring word, this technique, but all in all, it signifies only the tricks of the broadcasting business which have been learned by those who pioneered the development of the new art.

After all, every business or pastime must have its technique. The laymen demand technique, for without it they are at a loss to explain the accomplishments of those engaged in any occupation. From the viewpoint of the world, any form of work or play without technique is work or play of no importance. Consequently, this technique is altogether essential even in radio.

Radio technique, if we may take it for granted there is such a thing, is no different fundamentally than the technique involved in any occupation. It consists primarily in knowing what to do over the air. More important still, it teaches what not to do. Therefore, when we say a certain announcer is exceptionally good, we mean he is a good radio showman; in other words, he's learned the rudiments of broadcasting.

The Shining Examples

If we wish to catch a pretty fair glimpse of this more or less elusive technique we have only to consider the persons who have climbed to radio stardom. We think first, perhaps, of Wendell Hall. Certainly Hall has radio technique. Of course, he has also a very natural talent which he developed successfully in broadcast channels. In other words, he seized upon his natural ability to entertain and made it thoroughly adaptable to radio. Hall had appeared for several years before clubs and on the vaudeville stage. Then came the radio. Here was a new problem. His audience could not see him. All of his ability and personality must be put into his voice. Gestures and pantomime have no place in broadcasting. Hall realized this, I think more completely than many other of the early radio performers; at least his success indicates that he did.

All of the radio stars today have this technique business pretty well in hand. "Sen" Kaney is liked by the radio public not always for what he says, but for the way he says it. The same is true of George Hay, Steve Trumbull, Eddie Borroff, Roxie, McNamee, "Uncle Bob" (Walter Wilson), and a score of other broadcast announcers who have climbed high in public esteem.

A very striking example of radio technique occurs to me. I remember well about two years ago when Jerry Sullivan first came into prominence. Jerry was singing at various Chicago stations in those days. Fans were talking about his remarkable enunciation. Jerry, I believe, was one of the first radio artists to sing softly into a microphone. Often when he was appearing before the transmitter it was impossible to hear him in the rear of the studio. Jerry had learned another trick in radio technique—the necessity for clarity.

Know Before You Buy

BEGINNING with this issue, RADIO AGE is beginning a new department, to be known as "Know Before You Buy." Every month, four different makes of manufactured radio sets will be described in detail for the benefit of the fan about to purchase a radio receiver.

No favorites will be shown, but every type of manufactured set will be described from month to month, to enable the prospective buyer to choose wisely and economically, according to the capacity of his pocketbook. The manufacturers of the particular sets described support all the facts given in the description of their receivers.

In listing these sets, RADIO AGE will attempt to present every conceivable type of receiver from the simplest crystal to the most elaborate console models. Suggestions from readers regarding this new department will be welcomed, and manufacturers are invited to contribute material for these columns.

The Zenith Super X

The Zenith Radio Receivers are manufactured by the Zenith Radio Corporation, 332 S. Michigan Ave., Chicago. The Zenith Super X Model shown in the illustration is of the non-regenerative type with built-in twin loudspeakers and horns.

The Super Zenith X consists of six tubes with two tuning controls. An outdoor or indoor aerial may be used. The outstanding features of this new model are the built-in, patented Super-Zenith duo-loud speakers, which are harmonically synchronized twin speakers and horns, designed to reproduce both high and low pitched tones which otherwise would be impossible with single unit speakers.

The price of the Zenith Super X without tubes and batteries is $475. The set is particularly adaptable to the home, as it is of a beautiful console model especially designed to harmonize with attractive surroundings.

Other Zenith models range in price from $100 to $355. The Zenith 4R sells for $100 and the 3R for $175. The engineers of the Zenith claim their sets are especially designed to tune out strong local stations and bring in distant broadcasters with local volume.

The Pfanstiehl Model 7.

A five-tube Radio Frequency receiver, manufactured by the Pfanstiehl Radio Co., 11 S. LaSalle St., Chicago, Ill. This set is known at the Pfanstiehl "Overtone Receiver," using a new system of tuned radio frequency designed by Carl Pfanstiehl, the well known radio engineer and inventor. Pfanstiehl's system eliminates oscillations by a system which is said to cut them out of the circuit entirely. Tuning and operation of the set are quiet as well as simplified, there being three dials, each of which is set at the same reading when a set is being tuned.

One control regulates volume. Distortion is also eliminated. The distinguishing feature of the Model 7 is the unique station finder, which enables even the greenest novice to tune in a station. All that is necessary is to know the wavelength. The station finder shows the numbers on the dials at which to turn for given wavelengths.

The Model 7 makes use of the well known Pfanstiehl inductances, and brings in distant stations at will. The set itself is of beautiful finish. The price is $140 without accessories.

THE BEST HOOKUPS OF THE YEAR!

After testing and studying hookups from the laboratories of America's renowned engineers in the radio field, RADIO AGE compiled the best in the RADIO AGE ANNUAL for 1925. You will find nothing but the very latest in radio development in this wonder hookup book, with its 32-page, original BLUEPRINT SECTION. One dollar a copy. Buy yours now by clipping the coupon on Page 80.

"Know Before You Buy"

(Continued from opposite page)

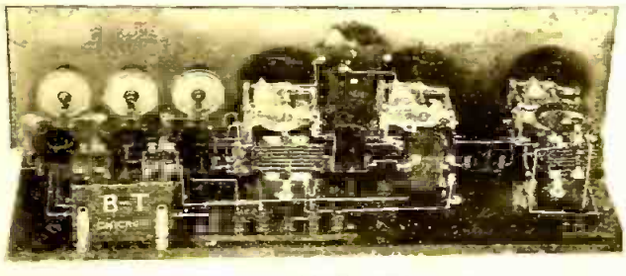
The Crosley Trirdyn Special

A new design for the famous Crosley hookup, manufactured by the Crosley Radio Corporation of 363 Sassafras St., Cincinnati, Ohio. The Crosley Trirdyn Special is exactly the same as the regular Trirdyn, except that it is encased in a more elaborate and artistic cabinet, finished in Adam Brown. The new sloping panel is used in the beautiful cabinet, making an artistic piece of furniture for any home. Ample room is provided inside the set for both "A" and "B" batteries. The price without accessories is $65, while the Trirdyn regular is $50.

The unique Trirdyn circuit is well known throughout the radio world. It is a combination of Armstrong regeneration, radio frequency amplification and reflexed audio amplification. Hundreds of communications from users of the Trirdyn testify to the Crosley Company's claim that the three-tube Crosley sets furnish selectivity, volume and ease of operation commonly had with five or even six tubes.

Miraculous distance records have been achieved with the Crosley Trirdyn, as well as the other Crosley models, which range in price from $14.50 for the Crosley "50," a one-tube outfit, to the elaborate "Special" at $65.

Crosley has perfected a new loudspeaker, shown in the illustration, which will be placed on the market soon. It is of a new design in loudspeaker construction and is reported to reproduce tones with unusual clarity.



The Bremer-Tully "Nameless"

A five-tube radio frequency receiver of the low loss type, built from the Bremer Tully "Nameless" kit, manufactured by the Bremer-Tully Mfg. Company of Chicago, Ill. While this set is not marketed in its complete form, the kit may be put together with the parts furnished by a radio fan with a working knowledge of radio construction.

The "Nameless" is noted for its hair-line selectivity on all distant and local stations; its remarkable distance qualities, volume and pure tone. Low loss parts are used throughout, and the circuit is of a reliable tuned R. F. type.

The Nameless Kits are furnished in two forms, with complete instructions for assembly. The Kit No. 3 contains 3-circuit transformers, laboratory condensers, control condenser and blueprints. This sells for $26.50, while the Nameless Kit No. 1 contains the 3-circuit transformers only, selling for $10.50.

The Bremer-Tully apparatus is of course recommended throughout in the construction of the "Nameless," but this only adds to the set's efficiency.

Where The DX Fans Congregate.

Are you a reader of RADIO AGE'S popular "Pickups and Hookups" section? Turn to the Pickups pages this month and read about our drive to determine the "Chief Dial Twister." We're out to get DX records, so if you have been logging the distant broadcasters lately, send in your list and maybe you'll be counted as one of "Who's Who in DX-Land" in the May RADIO AGE. Also, another record-breaking portable receiver for the outdoor fan will be published in the May issue.

