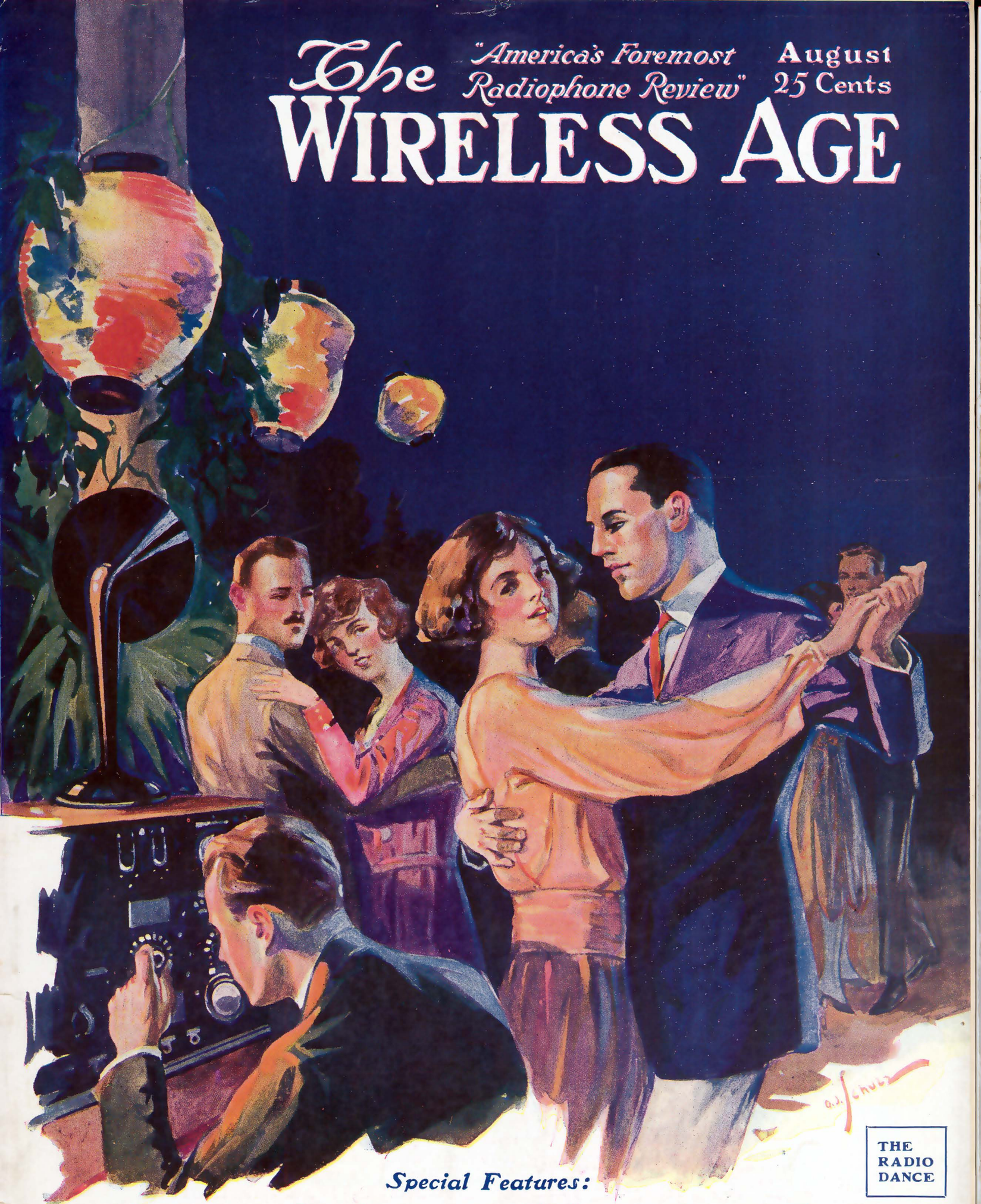
"America's Foremost Radiophone Review"

August
25 Cents

The WIRELESS AGE



THE RADIO DANCE

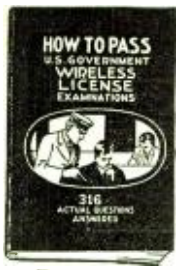
Special Features:

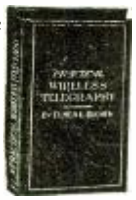
Russian Radio
Fighting Forest Fires
Radio Relief for the Ailing

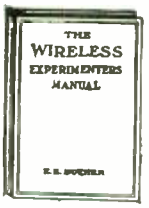
INDOOR ANTENNAS WITH CRYSTAL SETS

THE PROBLEM OF BROADCAST RECEPTION

Interviews with Air Entertainers—Radio Pictorial—Broadcasting Boxing Bouts







Jobbers

and

Dealers

Will you be ready to meet the demand when the rush starts?

Or will you be one of those scrambling for stock when your customers want deliveries?

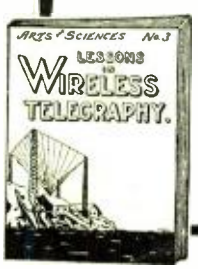
Check up your stock now.

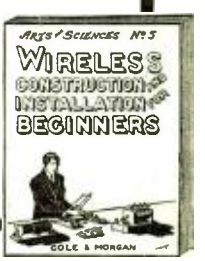
Place your orders.

Get ready for the buying rush

If you haven't got our complete list of books and discounts, *write for it to-day.*

This Fall's business is going to be a hummer and books will be more in demand than ever before.





WIRELESS PRESS, Inc.
326 BROADWAY NEW YORK

VOLUME 9

THE WIRELESS AGE

NUMBER 11

Edited by J. ANDREW WHITE

Contents—August, 1922

RENEWALS—When subscription expires you will find a renewal blank enclosed. Return with remittance promptly.

CHANGE OF ADDRESS—Notify us of any change in your address, giving both the old and new location.

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Owing to the fact that certain statements and expressions of opinion from correspondents and others appearing in these columns from time to time may be found to be the subject of controversy in scientific circles and in the courts, either now or in the future, and to sometimes involve questions of priority of invention and the comparative merits of apparatus employed in wireless signalling, the owners and publishers of this magazine positively and emphatically disclaim any privity or responsibility for any statements of opinion or partisan expressions if such should at any time appear herein. Printed in U. S. A.

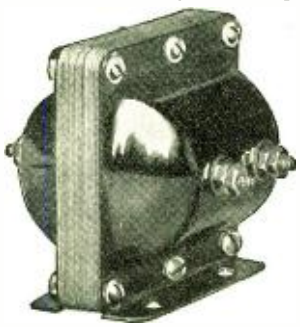
Advertisers' Index

CROSLEY RADIO PRODUCTS

"Better—Costs Less"

The Sheltran

Audio Frequency Amplifying Transformer



The CROSLEY SHELTRAN AUDIO FREQUENCY AMPLIFYING TRANSFORMER. High grade materials and excellent workmanship combine to give the CROSLEY SHELTRAN great efficiency and attractive appearance so often lacking, except in the most expensive transformers. Incorporated in the design of the SHELTRAN are all the characteristics necessary to obtain maximum amplification from the modern vacuum tubes. The ratio of turns is 9/1. The CROSLEY SHELTRAN has a base area of 1¼"x2½". Net weight 12½ ounces. The over-all length is 2½"; the over-all height is 2-7/16"; and the over-all width is 2-11/16".

Price, complete ready to mount—$4.00

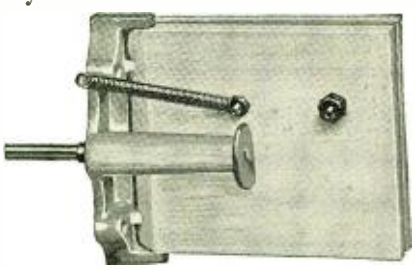
Harko Senior Radio Receiver

This instrument is a combination tuner and audion detector, and was developed to supply the demand for a low priced efficient receiving outfit with a range of 150 to over 600 meters. The hook-up is special—of our own design and is non-regenerative. New Jersey, Pittsburgh, Detroit and other phones are regularly copied in Cincinnati and other points, with this receiver. The HARKO SENIOR is 11½ inches wide, 6 inches high, and 4⅞ inches deep. Price, complete without "B" Battery, "A" Battery or phones—$20.00.

Crosley Two-Step Amplifier

This instrument was designed to give the very maximum in value and to match up with the Harko Senior, using the same sized cabinet. Complete with amplifying transformers, sockets, rheostat, switch, binding posts, etc., mounted on formica panel in mahogany finished cabinet. This efficient instrument can also be used with any other apparatus requiring two step amplifier. Price, complete as shown in illustration—$25.00.