* *Tested and Approved by* RADIO AGE *

Corrected List of Broadcasting Stations

KDKA	Westinghouse Electric & Mfg. Co.	East Pittsburgh	309
KDLR	Radio Electric Co.	Devils Lake, N. D.	231
KDPM	Westinghouse Electric & Mfg. Co.	Cleveland, Ohio	270
KDPT	Southern Electrical Co.	San Diego, Calif.	244
KDYL	Newhouse Hotel	Salt Lake City, Utah	250
KDYM	Savoy Theatre	San Diego, Calif.	280
KDZB	Frank E. Siefert	Bakersfield, Calif.	240
KDZE	Rhodes Department Store	Seattle, Wash.	270
KDZI	Electric Supply Co.	Wenatchee, Wash.	360
KFAD	McArthur Bros. Mercantile Co.	Phoenix, Ariz.	360
KFAE	State College of Washington	Pullman, Wash.	348
KFAF	Western Radio Corporation	Denver, Colo.	278
KFAJ	University of Colorado	Boulder, Colo.	360
KFAN	University of Idaho	Moscow, Ida.	230
KFAU	Boise High School	Boise, Idaho	271
KFAW	The Radio Den (W. B. Ashford)	Santa Ana, Calif.	280
KFBB	F. A. Buttrey & Co.	Havre, Mont.	360
KFBC	W. K. Azbill	San Diego, Calif.	278
KFBE	Horn & Wilson's "Radioland"	San Luis Obispo, Calif.	216
KFBG	First Presbyterian Church	Tacoma, Wash.	250
KFBK	Kimball-Upson Co.	Sacramento, Calif.	283
KFBL	Leese Bros.	Everett, Wash.	224
KFBU	The Cathedral	Laramie, Wyo.	283
KFCB	Nielson Radio Supply Co.	Phoenix, Ariz.	238
KFCC	The First Congregational Church	Helena, Mont.	248
KFCF	Frank A. Moore	Walla Walla, Wash.	256
KFCL	Leslie E. Rice	Los Angeles, Cal.	236
KFCP	Ralph W. Flygare	Ogden, Utah	360
KFCZ	Omaha Central High School	Omaha, Nebr.	258
KFDD	St. Michaels Cathedral	Boise, Idaho	252
KFDH	University of Arizona	Tuscon, Ariz.	368
KFDJ	Oregon Agricultural College	Corvallis, Oreg.	254
KFDM	Magnolia Petroleum Co.	Beaumont, Tex.	315
KFDX	First Baptist Church	Shreveport, La.	360
KFDY	South Dakota State College	Brookings, S. Dak.	360
KFDZ	Harry O. Iverson	Minneapolis, Minn.	231
KFEC	Meier & Frank Co.	Portland, Oreg.	248
KFEK	Augsbury Seminary	Minneapolis, Minn.	261
KFEL	Winner Radio Corp.	Denver, Colo.	254
KFEQ	J. L. Scroggin	Oak, Nebr.	268
KFER	Auto Electric Service Co.	Fort Dodge, Iowa	231
KFEY	Bunker Hill & Sullivan Mining and Concentrating Co.	Kellogg, Idahn	233
KFFP	First Baptist Church	Moberly, Mo.	266
KFFR	Nevada State Journal (Jim Kirk)	Sparks, Nev.	226
KFFV	Graceland College	Lamoni, Iowa	280
KFFY	Pincus & Murphey Music House	Alexandria, La.	275
KFGB	Heidbreder Radio Supply Co.	Utica, Neb.	224
KFGC	Louisiana State University	Baton Rouge, La.	254
KFGD	Chickasha Radio & Electric Co.	Chickasha, Okla.	248
KFGH	Leland Stanford University	Stanford University, Calif.	273
KFGQ	Crary Hardware Co.	Boone, Iowa	226
KFGX	First Presbyterian Church	Orange, Tex.	250
KFHA	Western State College of Colorado	Gunnison, Colo.	252
KFHH	Ambrose A. McCue	Neah Bay, Wash.	261
KFHJ	Fallon & Co.	Santa Barbara, Calif.	360
KFHL	Penn College	Oskaloosa, Iowa	240
KFHR	Star Electric & Radio Co.	Seattle, Wash.	283
KFI	E. C. Anthony, Inc.	Los Angeles, Calif.	468
KFIF	Benson Polytechnic Institute	Portland, Oregon	248
KFIO	North Central High School	Spokane, Wash.	252
KFIQ	First Methodist Church	Yakima, Wash.	242
KFIU	Alaska Electric Light & Power Co.	Juneau, Alaska	226
KFIX	Reorganized Church of Jesus Christ of Latter Day Saints	Independence, Mo.	240
KFIZ	Daily Commonwealth and Oscar A. Huelsman	Fond du Lac, Wis.	273
KFJB	Marshall Electrical Co.	Marshalltown, Iowa	248
KFJF	National Radio Manufacturing Co.	Oklahoma City, Okla.	252
KFJI	Liberty Theatre (E. E. Marsh)	Astoria, Oreg.	252
KFJL	Hardacre Manufacturing Co.	Ottumwa, Iowa	242
KFJM	University of North Dakota	Grand Forks, N. Dak.	280
KFJR	Ashley C. Dixon & Son	Stevensville, Mont. (near)	258
KFJX	Iowa State Teacher's College	Cedar Falls, Iowa	280
KFJY	Tunwall Radio Co.	Fort Dodge, Iowa	246
KFJZ	Texas National Guard, One hundred and twelfth Cavalry	Fort Worth Texas	254
KFKA	Colorado State Teachers College	Greeley, Colo.	273
KFKB	Brinkley-Jones Hospital Association	Milford, Kans.	286
KFKQ	Conway Radio Laboratories (Ben H. Woodruff)	Conway, Ark.	250
KFKU	The University of Kansas	Lawrence, Kans.	275
KFKV	F. F. Gray	Butte, Mont.	283
KFKX	Westinghouse Electric & Manufacturing Co.	Hastings, Nebr.	288
KFLA	Abner R. Willson	Butte, Mont.	283
KFLB	Signal Electric Manufacturing Co.	Menominee, Mich.	248
KFLD	Paul E. Greenlaw	Franklinton, La.	234
KFLE	National Educational Service	Denver, Colo.	268
KFLP	Everett M. Foster	Cedar Rapids, Ia.	256
KFLR	University of New Mexico	Albuquerque, New Mexico	254
KFLU	Rio Grande Radio Supply House	San Benito, Texas	236
KFLV	Rev. A. T. Frykman	Rockford, Ill.	229
KFLX	George Roy Clough	Galveston, Tex.	240
KFLZ	Atlantic Automobile Co.	Atlantic, Ia.	273
KFMB	Christian Churches	Little Rock, Ark.	254
KFMQ	University of Arkansas	Fayetteville, Ark.	299
KFMR	Morningside College	Sioux City, Iowa	261
KFMT	Dr. George W. Young	Minneapolis, Minn.	231
KFMW	M. G. Sateren	Houghton, Mich.	266
KFMX	Carleton College	Northfield, Minn.	336
KFNF	Henry Field Seed Co.	Shenandoah, Iowa	266
KFNG	Wooten's Radio Shop	Coldwater, Miss.	254
KFNJ	Central Mo. State Teachers College	Warrensburg, Mo.	234
KFNL	Radio Broadcast Ass'n	Paan Robles, Calif.	240
KFNV	L. A. Drake Battery and Radio Supply Shop	Santa Rosa, Calif.	234
KFNY	Montana Phonograph Co.	Helena, Montana	261
KFNZ	Royal Radio Company	Burlingame, Calif.	231
KFOA	Rhodes Department Store	Seattle, Wash.	384
KFOC	First Christian Church	Whittier, Calif.	236
KFOD	Radio Shop	Wallace, Idaho	224
KFOJ	Moberly High School Radio Club	Moberly, Missouri	246
KFOL	Leslie M. Schafbush	Marengo, Iowa	234
KFON	Echophone Radio Shop	Long Beach, Calif.	234
KFOO	Latter Day Saints University	Salt Lake City, Utah	261
KFOP	Rohrer Elec. Co.	Marshfield, Ore.	240
KFOR	David City Tire & Electric Co.	David City, Nebraska	226
KFOT	College Hill Radio Club	Wichita, Kansas	236
KFOU	Hommel Mfg. Co.	Richmond, Calif.	254
KFOX	Board of Education, Technical High School	Omaha, Nebraska	248
KFOY	Beacon Radio Service	St. Paul, Minn.	226
KFPB	Edwin J. Brown	Seattle, Wash.	224
KFPG	Garretson and Dennis	Los Angeles, Calif.	238
KFPH	Harold Chas. Mailande	Salt Lake City, Utah	242
KFPL	C. C. Baxter	Dublin, Texas	242
KFPM	The New Furniture Co.	Greenville, Texas	242
KFPR	Los Angeles Co. Forestry Dept.	Los Angeles, Calif.	231
KFPT	Cape & Johnson	Salt Lake City, Utah	268
KFPV	Heintz & Kohlmoos, Inc.	San Francisco, Calif.	236
KFPW	St. Johns M. E. Church	Carterville, Mo.	268
KFPX	First Presbyterian Church	Pine Bluff, Ark.	242
KFPY	Symons Investment Co.	Spokane, Wash.	283
KFQA	The Principia	St. Louis, Mo.	264
KFQB	The Searchlight Publishing Co.	Fort Worth, Tex.	221
KFQC	Kidd Brothers Radio Shop	Taft, Calif.	258
KFQD	Chovin Supply Co.	Anchorage, Alaska	207
KFQE	Dickenson-Henry Radio Laboratories	Colorado Springs, Colo.	224
KFQG	Southern Calif. Radio Ass'n	Los Angeles, Calif.	226
KFQH	Radio Service Co.	Burlingame, Calif.	231
KFQM	Texas Highway Bulletin	Austin, Tex.	268
KFQN	Tbrd Baptist Church	Portland, Ore.	283
KFQP	C. S. Carson, Jr.	Iowa City, Ia.	284
KFQR	Walter LaFayette Ellis	Oklahoma City, Okla.	220
KFQT	Texas National Guard	Denison, Texas	252
KFQU	W. Riker	Holy City, Calif.	253
KFQW	C. F. Knierim	North Bend, Wash.	248
KFQX	Alfred M. Hubbard	Seattle, Wash.	231
KFQY	Farmers State Bank	Belden, Neb.	273
KFQZ	Taft Radio Co.	Hollywood, Calif.	240
KFRJ	Guy Simmons, Jr.	Conway, Ark.	250
KFRM	James F. Boland	Fort Sill, Okla.	263
KFRN	M. Laurence Short	Hanford, Calif.	224
KFRO	Curtis Printing Co.	Ft. Worth, Tex.	246
KFRU	Oknulgee Dist. Oil and Gas Assn.	Bristow, Okla.	381
KFRW	United Churched of Olympia	Olympia, Wash.	220
KFRX	J. Gordon Klemgard	Pullman, Wash.	217
KFRY	New Mexico College of Agriculture and Mechanic Arts, State College, N. M		266
KFRZ	The Electric Shop	Hartington, Neb.	222
KFSG	Angelus Temple	Los Angeles, Calif.	278
KFSY	The Van Blaricon Co.	Helena, Mont.	281
KFUJ	Hoppert Plumbing and Heating Co.	Breckenridge, Minn.	242
KFUL	Thomas Goggan & Bros. Music Co.	Galveston, Tex.	258
KFUM	W. D. Corley	Colorado Springs, Colo.	242
KFUO	Concordia Seminary	St. Louis, Mo.	549
KFUP	Fitzsimmons General Hospital	Denver, Col.	234
KFUQ	Julius Brunton and Sons Co.	San Francisco, Cal.	234
KFUR	H. W. Peery and C. Redfield	Ogden, Utah	224
KFUS	Louis L. Sherman	Oakland, Calif	233
KFUT	University of Utah	Salt Lake City, Utah	
KFUU	Colburn Radio Labs.	San Leandro, Cal.	234
KFUY	Irvine M. Bouchard	Butte, Mont.	254
KFUZ	Y. M. C. A.	Virginia, Minn.	248
KFVF	Clarence B. Juneau	Hollywood, Cal.	208
KFWA	Browning Bros. Co.	Ogden, Utah	214
KFWB	Warner Bros.	Holywood, Cal.	252
KFWC	L. E. Wall and C. S. Myers	Upland, Cal.	211
KGB	Tacoma Daily Ledger	Tacoma, Wash.	252
KGO	General Electric Co.	Oakland, Calif.	361
KGU	Marion A. Mulrony	Honolulu, Hawaii, Waikiki Beach	360
KGW	Portland Morning Oregonian	Portland, Oreg.	491
KGY	St. Martins College (Reb. Sebastian Ruth)	Lacy, Wash.	258
KHJ	Times-Mirror Co.	Los Angeles, Calif.	405
KHQ	Louis Wasmer	Seattle, Wash.	273
KJQ	C. O. Gould	Stockton, Calif.	273
KJR	Northwest Radio Service Co.	Seattle, Wash.	405
KJS	Bible Institute of Los Angeles, Inc.	Los Angeles, Calif.	252
KLS	Warner Brothers Radio Supplies Co.	Oakland, Calif.	360
KLX	Tribune Publishing Co.	Oakland, Calif.	508
KLZ	Reynolds Radio Co.	Denver, Colo.	283
KMJ	San Joaquin Light & Power Corp.	Fresno, Calif.	248
KMO	Love Electric Co.	Tacoma, Wash.	250
KNT	Walter Heinrich	Kukak Bay, Alaska	263
KNX	Los Angeles Evening Express	Los Angeles, Calif.	337
KOA	General Electric Co.	Denver Col.	323
KOB	New Mexico College of Agriculture & Mechanic Arts	State College, N. Mex.	348
KOP	Detroit Police Department	Detroit, Mich.	286
KPO	Hale Bros.	San Francisco, Calif.	428
KPPC	Pasadena Presbyterian Church	Pasadena, Cal.	229
KQV	Doubleday-Hill Electric Co.	Pittsburgh, Pa.	270
KQW	Charles D. Herrold	San Jose, Calif.	210
KRE	V C Battery & Electric Co.	Berkeley, Calif.	275
KSAC	Kansas State Agricultural College	Manhattan, Kans.	341
KSD	Post Dispatch (Pulitzer Pub. Co.)	St. Louis, Mo.	545
KTHS	New Arlington Hotel Co.	Hot Springs, Ark.	375
KTW	First Presbyterian Church	Seattle, Wash.	360
KUO	Examiner Printing Co.	San Francisco, Calif.	246
KUOM	State University of Montana	Missoula, Montana	244
KWG	Portable Wireless Telephone Co.	Stockton, Calif.	360
KWH	Los Angeles Examiner	Los Angeles, Calif.	360
KYQ	Electric Shop	Honolulu, Hawaii	270
KYW	Westinghouse Electric & Mfg. Co.	Chicago, Ill.	535
KZM	Preston D. Allen	Oakland, Calif.	360
WAAB	Valdemar Jensen	New Orleans, La.	288
WAAC	Tulane University	New Orleans, La.	275
WAAD	Ohio Mechanics Institute	Cincinnati, Ohio	248
WAAF	Chicago Daily Drovers Journal	Chicago, Ill.	286
WAAM	I. R. Nelson Co.	Newark, N. J.	263
WAAN	University of Missouri	Columbia, Mo.	254
WAAW	Omaha Grain Exchange	Omaha, Nebr.	286
WABA	Lake Forest University	Lake Forest, Ill	227
WABB	Harrisburg Sporting Goods Co.	Harrisburg, Pa.	266
WABH	Lake Shore Tire Co.	Sandusky, Ohio	240
WABI	Bangor Railway & Electric Co.	Bangor, Me.	240
WABL	Connecticut Agricultural College	Storrs, Conn.	283
WABM	F. A. Doherty Automotive and Radio Equipment Co.	Saginaw, Mich.	254
WABN	Ott Radio, Inc.	LaCrosse, Wis.	244
WABO	Lake Avenue Baptist Church	Rochester, N. Y.	283
WABQ	Haverford College, Radio Club	Haverford, Pa.	261
WABR	Scott High School, N. W. B. Foley	Toledo, Ohio	270
WABU	Victor Talking Machine Co.	Camden, N. J.	226
WABW	College of Wooster	Wonster, Ohio	234
WABX	Henry B. Joy	Mt. Clemens, Mich.	270
WABY	John Magaldi, Jr.	Philadelphia, Pa.	242
WABZ	Coliseum Place Baptist Church	New Orleans, La.	263
WAFD	Albert B. Parfet Co.	Port Huron, Mich.	233
WAHG	A. H. Grebe & Co.	Richmond Hill, N. Y.	315
WAMD	Hubbard and Co.	Minneapolis, Minn.	244
WBAA	Purdue University	W. Lafayette, Ind.	283
WBAC	Clemson Agric. College	Clemson College, S. C.	331
WBAH	The Dayton Co.	Minneapolis, Minn.	417
WBAN	Wireless Phone Corp.	Paterson, N. J.	244
WBAO	James Millikin University	Decatur, Ill.	350
WBAP	Wortham-Carter Publishing Co. (Star Telegram)	Fort Worth, Tex.	476
WBAV	Erner & Hopkins Co.	Columbus, Ohio	232
WBAX	John H. Stenger, Jr.	Wilkes-Barre, Pa.	254
WBAY	Western Electric Co.	New York, N. Y.	492
WBBD	Barbey Battery Service	Reading, Pa.	234
WBBG	Irving Vermilya	Mattapoisett, Mass.	243
WBBH	J. Irving Bell	Port Huron, Mich.	243
WBBL	Grace Covenant Presbyterian Church	Richmond, Va.	283
WBBM	H. Leslie Atlass	Chicago, Ill.	226
WBBN	Blake, A. B.	Wilmington, N. C.	275
WBBP	Petoskey High School	Petoskey, Mich.	246
WBBR	Peoples Pulpit Asso.	Rossville, N. Y.	273
WBBS	First Baptist Church	New Orleans, La.	252
WBBU	Jenks Motor Sales Co.	Monmouth, Ill.	224
WBBV	Johnstown Radio Co.	Johnstown, Pa.	245
WBBX	Ruffner Junior High School	Norfolk, Va.	222
WBBY	Washington Light Infantry Co. "B" 118th Inf.	Charleston, S. C.	265
WBBZ	Noble B. Watson	Indianapolis, Ind.	227
WBCN	Foster & McDonald	Chicago, Ill.	266
WBDC	Baxter Laundry Co.	Grand Rapids, Mich.	256
WBES	Bliss Electrical School	Takoma Park, Md.	222
WBGA	Jones Elec. & Radio Mfg. Co.	Baltimore, Md.	254
WBR	Pennsylvania State Police	Butler, Pa.	246
WBRE	Baltimore Radio Exchange	Wilkes-Barre, Pa.	231
WBS	D. W. May, Inc.	Newark, N. J.	252
WBT	Southern Radio Corp.	Charlotte, N. C.	275
WBZ	Westinghouse E. & M. Co.	Springfield, Mass.	333
WCAD	St. Lawrence University	Canton, N. Y.	280
WCAE	Kaufmann & Baer Co.	Pittsburgh, Pa.	461
WCAG	Clyde R. Randall	New Orleans, La.	268
WCAH	Entrekin Electric Co.	Columbus, Ohio	296
WCAJ	Nebraska Wesleyan University	University Place, Nebr.	293
WCAL	St. Olaf College	Northfield, Minn.	336
WCAO	Sanders & Stayman Co.	Baltimore, Md.	275
WCAP	Chesapeake & Potomac Telephone Co.	Washington, D. C.	469
WCAR	Alamo Radio Electric Co.	San Antonio, Tex.	263
WCAS	W. H. Dunwoody Industrial Institute	Minneapolis, Minn.	280
WCAT	State College of Mines	Rapid City, S. Dak.	240
WCAU	Durham & Co.	Philadelphia, Pa.	278
WCAV	J. C. Dice Electric Co.	Little Rock, Ark.	253

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The classified advertising rates are but ten cents per word for a single insertion. Liberal discounts are allowed on three, six and twelve-time insertions, of five, fifteen and thirty per cent, respectively. Unless placed through an accredited advertising agency, cash should accompany all orders. Name and address must be included at foregoing rates and no advertisement of less than ten words will be accepted.

AGENTS WANTED

RADIO—Join our sales organization and make big money. We want a man in every county to sell well advertised sets and parts made by the leading manufacturers. Widener of Kansas City makes $150.00 weekly. You can do as well or better. Write today for catalog, and discounts. Name your county. Waveland Radio Company, Div. 52, 1027 No. State St., Chicago, Ill.

MANUFACTURER'S AGENT calling on Radio-Electrical Jobbers, Chicago and vicinity, has opening for 3 additional lines carrying volume business, as we cater to large jobbers. Edelatein, 1804 McCormick Bld., Chicago.

HELP WANTED

RADIO SALESMEN and SET BUILDERS—We need you and you need us. If you are reliable and well known in your community, we will appoint you our representative and furnish you with standard well advertised sets and parts at prices that will enable you to sell at a handsome profit. Write at once for catalog and sales plan. Waveland Radio Co., Div. 53, 1027 N. State St., Chicago, Ill.

MANUFACTURING FACILITIES

AN OLD AND WELL ESTABLISHED MANUFACTURING COMPANY IN THE MIDDLE WEST WITH LARGE WELL EQUIPPED PLANTS AND UNUSUAL FINANCIAL RESOURCES, DESIRING TO ENTER THE RADIO FIELD WILL CONSIDER THE MANUFACTURE AND SALE OF RADIO SETS OR DEVICES OF OUTSTANDING AND UNUSUAL MERIT ON A ROYALTY BASIS. ADDRESS BOX 1A, RADIO AGE.

RADIO

A PRACTICAL TUBE RECEIVING SET FOR $10, Postpaid, less phones and tube. Complete with phones, tube and battery, $18.00. J. B. RATHBUN, 1067 Winona St., Chicago, Ill.

Standard soderless radio Jacks. Binding post attachments. Double circuit. One dollar bill. Postpaid. Clinton Seward, Jr., New Paltz, New York, N. Y.

Three Cosmopolitan Phusiformers, each $5.50, book of instructions included. F. A. Mall, Triopli, Iowa.

100 VOLT EDISON TYPE "B" BATTERY, knocked down. Parts and plans—complete, $12.50. Lane Mfg., 2937 W. Lake, Chicago.

FOR SALE—3 Pfanstiehl tuning units, 3 Cardwell Condensers, 1 Bradleyometer, 2 Bradleystats. All goods New. Earl Price, Lodi, Wis.

RADIO CIRCUITS

BLUEPRINTS—Make your own set from proven original and up-to-the-minute blueprints. The following are merely three of a choice of almost one hundred different types:

HT-1-3—Five tube neutrodyne—50c.
FB-6—Three-honeycomb regenerative—35c.
D10-4—Diode single circuit—25c.
All three of above, for $1.00.

These tested blueprints are all made up in easily read circuit drawings. MIDLAND PRODUCTS COMPANY, 1413 Hood Ave., Chicago, Ill. Ask for our complete list, No. R-31.

RADIO DEALERS

DEALERS—Write for our illustrated catalog of reliable Radio Merchandise. Rossiter-Manning Corporation, Dept. D, 1830 Wilson Ave., Chicago, Ill.

STAMPS AND COINS

158 Genuine Foreign Stamps. Mexico War Issues. Venezuela, Salvador and India Service. Guatemala, China, etc., only 5c. Finest approval sheets, 50 to 60 per cent. Agents Wanted. Big 72-p. Lists Free. We Buy Stamps. Established 20 Years. Hussman Stamp Co., Dept. 152. St. Louis, Mo.

WANTED

WANTED—To complete my set RADIO AGE need August, September, October, November, 1923, issues, bound or unbound. Advise price. Lloyd C. Henning, Hollbrook, Arizona.

WRITERS

NEW WRITERS WANTED—Articles, stories, poems, scenarios, etc. $13,500 just paid to unknown writer. Entirely new field. (No. bunk.) NOT A CORRESPONDENCE COURSE. Moving picture industry and publishers crying for new original material. YOU CAN DO IT. We buy manuscripts for books and magazines. Send self addressed envelope for list of 100 subjects. CALIFORNIA STUDIOS, P. O. Box 697, Los Angeles, Calif.

BATTERY COMPOUND

LIGHTNING STRANGE BATTERY COMPOUND. Charges discharged batteries instantly. Eliminates old method entirely. Gallon free to agants. Lightning Co., St. Paul, Minn.

RADIO TUBES

SPECIAL Mastertone Radio tubes all sizes $1.85 postpaid. Nangle Co. 601 Washington Boul. Oak Park, Ill.