Crosley Variable Condensers



These condensers need no further introduction. They have been accepted by radio experts all over the country as being extremely efficient in all kinds of work. The Model "A" has a wood frame and the plates are high grade laminated wood. The Model "B" has die cast frame and best quality laminated wood plates. The Model "C" has die cast metal frame and porcelain plates and has a conservatively rated capacity of .001 MF. All CROSLEY CONDENSERS are tested under one thousand volts before shipment, and will not shower or break down in radio phone work.

	Price
Model "A" without knob and dial	$1.25
" "A" with knob and dial	1.75
" "A" with knob and dial mounted in mahogany finished cabinet complete with binding posts	2.50
" "B" without knob and dial	1.75
" "B" with knob and dial	2.25
" "B" with knob and dial mounted in mahogany finished cabinet with binding posts	3.00
" "C" without knob and dial	2.25
" "C" with knob and dial	2.75
" "C" with knob and dial mounted in mahogany finished cabinet with binding posts	3.50
Crosley knobs and dials complete, each	.50

Crosley V T Socket—60c

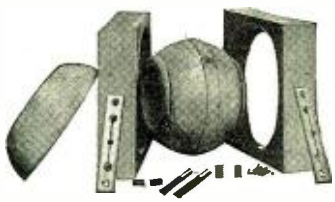
"Better—Costs Less"

The biggest selling socket on the market today. Practically unbreakable. For either base or panel mounting; made of one piece of porcelain. No metal shell and no ground hum. Better—and costs only 60c.

Harko Radio Receiver

The most compact, complete and efficient crystal receiving outfit on the market. Will tune from 200 to 600 meters, bringing in spark, voice and music with amateur antenna. A wonderful little instrument. Price, complete with battery, etc.—$9.00. One thousand ohm single head set, 125 feet of wire, insulators, etc., $6.00 extra. Complete outfit—$15.00.

Crosley Variometer Parts



Consist of two stators, one rotor and the necessary hardware as shown in the illustration for complete assembling. Shaft for knob and dial is 3/16" diameter. Wood parts are furnished either in mahogany or poplar.

Price, complete, made of poplar wood $1.50

Price, complete, made of mahogany wood $1.75

Crosley Variocoupler Parts

Consist of formica tube, rotor and brass hardware for complete assembling. Price, not wound or assembled, as shown in illustration. $1.50. Rotor only—40c.

Crosley Cabinets

We manufacture a full line of cabinets in gum, mahogany or quartered oak, and furnish them with genuine formica panels. Prices on cabinets range from $2.50 to $10.50.

Jobbers and Dealers: Order now if you expect early delivery.

CROSLEY MANUFACTURING COMPANY, Radio Dept. W-4, CINCINNATI, OHIO

No Wireless Receiving Set is complete without

The MAGNAVOX Radio

R-2
Magnavox Radio with 18-inch horn

For those who wish the utmost in amplifying power; for large audiences, dance halls, etc. Requires only .6 of an ampere for the field.

Price $85.00

AFTER once using a Magnavox Radio you would no more go back to the telephone headset than you would exchange your electric light for a feeble tallow candle. With the Magnavox Radio you hear every wireless program at its best—your receiving set only brings the message while Magnavox Radio tells it clearly and in

R-3
Magnavox Radio with
14-inch horn

The ideal instrument for use in homes, offices, amateur stations, etc. Requires one ampere field current from your filament battery.
Price $45.00

volume ample for dances, parties and other entertainment.

The Magnavox Company have been pioneers in the development of scientific devices for sound amplification.

Consequently the new radio situation created by the marvelous spread of broadcasting facilities has only served to give additional prominence to the basic importance of Magnavox products.

When you purchase a Magnavox Radio or Magnavox Power Amplifier you possess an instrument of the very highest quality and efficiency. The Magnavox Radio and Magnavox Power Amplifier may be had of good dealers everywhere.

Model C
Magnavox Power Amplifier

Insures getting the largest possible power input for the Magnavox Radio. Can be used with any "B" battery voltage which the power tube may require for best amplification.

AC-2-C, 2-Stage - - - $80.00
AC-3-C, 3-Stage - - - 110.00

Full Information—Send for It.

Every radio user will be interested in reading this new folder on the Magnavox Radio and Magnavox Power Amplifier. *Send for a copy today.*

THE MAGNAVOX COMPANY
Home Office and Factory:
Oakland, California
New York Office: 370 Seventh Ave.

MAGNAVOX Radio
The Reproducer Supreme

Ask to See This New Radio "B" Battery

Ask also to see the Willard All-Rubber Radio "A" Battery—a 6-volt battery built especially for Radio reception.

Ask your dealer or your nearest Willard Service Station to show you this specially designed 24-volt rechargeable Radio "B" Battery. Note the leak-proof glass jars—hard rubber screw-on covers—special Radio "B" plates—Threaded Rubber Insulation.

These features considered, it is not surprising that the Willard Radio "B" Battery has such a *remarkable ability to hold its voltage,* or that it is so noise-free and trouble-proof.

WILLARD STORAGE BATTERY COMPANY, CLEVELAND, OHIO
Made in Canada by the Willard Storage Battery Company of Canada, Limited, Toronto, Ontario

THREADED RUBBER BATTERY

Willard

Don't Strangle

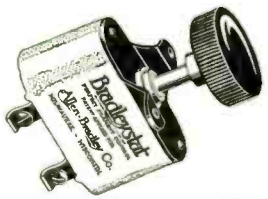
Your Radio Set With a *Wire* Rheostat!

Install a Bradleystat for vacuum tube control

When you build a radio set, do not overlook that *vital* part of the set, the filament rheostat. Install a Bradleystat in each vacuum tube circuit, and you will be sure to get—

1. *Clearest and Loudest Reproduction,* because the Bradleystat stepless control locates the precise filament current for greatest amplification or detection.
2. *Quickest and Easiest Tuning,* because one knob, without vernier, does the work. There are no interfering noises, no loss of time, and no worry, as with complex wire rheostats.
3. *Greatest Receiving Range,* because noiseless control detects weak radiophone waves, and by locating exact filament current, amplifies the waves to fullest extent.

Remember, the most critical part of all tuning is done with the filament rheostat. Use Bradleystats in place of wire rheostats and get the most out of your radio set.



Bradleystat

REGISTERED U. S. PAT. OFF.

PERFECT FILAMENT CONTROL

Two columns of graphite discs (not loose carbon grains) provide the delicate control so vital and essential for vacuum tubes in radio sets.

A single adjusting screw gradually applies or removes pressure from the discs, thereby changing the filament current in such a smooth and stepless manner that you quickly find the loudest and clearest reproducing point of your tube.

The Bradleystat is so simple and efficient that thousands of radio enthusiasts are using them to the exclusion of all wire rheostats. Twenty years of experience and research have made such perfection possible.

Allen-Bradley Co.
Electric Controlling Apparatus
283 Greenfield Avenue
Milwaukee, Wis.

INSIST ON THE CHECKERED BOX

Retail Price

$1.85

Postage 10c extra

MAIL Coupon for FREE BOOKLET on V. T. CONTROL

Allen-Bradley Co.
Electric Controlling Apparatus
283 Greenfield Av., Milwaukee, Wis.

Please send me latest bulletin on Bradleystat Perfect Filament Control, explaining how it will improve my radio set.

.....

.....

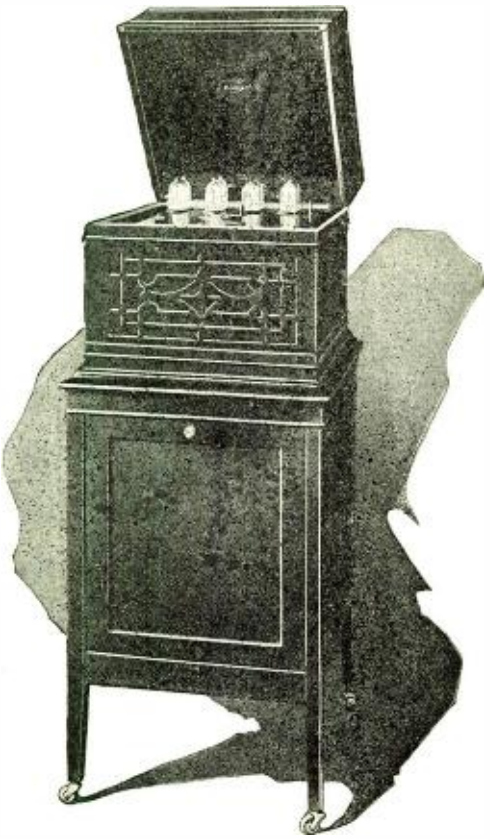
For this Broadcasting Receiver thousands have been waiting

EVER since broadcasting became the vogue there has been a demand for a receiver which would fill a whole room with music of perfect tone quality but which would be so simple that anyone could tune in by moving a single lever.