AGENTS

90c an hour to advertise and distribute samples to consumer. Write quick for territory and particulars. American Products Co., 2130 American Building, Cincinnati, Ohio.

Man wanted for this territory to sell wonderful value men's, women's, Children's shoes direct, saving consumer over 40%. Experience unnecessary. Samples supplied. Big weekly permanent income. Write today Tanners Mfg. Co., 1334C. St., Boston, Mass.

"B" BATTERIES

100 VOLT EDISON TYPE "B" BATTERY, knocked down. Parts and plans—complete, $12.50. Lane Mfg. 2937 W. Lake, Chicago.

RADIO OFFERS

15 to 25 per cent discount on nationally advertised sets and parts. Every item guaranteed. Tell us your needs. IMPERIAL RADIO COMPANY, Delaware, Ohio.

RADIO SETS. Our prices save you money. Lists free. The Radio Shoppe, Box 645, East Liverpool, Ohio.

JOIN THE RADIO Parts Exchange Club. Your parts inspected (Fee 25c), and exchanged for the parts you need. What have you; what parts do you require? Write us for details.
The Radio Parts Exchange Club, 112 So. Homan Ave., Chicago.

RADIO CIRCUITS

SPECIAL FOR APRIL
The Reinartz Radio Booklet, by Frank D. Pearne, fully illustrated, and RADIO AGE, for $2.50. Price of Booklet alone is 50c. Send check, currency or money order to RADIO AGE, 500 N. Dearborn Street, Chicago.

VOCATIONS

Make Big Money. Safe and Lock Expert. Wayne Strong, 3800 Lan Franco St., Los Angeles, Calif.

RADIO SUPPLIES

Ten per cent discount on all standard radio parts, from condensers to transformers to tubes, etc. Send for our latest price list, with special bargains on Static-eliminators, portable loud speakers, Radiotrons, German silver wire, etc. RADIOGRAPH LABORATORIES. 1234 Rosemont Ave., Dept. 4, Chicago, Ill.

MANUSCRIPTS

If you have a wonderful radio hook-up and would like to market it among various radio publications, etc., we can help you at a nominal cost. Don't be held back any longer by the inability to put your technical ideas into words. We will help shape your technical constructional articles so that they will BE SOLD at BIG MONEY to the best radio magazines and radio newspaper supplements. We give you free criticism and writers' service till your article is sold. Write for free descriptive folder. WILLIS ARNOLD AND ASSOCIATES. 210 E. Ohio St., Chicago.

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We are exclusive Radio Jobbers and DO NOT RETAIL.

Howard — Crosley
Liberty—Day-Fan
Receiving Sets

Complete line of parts.
We Sell to Dealers Only.
Write for Catalog.

TAY SALES CO.
6 N. Franklin St., Chicago

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Everyone Interested in RADIO Should Write for this FREE Radio Book

The Greatest Bargain Catalog published. Chock full of thousands of Radio Bargains at the lowest prices to be found anywhere in the United States.

Parts, Supplies, Sets, Parts of Sets, Latest Circuits.

Send for this catalog today.

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9 Church St., New York City

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RADIO
Storage "B" Battery
12 Cells 24 Volts
Lasts Indefinitely—Pays for Itself

Economy and performance unheard of before. Recharged at a negligible cost. Approved and listed as Standard by leading Radio Authorities, including Pop. Radio Laboratories, Pop. Sci. Inst. Standards, Radio News Lab., Lefax, Inc. and other important institutions. Equipped with *Solid Rubber Case*, an insurance against acid and leakage. Extra heavy glass jars. Heavy rugged plates. Order yours today!

SEND NO MONEY Just state number of batteries wanted and we will ship day order is received. **Extra Offer:** 4 batteries in series (96 volts), $13. Pay expressman after examining batteries. 5 per cent discount for cash with order. Mail your order now!

WORLD BATTERY COMPANY
1219 So. Wabash Ave., Dept. 81, Chicago, Ill.
Makers of the Famous World Radio "A" Storage Battery
Prices: 6-volt, 100 Amp. $12.50; 120 Amp. $14.50; 140 Amp. $16.00. All equipped with Solid Rubber Base.

World FOR RADIO
STORAGE BATTERIES

KDKA ≠ WEAF ≠ WGN ≠ WJS ≠ KHJ ≠ KGO ≠ KFAF ≠ WJY ≠ KOP

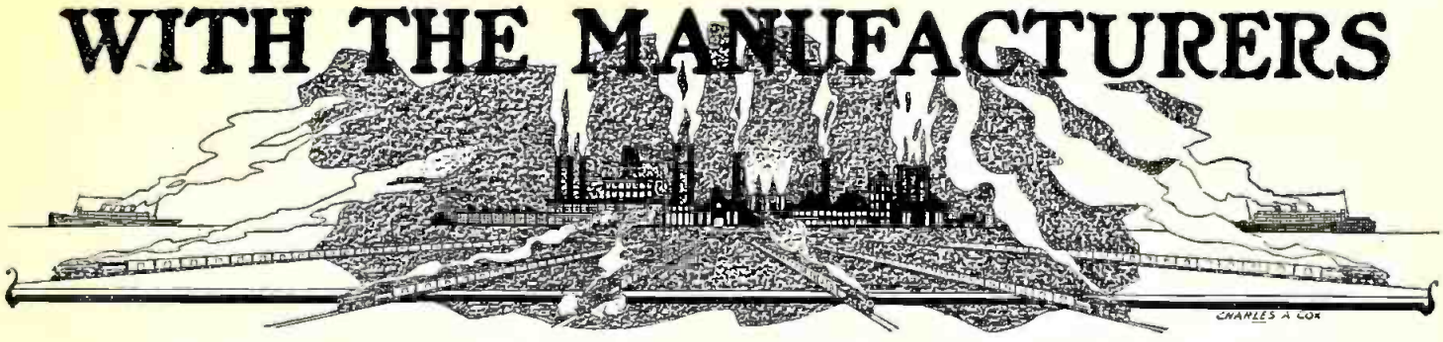
Classified Ad copy for May RADIO AGE must be in our office by March 28.

"Little Ads Mean Quick Sales"

✲ *Tested and Approved by* RADIO AGE ✲

WCAX	University of Vermont	Burlington, Vt.	250
WCAZ	Carthage College	Carthage, Ill.	246
WCBA	Charles W. Heibachm	Allentown, Pa.	280
WCBC	University of Michigan	Ann Arbor, Mich	280
WGBD	Wilbur C. Voliva	Zion, Ill.	344
WCBE	Uhalt Radio Co.	New Orleans, La.	263
WCBF	Paul J. Miller	Pittsburgh, Pa.	236
WCBG	Howard S. Williams (Portable)	Pascagoula, Miss.	268
WCBH	University of Miss.	Oxford. Miss.	242
WCBI	Nicoll, Duncan & Rush	Bemis, Tennessee	240
WCBJ	J. C. Maus	Jennings, Louisiana	244
WCBL	Northern Radio Mfg. Co.	Houlton, Me.	280
WCBM	Charles Swarz	Baltimore, Md.	229
WCBN	James P. Boland	Ft. Benj. Harrison, Ind.	266
WCBO	The Radio Shop, Inc.	Memphis, Tenn.	250
WCBQ	First Baptist Church	Nashville, Tenn.	236
WCBR	C. H. Meester	Providence, R. I.	246
WCBT	Clark University, Collegiate Dept.	Worcester, Mass.	238
WCBU	Arnold Wireless Supply Co.	Arnold, Pa.	254
WCBV	Tullahoma Radio Club	Tullahoma, Tenn.	252
WCBW	George P. Rankin, Jr., and Maitland Solomon	Macon, Ga.	226
WCBX	Radio Shop of Newark (Herman Lubinsky)	Newark, N. J.	233
WCBY	The Forks Electrical Shop	Buck Hill Falls, Pa.	268
WCBZ	Coppotelli Bros. Music House	Chicago Heights, Ill.	248
WCCO	Washburn-Crosby Co.	Twin Cities, Minn.	416
WCEE	Charles E. Erbstein, Villa Olivia	near Elgin, Ill.	278
WCK	Stix-Baer-Fuller D. G. Co.	St. Louis, Mo.	275
WCX	Free Press	Detroit, Mich.	516
WDAE	Tampa Daily Times	Tampa, Fla.	363
WDAF	Kansas City Star	Kansas City, Mo.	365
WDAG	J. Laurence Martin	Amarillo, Tex.	263
WDAH	Trinity Methodist Church (South)	El Paso, Tex.	268
WDAR	Lit Brothers	Philadelphia, Pa.	394
WDAY	Radio Equipment Corp.	Fargo, N. Dak.	244
WDBA	Fred Ray	Columbus, Ga.	236
WDBB	A. H. Waite & Co., Inc.	Taunton, Mass.	229
WDBC	Kirk, Johnson & Co.	Lancaster, Pa.	258
WDBD	Herman Edwin Burns	Martinsburg, W. Va.	268
WDBE	Cilbam-Schoen Elec. Co.	Atlantic, Ga.	278
WDBF	Robert G. Phillips	Youngstown, Ohio	315
WDBH	C. T. Scherer Co.	Worcester, Mass.	268
WDBI	Radio Specialty Co.	St. Petersburg, Fla.	226
WDBJ	Richardson Wayland Electric Corp.	Roanoke, Va.	229
WDBL	Wisc. Dept. of Markets	Stevens Point, Wis.	278
WDBN	Electric Light & Power Co.	Bangor, Me.	252
WDBO	Rollins College Inc.	Winter Park, Fla.	240
WDBP	Superior State Normal School	Superior, Wis.	261
WDBQ	Morton Radio Supply Co.	Salem, N. J.	234
WDBR	Tremont Temple Baptist Church	Boston, Mass.	256
WDBS	S. M. K. Radio Corp.	Dayton, Ohio	283
WDBT	Taylor's Book Store	Hattiesburg, Miss.	236
WDBV	The Strand Theatre	Fort Wayne, Ind.	258
WDBW	The Radio Den	Columbia, Tenn.	268
WDBX	Otto Baur	New York, N. Y.	233
WDBY	North Shore Congregational Church	Chicago, Ill.	258
WDBZ	Boy Scouts, City Hall	Kingstown, N. Y.	233
WDM	Church of the Covenant	Washington, D. C.	234
WDWF		Cranston, R. I.	440
WDZ	J. L. Bush	Tuscola, Ill.	278
WEAA	F. D. Fallain	Flint, Mich.	250
WEAF	American Telephone & Telegraph Co.	New York, N. Y.	485
WEAH	Wichita Board of Trade	Wichita, Kans.	280
WEAI	Cornell University	Ithaca, N. Y.	286
WEAJ	University of South Dakota	Vermillon, S. Dak.	283
WEAM	Borough of North Plainfield (W. Gibson Buttfield)	North Plainfield, N. J	286
WEAN	Shepard Co.	Providence, R. I.	273
WEAO	Ohio State University	Columbus, Ohio	293
WEAP	Mobile Radio Co.	Mobile, Ala.	263
WEAR	Goodyear Tire and Ruhber Co.	Cleveland, Ohio	389
WEAU	Davidson Bros. Co.	Sioux City, Iowa	275
WEAY	Iris Theatre (Will Horowitz, Jr.)	Houston, Texas	360
WEB	Benwood Co.	St. Louis, Mo.	273
WEBA	Electric Shop	Highland Park, N. J.	233
WEBC	Walter Cecil Bridges	Superior, Wis.	242
WEBD	Electrical Equipment and Service Co.	Anderson, Ind.	246
WEBE	Roy W. Walker	Cambridge, Ohio	248
WEBH	Edgewater Beach Broadcasting Station	Chicago, Ill.	370
WEBJ	Third Avenue Railway Co.	New York, N. Y.	273
WEBM	Radio Corporation of America	Portable	226
WEBP	E. B. Pedicord	New Orleans, La.	280
WEBT	The Dayton Coop. Industrial High School	Dayton, Ohio	270
WEBW	Beloit College	Beloit, Wisc.	283
WEBX	John E. Cain, Jr.	Nashville, Tenn.	263
WEBY	Hobart Radio Co.	Roslindale, Mass.	226
WEEI	The Edison Electric Illuminating Co.	Boston, Mass.	475
WEMC	Barrien Springs, Mich		285
WEW	St. Louis University	St. Louis, Mo.	280
WFAA	Dallas News & Dallas Journal	Dallas, Texas	472
WFAM	Times Publishing Co.	St. Cloud, Minn.	273
WFAV	University of Nebraska, Department of Electrical Engineering	Lincoln, Nebr.	275
WFBB	Eureka College	Eureka, Ill.	240
WFBC	First Baptist Church	Knoxville, Tenn.	250
WFBD	Gethsemane Baptist Church	Philadelphia, Pa.	234
WFBE	John Van De Walle	Saeymour, Ind.	226
WFBG	The Wm. F. Cable Co.	Altoona, Pa.	261
WFBH	Concourse Radio Corporation	New York, N. Y.	273
WFBJ	St. John's University	Collegeville, Minn.	236
WFBQ	Wynne Radio Co.	Raleigh, N. C.	255
WFBR	Fifth Inf. Md. Nat'l Guard, 5th Reg. Armory	Baltimore, Md.	452
WFBT	Gloucester Co. Civic League	Pitman, N. J.	231
WFBW	Ainsworth-Gates Radio Co.	Cincinnati, Ohio	309
WFBY	Signal Officer	Ft. Ben Harrison, Ind.	258
WFBZ	Knox College	Galesburg, Ill.	254
WFI	Strawbridge and Clothier	Philadelphia, Pa.	394
WFUV	G. Pearson Ward	Springfield, Mo.	252
WFUW	Earl William Lewis	Moberly, Mo.	233
WGAL	Lancaster Electric Supply & Construction Co.	Lancaster, Pa.	248
WGAQ	Yource Hotel	Shreveport, La.	252
WGAZ	South Bend Tribune	South Bend, Ind.	360
WGBB	Harry H. Carman.. 217 Bedell St.	Freeport, N. Y.	244
WGBC	First Baptist Church	Memphis, Tenn.	266
WGBF	Finke Furniture Co.	Evansville, Ind.	217
WGBG	Brietenbach's Radio Shop	Thrifton, Va.	226
WGBH	Fall River Hersld Puo. Co.	(Portable)	209
WGBI	Frank S. Megargee	Scranton, Pa.	240
WGBK	Lawrence Campbell	Johnstown, Pa.	248
WGBM	Theodore N. Saaty	Providence, R. I.	234
WGBN	Hub Radio Shop	La Salle, Ill.	266
WGBO	Dr. Roses Artan	San Juan, P. R.	275
WGBP	M. L. Price Music Co.	Tampa, Fla.	250
WGBQ	Stout Institute	Menominee, Wis.	234
WGBR	Marshfield Broadcasting Assn.	Marshfield, Wis.	229
WGBS	Cimbel Brothers	New York, N. Y.	315
WGBT	Furman University	Greenville, S. C.	236
WGBW	Valley Theatre	Spring Valley, Ill.	212
WGBX	University of Maine	Orono, Me.	252
WGBY	Progress Sales Co.	R. R. No. 2	218
WGI	American R. & R. Co.	Medford Hillside, Mass.	261
WGN	The Tribune Co.	Chicago, Ill.	370
WGR	Federal T. and T. Co.	Buffalo, N. Y.	319
WGY	General Elec. Co.	Schenectady, N. Y.	379
WHA	University of Wisconsin	Madison, Wis.	535
WHAD	Marquette University	Milwaukee, Wis.	280
WHAG	University of Cincinnati	Cincinnati, Ohio	222
WHAH	Hafer Supply Co.	Joplin, Mo.	283
WHAM	University of Rochester (Eastman School of Music)	Rochester, N. Y.	278
WHAR	SeasideHouse	Atlantic City, N. J.	275
WHAS	Courier-Journal & Louisville Times	Louisville, Ky.	399
WHAV	Wilmington Electrical Specialty Co.	Wilmington, Del.	360
WHAZ	Rensselaer Polytechnic Institute	Troy, N. Y.	385
WHB	Sweeney School Co.	Kansas City, Mo.	365
WHBA	C. C. Shaffer	Oil City, Pa.	250
WHBB	Hebel's Store	Stevens Point, Wis.	240
WHBC	Rev. E. P. Graham	Canton, Ohio	254
WHBD	Chas. W. Howard	Belefontaine, Ohio	222
WHBF	Beardsley Specialty Company	Rock Island, Illinois	222
WHBG	John S. Skane	Harrisburg, Pennsylvania	231
WHBH	Culver Military Academy	Culver, Indiana	222
WHBI	Chesaning Electric Co.	Chesaning, Mich.	227
WHK	Radiovox Company	Cleveland, Ohio	273
WHN	George Schnbel	New York, N. Y.	360
WHO	Bankers Life Co.	Des Moines, Ia.	526
WIAD	Howard R. Miller	Philadelphia, Pa.	254
WIAK	Journal-Stockman Co.	Omaha, Nebr.	278
WIAQ	Chronicle Publishing Co.	Marion, Ind.	226
WIAS	Home Electric Co.	Burlington, Iowa	283
WIK	K. & L. Co.	McKeesport, Pa.	234
WIL	Continental Electric Supply Co.	Washington, D. C.	360
WIP	Cimbel Bros.	Philadelphia, Pa.	509
WJAB	American Electric Co.	Lincoln, Neb.	229
WJAD	Jackson's Radio Engineering Laboratories	Waco, Texas	352
WJAG	Norfolk Daily News	Norfolk, Nebr.	231
WJAK	Clifford L. White	Greentown, Ia.	254
WJAM	D. M. Perham	Cedar Rapids, Iowa	268
WJAN	Peoria Star	Peoria, Ill.	293
WJAR	The Outlet Co. (J. Samuels & Bro.)	Providence, R. I.	305
WJAS	Pittsburgh Radio Supply House	Pittsburgh, Pa.	285
WJAZ	Chicago Radio Laboratory	Chicago, Ill.	263
WJD	Denison University	Grantville, Ohio	229
WJJD	Supreme Lodge, Loyal Order of Moose	Mooseheart, Ill.	303
WJY	Radio Corp. of Ama.	New York, N. Y.	454
WJZ	Radio Corp. of Ama.	New York, N. Y.	455
WKAA	H. F. Pasr	Cedar Rapids, Iowa	273
WKAD	Chas. Looff (Crescent Park)	East Providence, R. I.	240
WKAN	United Battery Service Co.	Montgomery, Ala.	229
WKAP	Dutee W. Flint	Cranston, R. I.	234
WKAQ	Radio Corp. of Porto Rico	San Juan, P. R.	340
WKAR	Michigan Agriculture College	East Lansing, Mich.	285
WKAV	Laconia Radio Club	Laconia, N. H.	254
WKBE	K & B Electric Co.	Webster, Massachusetts	231
WKBF	Dutee Wilcox Flint	Cranston, Rhode Island	236
WKY	Wky Radio shop	Okla City, Okla.	275
WLAG	Cutting & Washington Radio Corp.	Minneapolis, Minn.	417
WLAP	Wm. V. Jordan	Louisville, Ky.	236
WLAQ	Arthur E. Shilling	Kalamazoo, Mich.	233
WLAX	Putnam Electric Co.	Greencastle, Ind.	231
WLB	University of Minnesota	Minneapolis, Minn.	278
WLBL	Wisconsin State Dept. of Markets	Stevenspoint, Wis.	278
WLS	Sears Roebuck & Co.	Chicago, Ill.	344
WLW	Crosley Mfg. Co.	Cincinnati, Ohio	422
WMAC	J. Edw. Page (Olive B. Meredith)	Cazenovia, N. Y.	261
WMAF	Round Hills Radio Corp.	Dartmouth, Mass,	360
WMAH	General Supply Co.	Lincoln, Nebr.	254
WMAK	Norton Laboratories	Lockport, N. Y.	273
WMAL	Trenton Hardware Co.	Trenton, N. J.	256
WMAN	First Baptist Church	Columbus, Ohio	236
WMAQ	Chicago Daily News	Chicago, Ill.	447
WMAV	Alabama Polytechnic Institute	Auburn, Ala.	250
WMAY	Kingshighway Presbyterian Church	St. Louis, Mo.	230
WMAZ	Mercer University	Macon, Ga.	261
WMBF		Miami Beach, Fla.	384
WMC	Commercial Appeal	Memphis, Tenn.	503
WMH	Ainsworth-Gates Radio Co.	Cincinnati, O.	321
WMU	Doubledal-Hill Elec. Co.	Washington, D. C.	260
WNAC	Shepard Stores	Boston, Mass.	284
WNAD	University of Oklahoma	Norman, Okla.	258
WNAL	Omaha Central High School	Omaha, Nebr.	255
WNAP	Wittenberg College	Springfield, Ohio	271
WNAR	First Christian Church	Butler, Mo.	230
WNAT	Lennig Brothers Co. (Frederick Lennig)	Philadelphia, Pa.	254
WNAX	Dakota Radio Apparatus Co.	Yankton, S. Dak.	248
WNYC	Dept. of Plant and Structures	New York, N. Y.	526
WOAC	Page Organ Co.	Lima, Ohio	293
WOAE	Midland College	Fremont, Nebr.	280
WOAF	Tyler Commercial College	Tyler, Texas	353
WOAG	Apollo Theater (Belvidere Amusement Co.)	Belvidere, Ill.	274
WOAI	Southern Equipment Co.	San Antonio, Texas	392
WOAN	Vaughn Conservatory of Music (James D. Vaughn)	Lawrenceburg, Tenn.	280
WOAQ	Lyradion Mfg. Co.	Misbawaka, Ind.	359
WOAR	Lundskow, Henry P.	Kenosha, Wis.	225
WOAT	Boyd M. Hamp	Wilmington, Del.	360
WOAV	Pennsylvania National Guard. 2d Battalion, 112th Infantry	Erie, Pa.	242
WOAW	Woodmen of the World	Omaha, Nebr.	526
WOAX	Franklyn J. Wolff	Trenton, N. J.	240
WOC	Palmer School of Chiropractic	Davenport, Ia.	484
WOCL	Hotel Jamestown, Inc.	Jamestown, N. Y.	275
WOI	Iowa State College	Ames Ia.	270
WOO	John Wanamaker	Pbiladelphia, Pa.	509
WOR	L. Bamberger and Co.	Newark, N. J.	405
WORD	Peoples Pulpit Assn.	Batavia, Ill.	275
WOS	State Marketing Bureau	Jefferson City, Mo.	440
WPAB	Pennsylvania State College	State College, Pa.	283
WPAC	Donaldson Radio Co.	Okmulgee, Okla.	360
WPAJ	Doolittle Radio Corp.	New Haven, Conn.	288
WPAK	North Dakota Agricultural College	Agricultural College, N. D.	283
WPAL	Superior Radio & Telephone Equipment Co.	Columbus, Ohio	236
WPAU	Concordia College	Moorhead, Minn.	286
WPAZ	John R. Koch (Dr.)	Charleston, W. Va.	273
WPC	The Municipality of Atlantic City	Atlantic City, N. J.	309
WQAA	Horace A. Beale, Jr.	Parkersburg, Pa.	270
WQAC	E. B. Gish	Amarillo, Texas	234
WQAE	Moore Radio News Station (Edmund B. Moore)	Springfield, Vt.	275
WQAM	Electrical Equipment Co.	Miami, Fla.	283
WQAN	Scranton Times	Scranton, Pa.	280
WQAO	Calvary Baptist Church	New York, N. Y.	360
WQAS	Prince Walter Co.	Lowell, Mass.	256
WQJ	Calumet Rainbo Broadcasting Co.	Chicago, Ill.	447
WRAA	The Rice Institute	Houston, Tex.	256
WRAF	The Radio Club (Inc.)	Laporte, Ind.	224
WRAK	Economy Light Co.	Escanaba, Mich.	256
WRAM	Lombard College	Galesburg, Ill.	244
WRAN	Black Hawk Electrical Co.	Waterloo, Iowa	236
WRAO	St. Louis Radio Service Co.	St. Louis, Mo.	261
WRAV	Antioch College	Yellow Springs, Ohio	242
WRAW	Avenue Radio Shop (Horace D. Good)	Reading, Pa.	238
WRAX	Flaxon's Garage	Cloucester City, N. J.	268
WRBC	Imannel Lutheran Church	Valparaiso, Ind.	278
WRC	Radio Corp. of Ama.	Washington, D. C.	468
WREO	Reo Motor Car Co.	Lansing, Mich.	286
WRHF	Washington Radio Hospital Fund	Washington, D. C.	256
WRK	Doron Bros.	Hamilton, Ohio	360
WRL	Union College	Schenectady, N. Y.	270
WRM	University of Illinois	Urbana, Ill.	273
WRR	Police and Fire Signal Department	Dallas, Tex.	261
WRW	Tarrytown Radio Res. Labs.	Tarrytown, N. Y.	273
WSAB	Southeast Missouri State Teachers College	Cape Girardeau, Mo.	275
WSAC	Clemson Agricultural College	Clemson College, S. C.	336
WSAD	J. A. Foster Co.	Providence, R. I.	261
WSAG	Loren Vanderbeck Davis	St. Petersburg, Fla.	264
WSAI	United States Playing Cards Co.	Cincinnati, Ohio	325
WSAJ	Grove City College	Grove City, Pa.	258
WSAN	Allentown Call-Publishing Co.	Allentown, Pa.	229
WSAP	Seventh Day Adventist Church	New York, N. Y.	263
WSAR	Doughty & Welch Electrical Co.	Fall River, Mass.	254
WSAU	Camp Marienfeld	Chesham, N. H.	229
WSAV	C. W. Vick Radio Construction Co.	Houston, Tex.	360
WSAY	Irving Austin (Port Chester Chamber of Commerce)	Port Chester, N. Y.	233
WSAZ	Chas. Electric Shop	Pomeroy, Ohio	258
WSB	Atlanta Journal	Atlanta, Ga.	428
WSL	J. and M. Elec. Co.	Utica, N. Y	273
WSOE	School of Engineering	Milwaukee, Wis	246
WSRF	Hardem Sales and Service	Broadlands, Ill.	233
WSUT	State University of Iowa	Iowa City, Iowa	493
WTAB	Fall River Daily Herald Publishing Co.	Fall River, Mass.	248
WTAC	Penn Traffic Co.	Johnstown, Pa.	360
WTAF	Louis J. Gallo	New Orleans, La.	212