This ideal has at last been realized in the Aeriola Grand—the supreme achievement of present-day radio.

When you hear the voice and the music that come from the Aeriola Grand it is as if the lecturer or singer at the broadcasting station were in your presence. The whole family listens and marvels.

The Aeriola Grand stands unrivaled not only as a radio receiver but as a piece of cabinet work.



Prices

Complete with mahogany stand, storage battery, battery charger, antenna equipment and all accessories	$409.50
Without stand, storage battery, charger and receiving antenna equipment	$325.00
With stand, but without storage battery, charger and antenna	$350.00
Mahogany stand only	$ 35.00

See the Aeriola Grand at your nearest dealer

Before you buy any receiver, secure a copy of the book "Radio Enters the Home." It tells the real story of radio and will help you to get the most out of this new art. 128 pages—over 200 illustrations—35c a copy. At your dealer or write direct to

What the guests heard at the Jacksons' Aeriola Grand Party

- Baseball scores
- Dance music
- Songs by a great ballad singer
- Lecture on the "Wedding Ring, Past and Present"
- A story by a famous author
- Chamber music by a noted string quartet
- The whole opera "Cavalleria Rusticana" with explanations
- News of the day

Weather forecast for the following day

Radio Corporation of America

WORLD WIDE WIRELESS

Sales Dept., Suite 2064
233 Broadway
New York, N. Y.

District Office
10 So. La Salle Street
Chicago, Ill.

The Pink-a-tone

Guaranteed range 30 miles. Portable, efficient and selective set, mahogany finished cabinet. Famous No. 2 Stromberg-Carlson 2000 Ohms phones included. Price $25.00

Radisco Variocoupler

Positive contact assured by phosphor bronze brushes at each bearing. Wire is insulated. Wave length range with suitable condensers, 150 to 700 meters. $6.00.

Phonoscope

Extra headphones are unnecessary. The phonoscope permits four people to "listen in." Does not cause distortion. Only $5.00.

Pocket Receiver

The most convenient small set. Fits the coat pocket. Range 30 miles—permits sharp tuning. Only $5.00.

Clamping the jinx on lightning pranks

NIGHT and a storm—the sky's aflame. Now's the time you're glad you had the forethought to buy a Radisco Lightning Arrester for your radio set. Without it the high induced charges always present in your antenna during an electrical storm can ruin the delicate instruments.

With the Radisco Lightning Arrester installed on your antenna wire you clamp the jinx on lightning's pranks. The Radisco continually side-tracks these high induced charges (caused by lightning in your neighborhood) before they can harm your set.

Neat, inexpensive. Outside type $3. or the inside type for $2.50 at your dealer's or mailed direct. Ask also for our special summer catalog of radio supplies. You will find the best in many types of radio products listed for your convenience. Get it now while the supply lasts. The Radio Distributing Company, Newark, New Jersey.

RADISCO
LIGHTNING ARRESTER

In Our Opinion

Emergency Equipment for Aircraft

THE loss at sea off the Florida coast recently of the big passenger-carrying seaplane Miss Miami after a forced descent, with a toll of four lives, and the death of the French General Laperine by thirst and exhaustion in the Great Sahara Desert, after a forced descent of his airplane, brings out clearly in two extremes the peril to which travelers in heavier than air machines may be subjected and the consequent necessity for emergency radio equipment on planes of all types.

General Laperine setting out to fly across the Great Sahara was forced to make a landing in the desert, and wandered around until death from exhaustion, thirst and hunger overtook him. His plane was equipped with radio, but no signals were received from him by fixed radio stations well within range of his transmitter, for the interval of time between when the trouble in the plane first developed and when the craft actually landed was not sufficient to transmit a call. This tragedy emphasizes the inadequacy of the standard form of radio installation, in which the air-driven generator and trailing antenna are useless for transmitting purposes, once the plane has landed.

The case of the Miss Miami discloses gross carelessness, for this was a commercial seaplane plying between Miami and the Island of Bimini, off the eastern Florida coast. A forced descent when fifteen miles from the island because of a broken propeller, brought the frail craft down to a rough sea; then a storm came up, but for two days and nights the four passengers clung to the plane until one by one they succumbed to exhaustion and died, their bodies being washed overboard and lost. The wreck was finally sighted by a passing steamship and the pilot, more nearly dead than alive, was rescued.

The provision of reliable emergency radio sets on planes of various types has often been discussed by engineers but no acceptable method of furnishing primary power has yet been found. Storage batteries, small gasoline engines and hand-driven generators have been principally objected to because of weight. The antenna problem, however, is less serious, for an antenna fixed to the wings of the plane has been found to be serviceable over short distances and the Navy Department has conducted successful experiments with emergency antennas flown by kites.

Congress might well emulate the example of the British House of Parliament, which announced recently that regulations would soon be issued requiring that all British aircraft must be equipped with radio. American aircraft operating in commercial passenger-carrying traffic should protect the lives of pilots and passengers and should be required to install not only radio equipment for ordinary communication purposes, but emergency equipment as well.

Location of Radio Stations

THE tests of radio transmission and reception made recently between a moving train on the Lackawanna Railroad and several fixed stations along the route confirmed practically all previous theories with regard to the location of a station in relation to surrounding objects. Very little difference could be detected in received signals between the times the train was running on an open stretch of track or through cuts 30 to 40 feet deep. Signal strength increased noticeably, however, while the train was passing lakes, and even in greater degree when the run was over a high embankment. Whenever the train passed through heavily wooded country, the signals faded out entirely.

These tests clearly indicate that a station erected in open country, preferably on an elevation and clear of trees and other growth, will do better work than one in a valley or surrounded by trees.

* * *

The Propaganda of Fear

EVERY so often we hear of another revision of the Fire Underwriters' rules and regulations, coupled with warnings that radio fans must conform strictly to the "revised" code or face an increase in premium rates or refusal of insurance altogether.

Our valued contemporary, Electrical Merchandising, terms this the "Blight of the Underwriters," and observes:

"An ordinary radio receiving set, as every reader knows, involves about as much fire hazard as a white enamel bath tub."

It is advanced that even the authors of the underwriters' new rules freely admit that antennas installed wholly inside of buildings represent no fire hazard whatever—that any existent hazard lies in lightning striking the antenna that extends outside of the building.

"And how much lightning hazard is that?" is asked. With the answer: "Isn't the lightning, or fire hazard, of an antenna extending outside a dwelling or other structure, only comparable to the lightning or fire hazard of many familiar structures such as gutters, leaders, metal roofs, metal clotheslines—as much and no more?"

Lightning strikes literally only about one house in a million, so the hazard is an extremely small one, no greater than if the antenna did not exist. Fire underwriters nor anyone else has yet demonstrated, nor proven conclusively, that even an outdoor antenna is extra hazardous.

The restrictions are becoming absurd, and it is about time for the army of radio enthusiasts to take a firm stand against unreasonable requirements.

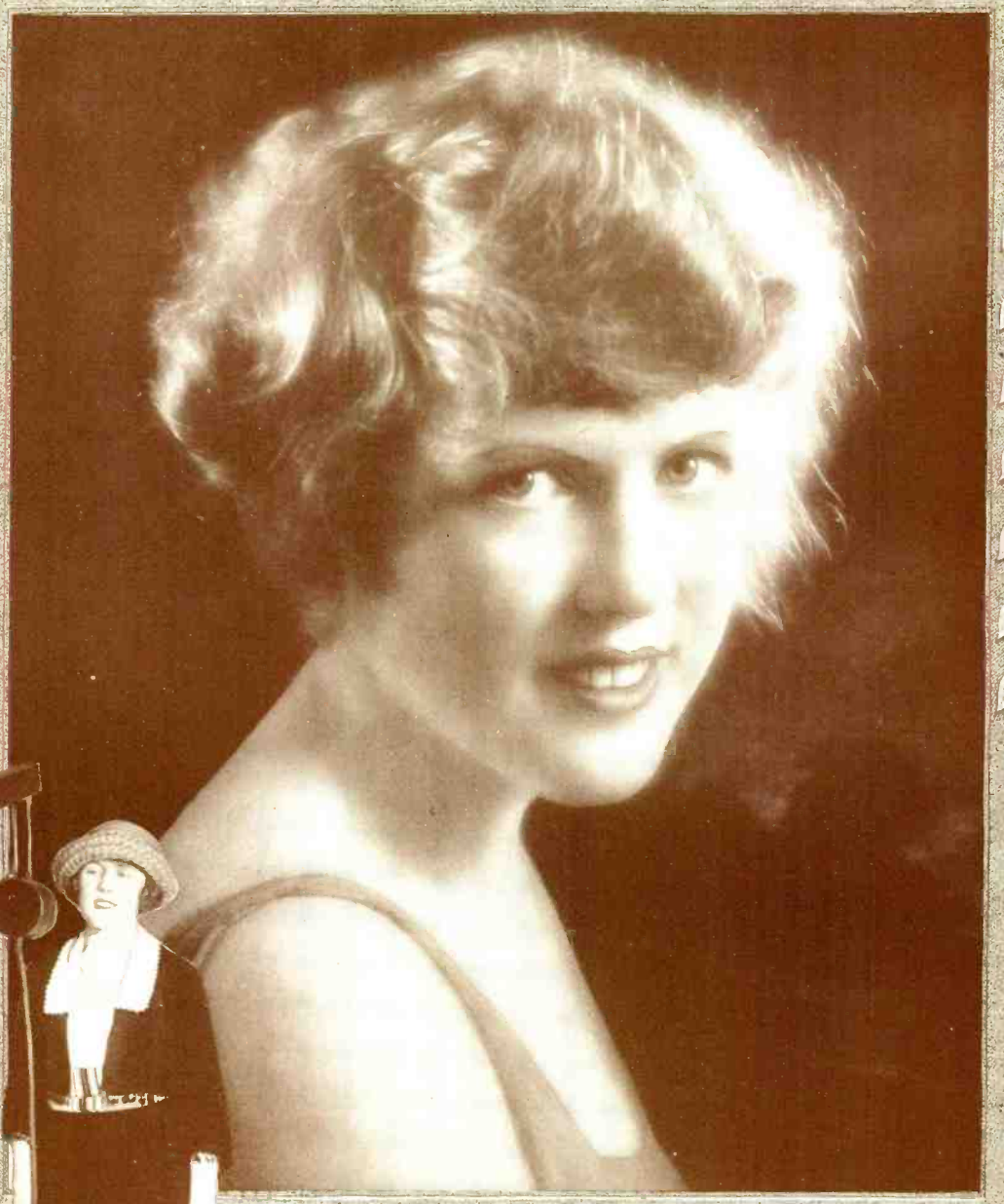
Any proposed campaign of cancellation of insurance policies might well begin with the indoor wiring of houses and other buildings throughout the country, a large percentage of which probably contain violations of the existing code. But any attempt to cancel insurance against all violations either of antennas, or the regular indoor wiring, would come pretty close to demoralizing the insurance business, so it is not expected that any such thing will be attempted.

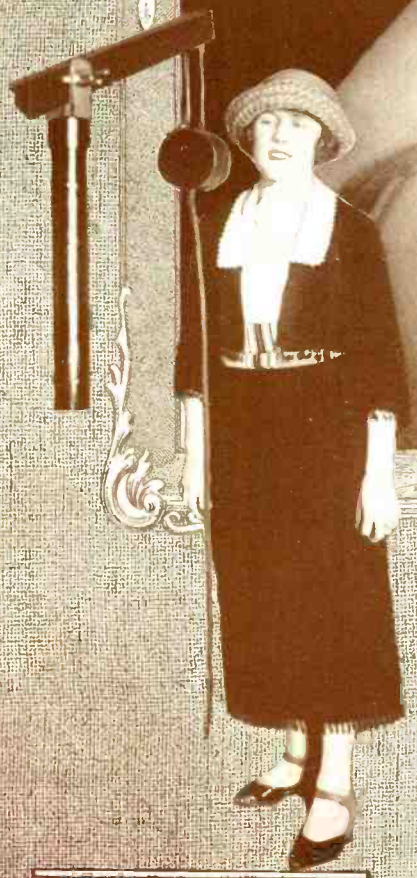
Yet it is undeniable that "propaganda of fear" carried on against radio has accomplished only one thing—restriction of the radio industry. Having no justification, it should be abandoned at once.

Kouns Sisters Are Real Friends of Radio Public

NELLIE AND SARA KOUNS believed Guglielmo Marconi when, in 1914, he told them that some day they would sing to hundreds of thousands by the radio telephone. The prophecy and how it came true is told on page 33

Radio Her Medium for Instruction in Graphic Art





TO this talented young caricaturist and actress, Ruth Hammond, first came the idea of teaching drawing via the radio telephone. On page 37 appears her first broadcast lesson, with her own instructive illustrations

"Howdy, Radio Fans," Says Comedian Eddie Cantor

WHEN Eddie Cantor spoke into the homes of the radio audience, his mail next day contained dimes, nickels, pfennigs, Austrian kronen and buttons. The article on page 39 tells how it happened and who got the collections

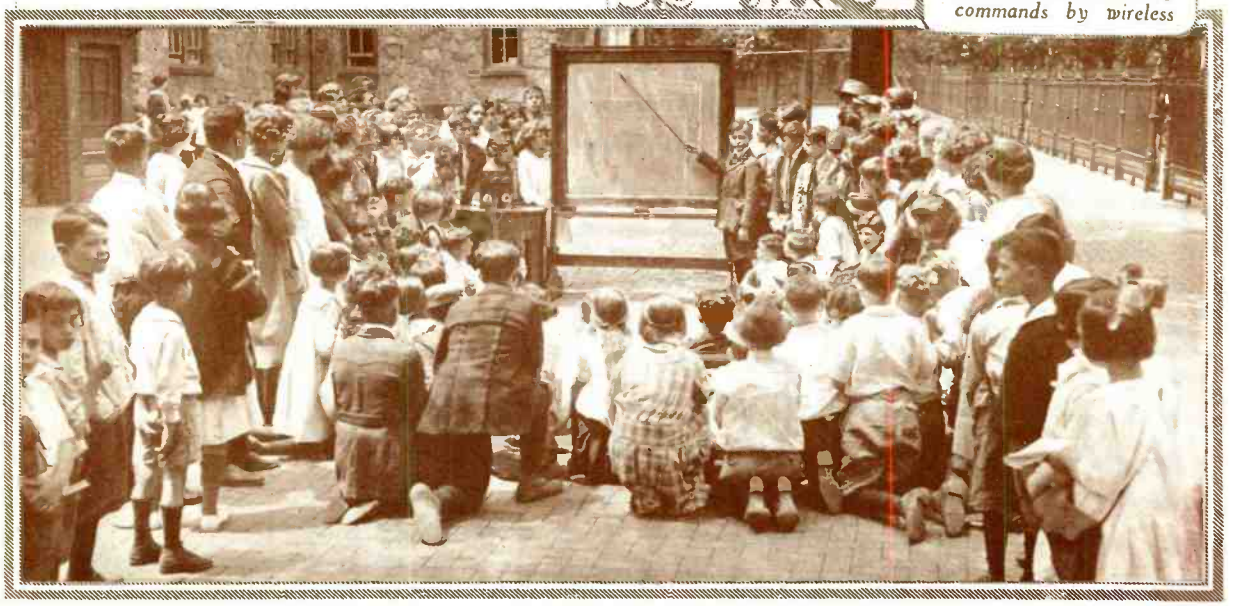
Noted Pianiste Pays Radio a Deep Compliment

CAROLYN BEEBE, founder of the New York Chamber Music Society, considers that the radio telephone is aiding her in developing public appreciation of the best music. Her broadcasting experiences, told on page 47, proved this to her

Children Prove Age Is No Bar in Radio Work

Jackie Coogan listens over the radio telephone to the broadcasting of the new song "Oliver Twist," written around his latest motion picture of that name