WITH THE MANUFACTURERS



New Advertising Manager for Zenith Radio

Thomas E. Carnahan, formerly of H. W. Kastor and The Arnold Joerns Advertising Agencies, has been appointed Advertising Manager of the Zenith Radio Corporation in Chicago.

Mr. Carnahan is to have charge of all advertising, whether it be direct mail, outdoor, national or local display. He should be well fitted for the position inasmuch as he has acted in the capacity of space buyer, copy writer and production manager, while connected with the two advertising agencies.

Cardwell Condensers Now a Standard

The Cardwell Condenser needs no introduction to the advanced radio fan. They have been on the market for a large number of years. Most amateurs consider them a standard of comparison. This is quite an enviable reputation to have.

In the present day market, many concerns are marketing condensers that are especially designed to eliminate losses. It was not necessary for the Cardwell people to re-design their condenser for this reason. Their condensers have always been low-loss. In fact, the term low-loss was applied to their condensers years ago to distinguish them from condensers of the ordinary type.

Performance is the only real test of a condenser. The Cardwell condensers have proven their superiority because of their scientifically correct design—small area of contact between insulation and stator supports, firm three-point frame, permanent alignment, accurate adjustment, etc.

Such details permit of exceptionally fine distance records, smooth tuning, freedom from noises and changes in capacity at given settings.

Pearsall New Zenith Distributors

The Zenith Radio Corporation of Chicago announce the appointment of Silas E. Pearsall as their Eastern Jobbers.

For a number of years the name of Silas E. Pearsall has been identified with the Victor Talking Machine Co. He won an enviable reputation while acting as Victor jobbers, successfully serving over 300 Victor Dealers. With the advent of the radio business, the Pearsall Company foresaw a more extensive field of endeavor in this line. They investigated every angle and phase of the radio industry.

New Gollos Receiver on Market

Head phones are not required for the Gollos Circuit, all stations being easily tuned in on the loud speaker. In many cases the loud speaker can be operated on one step of audio frequency, the volume being too great when plugged in on second or third step. The second

Maj. Gollos

step, however, is desirable and needed for long distance reception. The third step is mostly desired for Summer receptions at weak signals on loud speaker. If a loud speaker is not at hand and phones are used, it will be quickly noted that the signals come through the phones without any deafening diaphragm rattle.

Major Anatol Gollos, the inventor of the circuit, planned and installed the electrical equipment in the Chicago & Northwestern R. R. Station at Chicago, and is the inventor of the Gollos Automatic Train Control, which was favorably reported to Congress by the Interstate Commerce Commission. Major Gollos entered the service of the government during the war.

"Audiohm" Prevents Distortion

The Electrad "Audiohm," manufactured by the Electrad Company, Inc., of 428 Broadway, New York, is showing increasing popularity among the fans who "build their own" as well as manufacturers who have been incorporating this new unit into their sets.

The "Audiohm" controls tone, quality and volume remarkably and is also used for resistance coupled amplifiers. It has a resistance ranging from 10,000 to 120,000 ohms and works efficiently when placed across the secondary of the last audio frequency transformer. Distortion is practically eliminated by intelligent use of the "Audiohm."

The "Audiohm" is but one of the many devices manufactured by the Electrad Company.

"Telos Radio"

Danziger Jones Inc., 25 Waverly Place, New York, N. Y., an old firm of established reputation, is marketing a receiving set kit under the above name. The kit is furnished in a most complete manner and the set when properly constructed is very efficient.

The basic design of the new "Telos" is the same as it has been for three years, with the added improvements of three stages of tuned R. F. and superimposed (reflex) resistance coupled A. F. as well.

The set can be built as a five, six, or seven tube outfit, and will operate entirely on dry cells. It will cost less to operate than any other set of like power. A crystal detector can be used if desired. This makes for increased economy of operation.

Alpha Radio Supply Co.

The Alpha Radio Supply Company, Inc., 611 Broadway, New York City, have recently started production on a new product known as Alpha Insulated Bus-Bar Wire, (a spaghetti covered bus-wire). An insulating compound is applied to a perfect No. 14 B. & S. round tinned bus-bar wire. This wire is well tinned, has an even shiny surface and covers a pure copper base.

This product is energy conserving and will undoubtedly increase the sensitiveness of a receiving set and prevent short circuits where one wire crosses another. The insulation may be depended upon as permanent and will retain its dielectric strength indefinitely.

Alpha Insulated Bus-Bar Wire is puncture-proof and every length that leaves is tested for efficiency in every respect, including heat resisting, oil, water and gas and acid proof.

The insulating compound is applied directly to the wire. No cloth, cotton or any other fabric is necessary between the insulation and the wire. Rolled cotton placed on the wire is impractical, due to the fact that when stripped, it becomes unraveled or frayed, making an untidy job.

The wire is made in uniform, straight, two (2) ft. lengths and is made in five colors—gold, red, black, blue and green.

A Portable Loud Speaker

The Radiograph Laboratories, Chicago, announce they will soon begin production of a small loud-speaker that may be placed as a part of any portable receiving set, whether contained in a suitcase or in other form. This new "Radiograph" Loud Speaker is of the reflected tone type and is built for durable wear in portable receivers.

Additional Munufacturers' News on page 79.