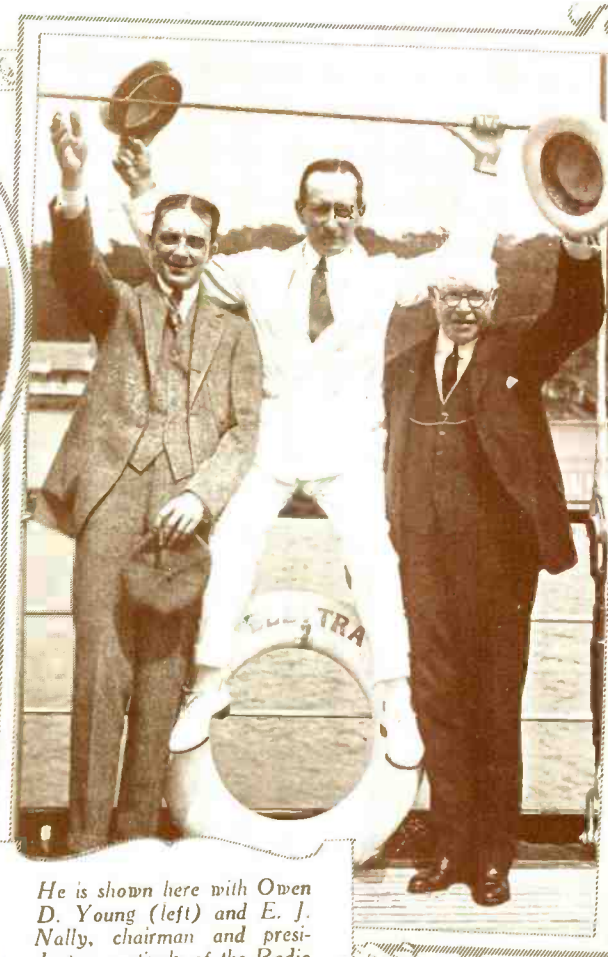
These students of the Lane Technical High School, Chicago, demonstrated radio telephone direction of military movements at their annual review, receiving commands by wireless



Philadelphia's reputation for sleepiness may or may not have been earned in the past, but if the new generation lives up to its present speed all somnolence soon will be banished there. William Noble Allen is the present leader of the sleep-banishers, for despite his 11 years he is a licensed radio operator and conducts instruction classes for school children and adults, as shown above. William is looked upon as a youthful code speed king, being expert in both practice and theory

Nation Honored by Visit of Guglielmo Marconi

Senatore Marconi aboard his yacht "Elettra" immediately upon arrival in New York City late last June



He is shown here with Owen D. Young (left) and E. J. Nally, chairman and president respectively of the Radio Corporation of America

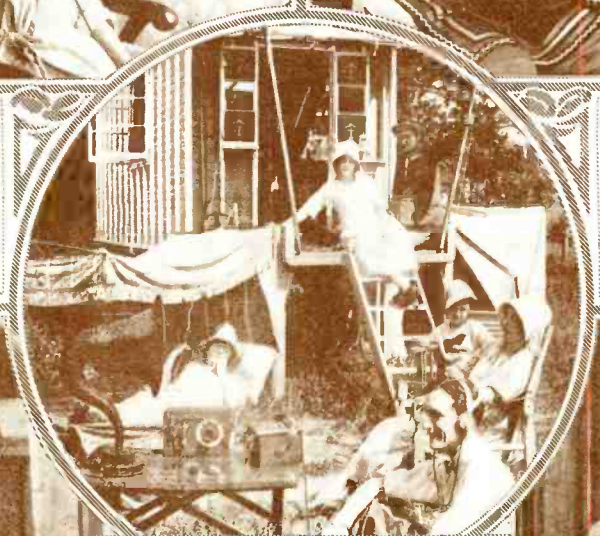
Mr. Marconi and Roy Weagant, famous expert in static elimination, standing in front of Alexanderson alternator at Radio Central, the Radio Corporation Station on Long Island

Before Marconi's departure for his home in Italy the photographer caught this interesting study of the wireless wizard in his element aboard his yacht

Radio Telephone Serves Well in Work and Play

An enterprising London, England, hairdresser provides her patrons with a permanent wave and radio waves at the same time

Chief Little Bear says "Radio Heap Good" and beats time with his tomtom as he listens to a broadcast concert in Chicago



Major Cleghorn, British war veteran, takes his radio set along when vacationing along England's by-ways in his completely fitted bungalow on wheels

This experimenter has worked out a transmitting microphone that he straps under his chin, where it catches the voice vibrations much as does an ordinary telephone when placed against the chest

If spiritualistic mediums are frauds, the Kymograph, operated by Dr. Hereward Carrington, its inventor, will show the imposition. It automatically distinguishes between voluntary and involuntary acts

Radio Music Charms Stage and Screen Beauties

For instance, Priscilla Dean at Universal City, Cal., finds time, even while in costume, to listen in on the radio

And Marion Merle, of vaudeville, at times places the phones about the ears of her trained and wondering parrots

While during a delay in street traffic, Corinne Griffith tunes in with her portable radio set and in her auto catches anything that may be in the air—concerts, news, lectures, etc.

"Radio, Page Mr. Brown!"

RADIO amplifying equipment, such as is used in many amateur receiving sets, is being used by the Hotel Essex, Boston, Mass., to replace the time-honored paging system. When requested to "page Mr. Brown" the telephone operator merely turns to a paging transmitter at her elbow and says, "Mr. Brown, please. Misterr Brrownn." And Mr. Brown, if he is in the lobby, hears the call from loud speakers located at suitable points.

Radio in Community House

RADIO instruments have become part of the essential equipment of community houses, being classed with the motion picture projector, the bowling alley, the basketball court and the showers. Such, at least is the opinion of the B'nai B'rith Congregation of Los Angeles, Cal., which is erecting a new synagogue and community house. The latter will have a complete radio set.

W J Z Gives Ships' Positions

A NEW and much-appreciated addition to the regular features of the program at WJZ, Newark, N. J., is the announcement of the positions of ships. Information as to the location of various vessels is secured from the Radio Corporation of America and given daily over the radio telephone at 8 p. m. The ships are described as being so many miles in a certain direction from various light ships, in most cases, as, "350 miles east of Ambrose Light Ship." This is especially liked by those of the radio audience who have relatives, friends or cargoes on the ships named.

Post-Office Official Station

COMMENCING July 1st Station WYX of the Post Office at Washington, D. C., began to broadcast by the radio telephone on 1100 meters, so that all may get the latest weather, crop and market news without knowing code.

The daily schedule, except for Saturday, when the station closes at 1 p. m., is as follows:

10:00 a. m. Weather (Eastern-Central only).
10:30 a. m. Washington wholesale fruits and vegetables.
12:30 p. m. Live stock, opening St. Louis and Chicago (form 41).
2:15 p. m. Chicago and St. Louis live stock closing (form 20).
3:00 p. m. Crop report and special market news.
3:30 p. m. General fruits and vegetables.
5:00 p. m. Wholesale dairy produce, New York and Chicago (form 59).
5:30 p. m. Grain report.
7:30 p. m. Live stock and grain (form 43).
8:00 p. m. Fruits and vegetables.
9:30 p. m. Weather.

Campfire Concert Broadcast

CAMP CURRY in Yosemite Valley, known for its campfire concerts, desired to "tell the world" about them and so selected the modern means of radio telephony.

The entertainers made the trip to Stockton and from the Stockton Record broadcasting station of the Portable Wireless Telephone Company sent out a concert exactly as held each evening beside the campfire at Camp Curry in the Yosemite.

Radio to Aid Babies

JUDGE Gustave Hartman of New York City, who is president of the Israel Orphan Asylum made a radio appeal recently from WJZ for funds to rebuild a home for 200 orphan babies, made homeless by the recent disastrous Arverne fire.

Finds Jobs by Radio

BY MEANS of the Navy's radio broadcasting station at Anacostia, NOF, the Veterans' Bureau Employment Service is broadcasting to veteran radio fans opportunities for employment, and is also broadcasting the names, for the benefit of prospective employers, of "Vets" skilled in various trades and professions who are in search of employment.

The first "Radio Want Ads" which went out, brought several replies. The broadcasting is a part of the Bureau's plan to establish national and departmental clearing houses for social, industrial and professional employment. Officials of the Bureau believe that with radio they are getting into closer touch with both the Veterans and the employers, as they reach the family circle in an even more personal way than through the newspapers.

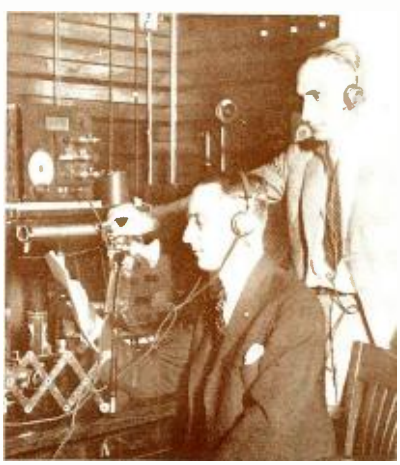


Photo shows Dr. Rogers (seated) of the Veterans' Bureau broadcasting a list of vacancies for former service men

Mars Still Silent to Marconi and the Earth

THE newspaper stories about Marconi's messages from Mars still lack confirmation from the famous radio expert, who declared on his recent arrival in this country that talk of his having received signals from Mars was "bosh." Among radio experts generally there is considerable doubt as to whether inter-planetary communication ever will be possible, for each planet is in effect a vast magnet, within the field of which radio signals travel, and from which it probably would be impossible for them to escape.

Mars for years has been a fertile source of conjecture. When Dr. Otto Klotz, director of the Dominion Observatory, returned to Canada recently from Europe he told ship news reporters that he would say nothing about communicating with Mars.

"Don't ask me to comment on Mars," he said. "Years ago we had a town planning campaign in Canada and a number of us wrote on various topics, all of which we had hoped would contribute to the gaiety of the occasion. I wrote about Mars and my screed was in the nature of a communication from the planet telling us that we were all wrong about laying out towns and about our mode of life.

"I remember that Mars had a method of making a superior brand of liquor and the best of beer was made over night from a preparation sold in the department stores of Mars. Well, some of the papers took the thing seriously and I heard from that story from all parts of the world. Some of the papers caught the spirit of the josh and kidded back on it, but a lot of them took it seriously and handed me back a fine stream of sarcasm. I was kidded, joked, jabbed, guyed and held up to scorn and for more than a year didn't know what peace of mind was. You will excuse me if I refrain from being quoted on anything that has anything to do with Mars."

Broadcasts Illustrated Talk

THE familiar habit of the lecturer who says "Next picture, please," made it possible for Ralph Hayes Hamilton to broadcast his illustrated lecture on the Yellowstone National Park, from the Rike Kumler station in Dayton, O. Mr. Hamilton distributed sets of his stereopticon slides to various churches and other organizations within the range of the station. The slides were arranged in proper order, and each separate audience, as it listened to Mr. Hamilton's words issuing from a loud speaker, was able to view on its own screen the appropriate picture.

J. Andrew White speaking at the ringside to the radio audience

Radio Telephone Gives Public Vivid Description of

Leonard-Britton Bout

Broadcasting of Championship Boxing Match Thrills Hundreds of Thousands

By Maurice Henle

WHEN the last gong had sounded, and the referee had announced the defeat of Benny Leonard by Jack Britton on a foul in the recent championship bout at the New York Velodrome, boxing fans within the immense open-air arena poured from the exits and scattered to their homes, the telegraphers snapped shut their keys and hurried away with the newspaper men. The special policemen, ushers, and helpers departed, the last man switched off the lights—and there was darkness. The contest was over.

That is what happened within the grounds where the classic contest was staged, but the true story of that championship match cannot be limited to the board fence encircling the stands.

Because for the first time in ring history the blow-by-blow results of a championship match were sent out from the ringside by wireless telephone direct to more than 250,000 listeners within a radius of as much as 800 miles. The greater part of this audience was packed within the states of New York, Connecticut, New Jersey, Pennsylvania and Delaware, although people as far west as Indiana and Ohio and north to Nova Scotia, heard the results.

So that in reality, at the same time the lights were being switched off at the New York Velodrome and the gates were being closed, a quarter million individuals scattered here, there and everywhere were taking off their head phones, were shutting off their loud speakers and leaning back with sighs of satisfaction.

For, through the eyes of J. Andrew White, Editor of THE WIRELESS AGE, they *saw* the fight, saw it almost as clearly as if they had been at the ringside with him. They heard by radio the gong, the shouts of the crowd and Mr. White's voice-picture of the bout as it progressed round after round.

A world's championship match had been broadcast before. The radio audience back in July, 1921, received the reports of the "Battle of the Century" between Dempsey and Carpentier, but in that instance, as in others, the description of the match was telephoned by wire and then relayed by another voice speaking by radio. No such round-about process was used in broadcasting the Leonard-Britton bout. Through a radio engineering feat, described elsewhere in this article, the voice of one man was used, that of Mr. White, at the ringside.

On the night of the championship match, Monday, June the 26th, the weather in the Metropolis was ideal, even for New York. The streets were crowded with a restless, ever-moving throng from the Battery to Van Cortlandt Park, from one end of Brooklyn to the other, and in the congested sections of the Bronx. It was a clear night, just a trifle too hot for the theatre and not hot enough for the seashore resorts, so the people stayed in town and Broadway claimed its own.

The subways, the busses and the taxi cabs were filled to capacity, Velodrome bound, but the huge bowl despite its proportions after all could only hold a bare 30,000 and greater New York claims more than 7,000,000.

A RUSH FOR HOME

So those who owned radio receiving apparatus stayed at home, having eagerly anticipated for a week the broadcasting of the championship match. They did not want to miss it. Those who did not own receiving equipment tried their best, if they were not going to the fight itself, to ferret out a friend who was fortunate enough to possess one.

The town was on edge and in the

Just one of the New York street-corner crowds that gathered in front of loud speakers. In this case, part of the radio and boxing fans at 94th Street and Broadway, where 450 people heard the description via an instrument in the laboratory of the Waveolian Radio Corporation

words of the showman, the stage was set for a successful event.

There are scattered along Broadway and throughout greater New York many small dealers in radio equipment. They too "sensed" the eagerness of the crowd and had—practically every one of them—loud speakers rigged up, and announced in advance that the description of the bout would be heard.

The crowds paused. They heard a voice:

"This is WJZ, the Radio Corporation-Westinghouse Broadcasting Station at Newark, New Jersey. A blow-by-blow description of the Leonard-Britton championship bout will now be given from the ringside at the New York Velodrome. One moment please, while we make connections."

The crowd became interested. It seemed to settle—to lose its roving spirit.

"Hello! Hello! Good evening. This is J. Andrew White, speaking from the ringside. A blow-by-blow description of the championship match will now be broadcast via WJZ. The contestants are not quite ready so I will first describe for you the scene here at the Velodrome."

The thousands listened while the voice told of the colorful crowd in the banked up seats and went on to say that Jack Dempsey was coming up the aisle; other celebrities of art and industry were mentioned; a famous sporting editor was introduced, and an effort made to have him say a few words over the radiophone. Another pause and then the same voice announced that the boxing expert was overcome by modesty and stage fright, but that he sent his greetings. Then the voice introduced Senator James Walker who fathered the present New York State boxing law, announcing that Senator Walker would say a few words. This he did and in his short speech declared that the members of the New York Boxing Commission were convinced that the public wanted clean sport and that its belief was being fully justified in the capacity crowd at the Velodrome and in the knowledge that 250.00 more people who could not get in, were listening to the radio description that night.

And then the voice of the observer went on to say that many women were present, and had enjoyed the preliminary bouts.

A gong clanged incessantly and the voice explained that the gong the radio audience had just heard was rung in the endeavor to secure silence from the crowd, because the announcer, Joe Humphreys, had something to say. This was to introduce the boxing champions present and then the principals of the bout and to give their weight and so forth. Then there was a pause and a deafening roar; the voice explained that this was the greeting accorded Leonard and Britton by the crowd as the two champions entered the ring.

"In a moment the fight will commence," said the voice.

By this time the crowds along Broadway had become completely absorbed and all thoughts of drifting further had fled from their minds. Knots of people, grouped around the many loud speakers in front of the radio shops, waited with bated breath.

Truly, radio was claiming its own.

Clang—gg-g!!

"That," said the voice, "was the gong for the commencement of the first round. The men are now in the center of the ring, sparring lightly for an opening. Leonard lands a light left on Britton's face. The men are sparring. Leonard jabs a left to the face. He jabs another left without any return from Britton. Britton tries a left hook to the body but fails to connect. Another left hook and another to the same spot fall short. Leonard connects with a left jab to the face. The men now are in a clinch. Britton lands a left to the stomach. Leonard crosses with a right to the face and Britton counters with a hard left to the stomach. The men again go into a clinch. Leonard tries a right but is high and Britton makes a left dig to the body. The men are sparring..."