WTAL	Toledo Radio & Electric Co.	Toledo, Ohio	252
WTAM	Willard Storage Battery Co.	Cleveland, Ohio	389
WTAP	Cambridge Radio & Electric Co.	Cambridge, Ill.	242
WTAQ	S. H. Van Gordon & Son	Osseo, Wis.	220
WTAR	Reliance Eectric Co.	Norfolk, Va.	280
WTAS	Charles E. Erbstein	Elgin, Ill.	303
WTAT	Edison Electric Illuminating Co.	Boston, Mass. (portable)	244
WTAU	Ruegg Battery & Electric Co.	Tecumseh, Nebr.	242
WTAW	Agricultural & Mechanical College of Texas	College Station, Tex	280
WTAX	Williams Hardware Co.	Streator, Ill.	231
WTAY	Oak Leaves Broadcasting Station	Oak Park, Ill.	283
WTAZ	Thomas J. McGuire	Lambertville, N. J.	283
WTG	Kansas State Agricultural College	Manhattan, Kans.	273
WTIC	Travelers Insurance Co.	Hartford, Conn.	323
WTX	H. G. Saal Co.	Chicago, Ill.	268
WWAD	Wright & Wright (Inc.)	Philadelphia, Pa.	360
WWAE	The Alamo Ball Room	Joliet, Ill.	242
WWI	Ford Motor Co.	Dearborn, Mich.	273
WWJ	Detroit News (Evening News Assn.)	Detroit, Mich.	352
WWL	Loyola University	New Orleans, La.	260
WWOA	Michigan College of Mines	Houghton, Mich.	244

Canadian Stations

CFAC	Calgary Herald	Calgary, Alberta	430
CFCA	Star Pub. & Prtg. Co.	Toronto, Ontario	400
CFCF	Marconi Wireless Teleg. Co. of Canada	Montreal, Quebec	440
CFCH	Abitibi Power & Paper Co.	Iroquois Falls, Ont.	400
CFCJ	La Cie de L'Evenement	Quebec, Quebec	410
CFCK	Radio Supply Co.	Edmonton, Alberta	410
CFCN	W. W. Grant Radio (Ltd.)	Calgary, Alberta	440
CFCQ	Radio Specialties (Ltd.)	Vancouver, B. C.	450
CFCR	Laurentide Air Service	Sudbury, Ont.	410
CFCT	Victoria City Temple	Victoria, Britisb Col.	410
CFCU	The Jack Elliott Radio Limited	Hamilton, Ont.	410
CFCW	The Radio Shop	London, Ont.	420
CFDC	Sparks Co.	Nanaimo, B. C.	430
CFHC	Henry Birks & Sons	Calgary, Alta.	440
CFLC	Chas. Guy Hunter	551 Adelaide St., London, Ont.	410
CFQC	The Electric Shop (Ltd.)	Saskatoon, Saskatchewan	400
CFRC	Queens University	Kingston, Ontario	450
CFUC	University of Montreal	Montreal, Quebec	400
CFXC	Westminster Trust Co.	New Westminster B. C.	440
CFYC	Victor Wentworth Odlum	Vancouver, B. C.	400
CHAC	Radio Engineers	Halifax, Nova Scotia	400
CHBC	Albertan Publishing Co.	Calgary, Alberta	410
CHCB	Marconi Company	Toronto, Ont.	410
CHCD	Canadian Wireless & Elec. Co.	Quebec, Quebec	410
CHCE	Western Canada Radio Sup. (Ltd.)	Victoria, B. C.	400
CHCL	Vancouver Merchants Exchange	Vancouver, B. C.	440
CHCM	Riley & McCormack	Calgary, Alberta	415
CHCS	The Hamilton Spectator	Hamilton, Ont.	420
CHNC	Toronto Radio Research	Toronto, Ont.	350
CHXC	J. R. Booth	Ottawa, Ont.	435
CHYC	Northern Electric Co.	Montreal, Quebec	410
CJBC	Jarvis Baptist Church	Toronto, Ont.	312
CJCA	Edmonton Journal	Edmonton, Alberta	455
CJGC	London Free Press Prtg. Co.	London, Ont.	430
CJCD	T. Eaton Co.	Toronto, Ont.	410
CJCE	Sprott-Shaw Radio Co.	Vancouver, B. C.	420
CJCF	The News Record	Kitchener, Ont.	295
CJCI	Maritime Radio Corp.	St. John, New Brunswick	400
CJCK	Radio Corp. of Calgary	Calgary, Alta.	316
CJCM	J. L. Pbillipe	Monti Joli, Quebec	430
CJCN	Simons Agnew & Co.	Toronto, Ont.	410
CJSC	Evening Telegram	Toronto, Ont.	430
CKAC	La Presse Pub. Co.	Montreal, Quebec	430
CKCD	Vancouver Daily Province	Vancouver, B. C.	410
CKCE	Canadian Independ. Telephone Co.	Toronto, Ont.	450
CKCK	Leader Pub. Co.	Regina, Saskatchewan	420
CKCO	Ottawa Radio Association	Ottawa, Ont.	440
CKCX	P. Burns & Co.	Calgary, Alberta	440
CKLC	Wilkinson Electric Company	Calgary, Alberta	400
CKOC	Wentworth Radio Supply Co.	Hamilton, Ont.	410
CNRA	Canadian Natl. Rys.	Moncton, N. B.	313
CNRC	Canadian National Railways	Calgary, Canada	357
CNRE	Canadian National Railways	Edmonton, Alta.	455
CNRM	Canadian National Railways	Montreal, P. Q.	410
CNRO	Canadian National Railways	Ottawa, Ont.	430
CNRR	Canadian National Railways	Regina, Sask.	312
CNRS	Canadian National Railways	Saskatoon, Sask.	329
CNRT	Canadian National Railways	Toronto, Ont.	357
CNRW	Canadian National Railways	Winnipeg, Man.	384

Cuban Stations

PWX	Cuban Telephone Co.	Habana	400
2DW	Pedro Zayas	Habana	300
2AB	Alberto S. de Bustamante	Habana	240
2OK	Mario Garcia Velez	Habana	360
2BY	Frederick W. Borton	Habana	260
2CX	Frederick W. Borton	Haoana	320
2EV	Westinghouse Elec. Co.	Habana	220
2TW	Roberto E. Ramires	Habana	230
2HC	Heraldo de Cuba	Habana	275
2LC	Luis Casas	Habana	250
2KD	E. Sanchez de Fuentes	Habana	350
2MN	Fausto Simon	Habana	270
2MG	Manuel G. Salas	Habana	280
2JD	Raul Peres Falcon	Habana	150
2K	Alvara Daza	Habana	200
2HS	Julio Power	Habana	180
2OL	Oscar Collado	Habana	290
2WW	Amadeo Saenz	Habana	210
5EV	Leopoldo V. Figueroa	Colon	360
6KW	Frank H. Jones	Tuinucu	340
6KJ	Frank H. Jones	Tuinucu	275
6CX	Antonio T. Figueroa	Cienfiegos	170
6DW	Eduardo Terry	Cienfiegos	225
6BY	Jose Ganduxe	Cienfiegos	300
6AZ	Valentin Ullivarri	Cienfiegos	200
8BY	Alberto Ravelo	Stgo. de Cuba	250
8FU	Andres Vinnet	Stgo. de Cuba	225
8DW	Pedro C. Anduz	Stgo. de Cuba	275

European Broadcasting Stations

British Stations

2LO	London	365	
5IT	Birmingbam	475	
5WA	Cardiff	350	
6BM	Bournemouth	385	
2ZY	Manchester	375	
5NO	Newcastle	400	
5SC	Glasgow	420	
2BD	Aberdeen	495	
6SL	Sheffield (relay station)	303	

French Stations

YN	Lyon	740	
FL	Paris (Eiffel Tower)	2,600	
8AJ	Paris	1,780	
ESP	Paris	450	

IF readers wish to show their approval of the stand taken by RADIO AGE against the Radio Corporation of America, they can do it in the most practical way by sending in $2.50 for a year's subscription to our magazine or, if they are already subscribers, urge a friend to subscribe. We believe the fans are with us. Address all communications to RADIO AGE, Inc., 500 North Dearborn Street, Chicago, Ill.

Tuning Dials Are Now Improved

While the engineers have constantly striven to improve circuits and apparatus used in radio receivers, the manufacturers of panels and dials of Bakelite have been busy trying to improve the appearance and beauty of their product to keep apace. The mechanical limitations of the average radio fan have also been seriously taken into consideration by the research and design engineers.

For example, an improvement has recently been made in such a simple piece of apparatus as a tuning dial. The customary set screw which has heretofore been almost universally used in attaching dials and knobs to the shafts of instruments has been replaced by a much better device.

A small spring bushing or chuck is used. This is slipped over the end of the shaft, the dial then going over the bushing and the knob is screwed up tightly on the threaded end of the chuck. As the knob is tightened, the chuck grips the shaft from four sides and the dial is firmly held in place without the use of tools of any sort.

The set screw method is lacking in mechanical fitness. If the shaft happens to be a trifle smaller than the hole in the ordinary dial, the dial will not run true and very likely will wabble and scrape the panel at certain points. If the shaft is a close fit, difficulty is often experienced in getting the dial on or off of the end of the shaft. Where instruments turn hard, the set screw often slips and allows the dial to turn without turning the shaft.

Bakelite Demand is Increasing

"The rapidly increasing use of bakelite in radio sets by practically all of the important manufacturers is of interest to the hundreds of thousands of radio enthusiasts throughout the country," declared W. R. Yates of the Continental Fibre Company recently when interviewed on the importance of good insulation.

"The amateur may find himself more or less confused," he said, "when he reads of the electrical properties of any of a half-dozen materials proposed for insulation service on his radio receiver. He will find that each of these materials is praised for some certain quality and will end by feeling that if he could use all of them at the same time he would have the ideal substance for all purposes.

"What he really needs to know is which one material will give him the best and most lasting service. Probably the best way for him to discover this material is to find out what the great makers of really dependable radio sets are using.

"The manufacturers have been forced to discard many insulating materials because they do not stand up and the life of radio sets equipped with these materials is short," continued Mr. Yates. "The manufacturers have adopted the phenolic condensation products, more generally known under the trade name of bakelite, either in laminated or moulded form, and these are being used almost universally. Bakelite has none of the changeable qualities of other insulating materials like rubber, and it retains its good properties indefinitely.

"The amateur can do no better than to imitate the manufacturers. He will thus be profiting by their experience and experiments and will obtain equipment for his radio set that will be satisfactory in every way."

Gain for Reflex Sets

Development of reflex receiving sets is already making great progress, due largely to the recent announcement that the United States Navy Department will license all reputable American manufacturers under the navy owned patents, which are basic on reflex and radio frequency circuits. One of the first concerns to have its application for a license approved by Secretary Wilbur was the All-American Radio Corporation.

The engineering staff of this concern has worked out a circuit which is extremely simple to build and operate, and which will give much more than ordinary strength from a minimum amount of apparatus. The reflex circuit has long been recognized as about the most economical to construct and operate and, in the circuit here described, three tubes will do the work of five under ordinary circumstances.

The three tube reflex embodies two stages of radio frequency, detector, and two stages of audio frequency amplification. The set is highly selective and is capable of receiving from long distances. A crystal detector is used and gives the circuit true and faithful reproduction. The range of the set is not limited by the crystal detector, as the signal is amplified by two tubes before it reaches the detector. In this manner signals that are too faint to be heard with a crystal set are readily reproduced.

In contrast with many types of receiving sets that use three main tuning dials, the reflex has but two, which greatly simplifies tuning. The two condenser dial settings follow each other closely and can be accurately "logged" so that a station can be found again by turning the dials to the same place. The circuit is non-oscillating and therefore will not interfere with other receiving sets in the neighborhood.

The wiring of the receiver is simple. All leads are short, and usually run from a binding post on one transformer to the binding post on an adjacent transformer, thereby eliminating the need of soldering connections in all but a few places. In making the connections on the fixed condensers, it is well to use a small machine screw and nut, making a bend in the wire and placing the loop of wire under the head of the screw and tightening. It is not advisable to solder to the metal ends of the condenser as the heat of the iron is liable to change the capacity of the condenser.