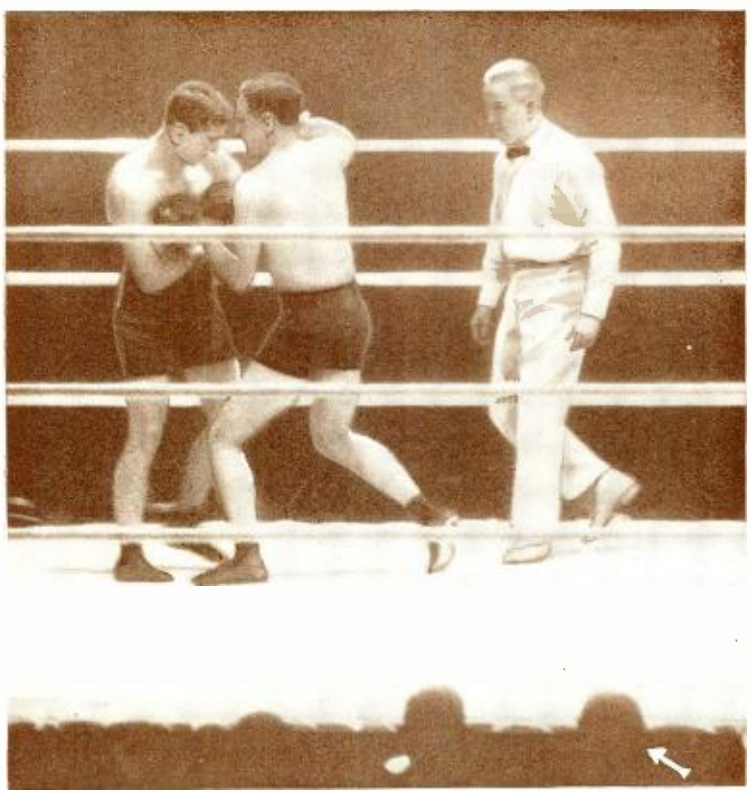
Clang—gg-g!!

"That is the bell for the conclusion of the first round. The men are now going to their corners and are receiving the attention of their seconds. Neither man shows any effects of the milling of the first round."

The writer wanted to get an unbiased description of how the news was received by those listening in. He did not stay in any one group; he did not pick out any one locality; nor did he disclose to any friend he happened to meet that he was there to record the impressions of the crowd, because he wanted to have clear-cut, frank and unbiased expressions from the thousands who were listening in.

And he can say in all sincerity that if one conclusion could be drawn from his wanderings around the Metropolis that night, that if one outstanding point must be emphasized, as to what he learned from his observation, then it was the fact that the public has accepted radio as something established, not to be marveled at, not astounding, but something as matter-of-fact as the telephone, typewriter, and almost as commonplace and convenient as the megaphone.

That in itself is really astonishing. Radio telephony, as the public knows



Arrow points to J. Andrew White, Editor of The Wireless Age, who was the ringside announcer for the radio public. Photo shows Britton (center) landing a blow in an early round, with Referee Patsy Haley keeping a watch on every move

it, has been a familiar agency only a little over a year, and yet within that short time the people have passed through the stage wherein it was a scientific phenomenon to be regarded with awe. They now class it with other established means of communication.

In but one or two instances during the entire period that the returns were coming through, the writer heard such exclamations as "Gee, that's wonderful!" "Just think—by wireless!" and "So plain, too!" For the rest, it appeared that the assembled crowds had their minds concentrated on the words that they heard and not on the medium through which they heard them. At some shops very little amplification was used and as a result the crowd could only be four or five deep around the horn. Those up close, in their eagerness and in the excitement of the moment, would pick up a phrase and relay it to those beyond the point where the words were clearly distinguished.

In most of the shops, however, the voice came over very strong and in such instances the streets were blocked from sidewalk to sidewalk with a listening mob. In many such instances people at the most distant point of the crowd could hear the results more clearly than could those directly under the horn.

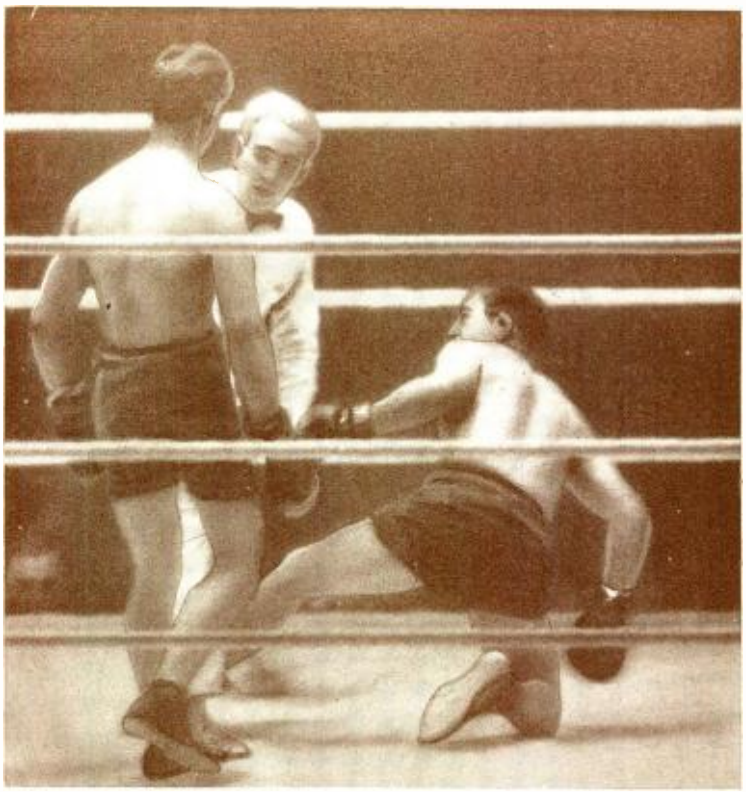
So great were the crowds around these high amplification loud speakers at several points that police reserves from the district precinct had to be called out to clear the traffic. At 94th Street and Broadway, two loud speakers were extended from second story windows, one on the Broadway side and another on the 94th Street side. On the Broadway side, traffic regulations restricted the size of the crowd but on the 94th Street side people were packed up against the sides of the buildings on the opposite street corner. The groups included men, women and children, who stayed from start to finish.

At Times Square, the heart of New York, the crowd became so great on the street that the manager at the radio shop was forced to lessen the volume of sound because with the power that he was using the voice travelled as far away as the Claridge Hotel, which is a good 250 yards away.

Gong Pleases Crowds

And then still farther on downtown, at 23rd Street, similar scenes were being enacted, with police lines holding the crowd in check. And so in Brooklyn. And the Bronx. And Staten Island. And Jersey City. And Newark. And everywhere.

The thing that tickled the fancy of the crowds that night, more so than possibly any other point, was the clearness with which the gong could be heard. It brought a smile to every face, an involuntary smile. It was one of the little touches that made the whole affair so real, and delighted all even more than hearing the crowd cheer and yell.



The foul in the exciting boxing exhibition in the thirteenth round. Leonard (left) being waved to his corner by Referee Patsy Haley. Leonard hit Britton after the latter had dropped to one knee, and the photographer caught the group a second later

It was the one time, if at any, when the crowds along Broadway lost their poise. They chuckled with that same sheepish snicker of the school boy caught smoking corn silk. A few seemed to realize for an instant that they were, after all, listening to history in the making and that fully as wonderful as the description of the bout itself, was the instrument used to describe it.

But only for an instant, and then in the next second the crowd settled back into that same sophisticated attitude it already had assumed—an attitude closely identified with New York.

"We know radio is practical. We know it is here to stay. We realize the voice comes over clearly. What we want to hear is the fight." That was the sentiment of the crowds in the nation's metropolis.

But not only the people of New York were being entertained that night. Radio knows no limitations within the scope of the power used or of the sensitiveness of the receiving apparatus, so that at the same instant New Yorkers were hearing Mr. White's words, so were people in many other states.

"I do not know when I have enjoyed anything more thoroughly than your ringside account of the fight," Chester M. Scripture of Willimantic, Connecticut, told officials of WJZ.

"Mr. White's voice came over very clearly and was understood by all of us. I could hear the bell and the shouting of the crowd."

In another part of the State, at Bridgeport, other fans were fully as enthusiastic and as a typical example of what was going on there may be cited the little party that was held in the home of E. J. Huber, manager of the Postal Telegraph-Cable Company of this city. The little group was so enthusiastic that it actually cheered when Britton was declared the winner, just as though they were at the ringside, and all Mr. Huber's friends agreed that was one of the most enjoyable evenings they had ever spent.

It seems rather peculiar to imagine anybody in staid Boston, Massachusetts, having a ringside seat at the bout. But that is exactly what M. J. Daley of that city told friends that he considered he was having.

Mr. White's voice also penetrated Pennsylvania and found its way into homes in Wilkes-Barre, Scranton, Nanticoke and other places. S. L. Fenstermacher of Berwick, Pa., held a little party that night and about a dozen persons listened in at his home. An-

other little drama was enacted in his house that night and the little group declared that they could see the blows that were being described and every now and then they would break out in excited exclamation. The comment of F. R. Krupp, of Scranton, Pa., was very much like that of others of his State.

"We could hear all the details, the gong for each round, during the time that we were listening in. We could hear the uproar from the crowd because of the foul, and we could hear the gong ring for silence just before the referee made his announcement."

It was a great night for clubs, and many of them called special meetings. That is what happened to the Hooker Hall Radio Club of Springfield, Mass., according to the record of Ernest A. Berry, secretary.