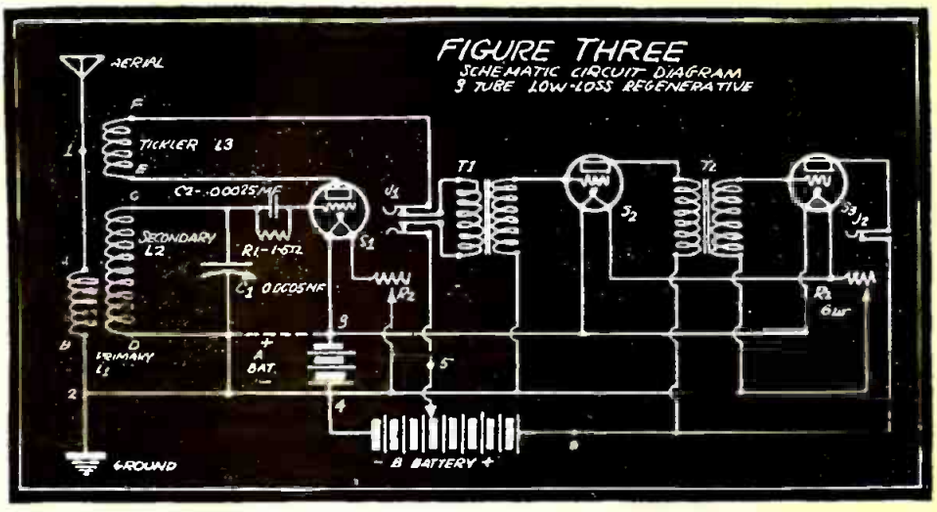
A New Metalectric Soldering Iron

The Post Electric Co., of 125 Harrison av., Long Island City, N. Y., have placed a new Metalectric Soldering Iron on the market for radio use. Instead of a bulky, unwieldy iron of superfluous size and weight, the Post Iron is easy to handle and makes soldering as "simple as writing with a lead pencil."

The iron is guaranteed and has these features: there is ample heat capacity; a quarter-inch interchangeable tip is always ready for emergencies; and the handle is always cool. The construction of the Metalectric Soldering Iron involves a nickeled brass handle and flange, fitted to which is a semi-rigid coil of spring steel which absorbs the back flow of heat and prevents its passing to the handle. The soldering tip is composed of nickeled silver, insuring minimum oxidation and infrequent renewal of the tips.

The iron is thoroughly insulated and furnished with eight feet of cord wire.

Hookups Like This One Get Results!



Above is a circuit diagram of a hookup published in the RADIO AGE ANNUAL for 1925, and which has taken the radio fans by storm! Although it is but a three-tube affair, it consistently "pulled in" California stations on the loudspeaker while located less than a mile from two powerful Chicago broadcasting stations! Hookups such as these make the ANNUAL for 1925 a necessity in your store of radio knowledge.

You'll Find Them in The Radio Age Annual for 1925!

A 32-PAGE BLUEPRINT SECTION

is the predominating feature of the RADIO AGE ANNUAL for 1925. Sixteen pages of actual-color blueprints of every kind of hookup from the simplest one-tube sets to the very latest 8-tube super-het. The only blueprint section ever printed.

HAVE YOU seen the new RADIO AGE ANNUAL for 1925? Thousands of fans have already bought their copies, and the end of the first edition supply is not far off. Every buyer of the ANNUAL for 1925 has supported our contention that it is the biggest radio dollar's worth ever published. Scores of new hookups, tried and tested in the RADIO AGE laboratories, hundreds of isometric, circuit and photographic illustrations, and a 32-page blueprint section are some of the features that make this 120-page book invaluable to the technical fan. The expert will find the latest in experimental and multi-tube hookups, while the beginner will feel "at home" with a galaxy of "how to do it" articles written especially for him.

$1.00 a Copy

RADIO AGE ANNUAL FOR 1925

$1.00 a Copy

Some of the Features

How to read and understand hookups.
How to understand radio phenomena.
Building your first simple set.
How to select the right receiver.
Substituting a tube for a crystal—building the first tube set.
How to amplify any kind of set.
Making a reflex set.
Building your first Reinartz set.
The renowned Baby Heterodyne No. 1.
Adding audio and radio stages to the Baby Het.
How to make a battery charger.
How to make a loud speaker.
RADIO AGE ANNUAL BLUEPRINT SECTION with such popular hookups as the aperiodic variometer, loop sets, feedback receivers, neutrodynes, reflex hookups, Baby Het No. 2, a Wonder Super-Het, and others.
How to get rid of interference.
How to make an amplifying unit.
How to recognize and deal with every kind of tube trouble.
Another super-heterodyne for the super experimenters.
Hints on tracing troubles in super-heterodyne circuits.
A three-tube long distance regenerator.
A 3-tube set that easily receives KGO on the loud speaker from Ohio.
Improving the ever popular Reinartz.
AND MANY OTHER UP-TO-THE-MINUTE HOOKUPS AND ARTICLES.

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Name.....

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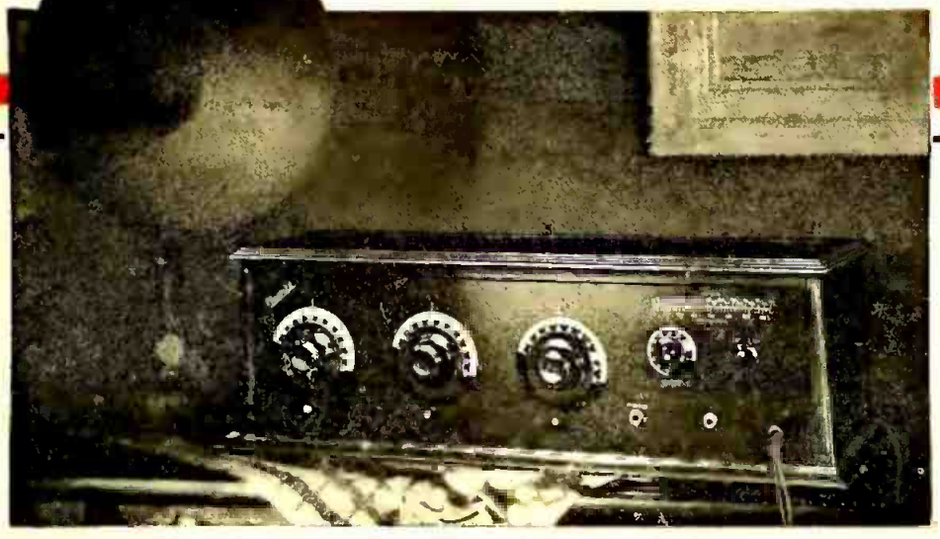
City.....State.....

4-25

Why Radio Receivers Differ so Widely in the Quality of their Tone

It's all in the Overtones



A 5-tube Receiver using the new Pfanstiehl system of tuned radio frequency

AS RADIO becomes less of a stunt instrument for fans to play with and more of a musical instrument in the home, people are demanding, above every other value, TONAL BEAUTY. Clear tone, of course, but more than that, *lovely* tone—all of the beauty which distinguishes fine singing and the best in musical performance.

It is easy to get distance and volume with proper amplification. The difficulty has been to control the tone—to keep it free, flexible, full and rich.

In the average radio receiver the tone is sometimes clear, and sometimes not. That depends upon neutralization. But it is always flat, thin or hard. It lacks those delicate overtones which give to the tone itself its quality or timbre. It is the attendant overtones or harmonics which make real music. Without them you have merely pitch.

The difference between a fine piano tone and a pure piano tone is in the overtones. Middle "C," for instance, is Middle "C" all the time and everywhere, as far as pitch is concerned. But there is the widest difference in quality. One has a rich, sweet resonance. The other is thin and bare.

The same is true of the human voice. Its charm is all in the overtones. They identify it, make it an intimately personal thing.

The matchless tone of the Pfanstiehl lies in its perfect control of the overtones—a simple thing and still the most important thing which has as yet happened to radio.

Overtones perfectly reproduced

Of course, no radio can receive a poor tone and make it sound beautiful. It does not create tones. It reproduces them. Its utmost achievement is to reproduce from a distance the *full* depth and individual beauty of fine music. That has not been possible hitherto. Radio has not been able to bring in and hold intact the *full* stream of radio energy embracing not only the fundamental tone but also ALL the minute overtones which accompany it in transmission and should accompany it in reception, if enjoyable song or music is to result.

The radio stream gets out of bounds, as it were, in the set itself. It spills over between circuits and feeds back instead of forward. In entering the preceding circuit this feedback of stray energy causes a disturbance in it, the two being "out of phase," as an electrician would say. The true forward stream of radio energy does not mesh with the stray energy feeding back. They conflict. Squeals and noises result. To prevent them, neutralizing devices have been used. But these do not work unless perfectly adjusted. *And even if they do work, both they and the feedback tend to blur or spoil the delicate overtones of the true signal.*

No errors to neutralize

In the Pfanstiehl there are no internal noises possible. The radio energy is completely controlled. There is no feedback. No absorbing or neutralizing devices are used. They are not needed. How this control is accomplished is a technical story of great interest to radio engineers, told elsewhere in this statement. Briefly, it consists of a new system of reception designed to hold in leash the full forward stream of radio energy, so that none of it spills over or escapes to cause feedback. All of the overtones are thus included. *And you get full tone quality, the timbre which makes the emotional appeal in music and gives to the human voice its supreme charm.*

Nothing could be simpler. Nothing could be more important, if radio is to become the enjoyable instrument people are looking for. The simplicity of the Pfanstiehl is unique. There are no complications. Nothing to adjust or get out of order. Operation is dependable and absolutely quiet. In this respect distance makes no difference. No lover of music who has once listened to a Pfanstiehl will ever be satisfied with any other system of radio reception, its superiority is so marked.

Hear the new Pfanstiehl Overtone Receiver at your radio or music dealer's. If he does not have one we can quickly get it to him.

PFANSTIEHL RADIO COMPANY

Sales Offices: 11 S. La Salle St., Chicago, Ill.

Factories: Waukegan, Ill.

Pfanstiehl

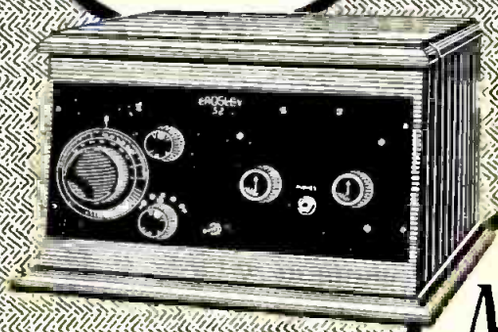
OVERTONE RECEIVER

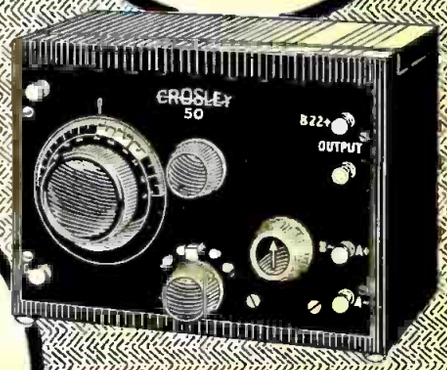
✻ *Tested and Approved by* RADIO AGE ✻

CROSLEY 1 AND 3 TUBE RADIOS

52 Special
$35
3 Tube

50 Regular
$14.50
1 Tube





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