"Forty members of the club listened in," said Mr. Berry. "Static conditions interfered somewhat with us but we were able to follow the fight round by round. But here in Massachusetts many people did not know in advance that the fight would be broadcasted and when they finally learned of it there was a mad scramble for the phones."

Indiana, too, was represented and from Veedersburg of that State, Marvin H. Cook wrote to congratulate WJZ.

And even at Bridgeton, Maine, the returns were heard. A. P. Clark of that city told friends that with his vaccum tube set, without amplification, he heard every word of the announcer perfectly and he could catch the noise of the crowd and the ringing of the gong clearly. Thousands of letters since the fight have reached the desk of Mr. White and of officials at WJZ. They came from widely scattered points, although the bulk of them were concentrated within a radius of one hundred miles of Newark.

It will be of interest to the radio public to read some of these letters which are printed in this issue.

Special Technical Equipment Insured Success

The technical arrangements by means of which the voice of Mr. White was broadcast from WJZ necessitated the use of much special equipment at the ringside and at WJZ. Special facilities were supplied, too, by the American Telephone & Telegraph Company in providing continuous and undisturbed wire line transmission between the ringside and the Newark station.

A transmitter of special design was used at the ringside. It was connected to several steps of audio-frequency amplification, in order to strengthen the voice of the speaker so that it would be of sufficient volume to properly modulate the transmitting set at Newark.

A special telephone line was run to the ringside from the nearest telephone cable, and connection made at the local telephone exchange with a through leased wire which ran direct into the operating room of WJZ station. Here the voice of the speaker was further amplified before going into the modulation system of the regular transmitting set. Arrangements were made so that the operator in charge at WJZ could if necessary cut in on the wire and talk to Mr. White at the ringside, or, himself, talk into the transmitting set for the purpose of broadcasting the preliminary and final announcements concerning the undertaking.

At the Velodrome several technical men stood watch under direction of Walter Frazier of the Westinghouse Co., either at the transmitter itself, or along the line, prepared to act instantly in the case of the slightest interruption to the service. At the telephone exchange and at other control stations of the telephone company, experts stood by to insure constant and satisfactory communication. The operator in charge at WJZ listened to every word radiated from the station into space, and such adjustments as were necessary were made from time to time to insure proper quality and quantity of the voice coming from the ringside.

The reports of the technical staff record that there was not a single instant's interruption of the service, nor the slightest disturbing noise of any character on the line throughout the entire evening. That the public also appreciated the faultless service has been fully demonstrated by several thousand letters of appreciation received, which specially referred to the excellence of the technical arrangements.

A Ringside Seat in the Parlor.

(From an Orange, N. J., Radio Fan.)

The Leonard-Britton fight description entered many homes where heretofore this sport was never mentioned.

In addition to the returns as broadcast by WJZ, many listeners heard on the side something like the following:

Willie: "Hey Pop! the fight's gonna start."

Mother (answering for both): "You listen yourself; father and I are not at all interested."

Father (more interested than he appears to be): "Don't be foolish, let's see what it is like anyway."

Both join Willie at the receiving set, mother with a very disapproving look.

Mother: "Your bulbs are howling, Willie."

Father: "Howling nothing! That's the crowd yelling; just listen to that racket!"

Willie (trying to hear the announcer): "Yeh! can't listen cause of the racket in here!"

Two minutes of silent attention.

Willie: "Boy! this is gonna be the berries!"

Mother (disgusted with the thought of it): "Yes, I can just imagine what it is going to be like. I never—"

Father: "Never mind the lecture now; let's hear what is going to happen. There's the gong for the first round."

Reports follow of jabs, hooks and stiff blows, until mother can hold her peace no longer and remarks:

"Oh! that's brutal! their faces will be mashed to pulp!"

Willie: "That's nothing! just wait 'till they get going!"

Round after round the fight goes on with continued reports of heavy punching, suddenly followed by a loud roar by the crowd.

Father: "Listen! someone got knocked for a loop sure as guns!"

Willie: "Wow! sounds like church bells were ringing for somebody don't it?"

Mother: "Well! of all the language! Where in the name of heavens do you hear such talk?"

By the eleventh round, father has forgotter himself completely and is perched on the edge of his chair. Willie, all excited, sits grinning, while mother still talks of the cruelty of it all and is certain one of the fighters will be killed before it ends; nevertheless she still holds tight to the receivers.

Willie: "Gee!, listen to 'em holler!"

Mother: "Goodness! I don't see how that announcer can be so calm and unconcerned with all the racket. Willie, just open the window, it's getting terribly warm in here."

Willie (winking at Pop): "Whatsa matter ma, gettin' excited?"

Pop laughs, and for a reason all her own mother does not attempt to reply.

Father: "Well, can you beat that! Leonard loses by a foul," (*meekly*) "that's a shame."

Willie grumbles disgustedly because no knockout occurred, while father sharing his young hopeful's disappointment dare not say it.

Mother (still trying to appear disgusted): "Well that is certainly terrible! I don't see any sport in it at all!" (*unconsciously*) "My! it certainly must be very exciting to be there and see it!"

Willie: "Well! as long as you both enjoyed it so much (terrible as it was) I guess I'll write WJZ and tell him how good it was."

"How'd you like to go to a fight with me sometime Ma? Huh?"—REINIE.

Having refused an invitation to see the fight between Leonard and Britton, I remained at home while my husband joined a party of men who went to see the fight. Bouts have never interested me.

Seeking amusement, I went to the radio—expecting to hear the concert, instead I listened (intently too) to every detail of the fight. I clearly heard the gong, the crowds yelling and became so enthused I called in my neighbors—all I could find who were interested—and we were all thrilled!

Won't Mr. Owitz (my husband) be surprised when at breakfast I can discuss the fight—for instance I plan to say: "Wasn't it a pity Leonard got so excited he hit Britton while he was down. The first seven rounds was just mere play—but—the round Leonard nearly cinched the fight when the crowds yelled 'follow him up! Finish it!'"

(*Continued on page* 42)

The Future of Radio

Wireless Telegraphy Is 22 Years Old and Has a Permanent Place in Commercial Communications—Wireless Telephony Has Been Developing for 15 Years—Broadcasting's Vast Benefits Still Only Nebulously Perceived

By E. J. Nally
President Radio Corporation of America

CONTRARY to the popular understanding, radio has not come to us suddenly. It has been under development continuously during the past twenty-two years. Commercial radio communication, that is, overseas radio telegraphy, has reached a high state of development and has found its place in the commercial world. Radio is now carrying a large part of the telegraph traffic between the United States and Europe and between the United States and Japan, the total volume of traffic constantly increasing.

Radio telephony has been under development during the past fifteen years, and during the late war was successfully used for both one-way and two-way communication.

"One-Way" Broadcasting

Popular radio—relatively short-distance radio telephone broadcasting, is the outcome of the realization of the vast possibilities of one-way transmission of news matter, vocal and instrumental music, lectures, sermons, etc.

Radiophone transmission from central, organized sources of information and entertainment makes it possible for the citizen to receive this service through the small investment involved in purchasing a radiophone receiver.

It is not communication in a two-way sense; radio broadcasting is the employment of a fairly well developed

E. J. Nally

science to a new use. Broadcasting is the recent development—not radio.

The future of radio telegraphy, therefore, is assured. It already has a healthy and well defined field. The future of radiophone broadcasting is another matter, and in this we can speculate with only the imagination limiting.

We may visualize the future of radio as developing in quantity and quality perhaps as news distribution has grown since Franklin's time, and as organized entertainment has grown in popular favor since the days of the Globe Theatre.

Radiophone broadcasting here gives us a new facility by means of which these potent agencies of civilization may be strengthened and made more popular and universal.

Broadcasting already has given the condition of isolation a new meaning. Isolation now, if it exists, must be a desired condition. No man, no family no matter where located geographically with regard to railroads or wire telegraphs, need be beyond the range of daily radiophone broadcasting of news items and entertainment.

Infinite Possibilities

It is difficult to understand how any thinking person can believe that broadcasting will not be further extended. Isolation of families in rural or mountain districts no longer need be involuntary.

The facility of the radiophone is here. It is available. If there is anything nebulous about its status, it is only that its vast, significant possibilities have been realized so recently that there is not yet agreement as to what its most useful application shall be.

In the meantime it is serving—making its way here and there and getting acquainted, so that we may well believe that in time it will occupy a destined place among the great forward steps of civilization along with the newspaper, the magazine, the rural phone and the automobile.

Operating room, showing high speed recorders, of the Radio Corporation of America, at New York City. Here the transmission of the Rocky Point plant is controlled

University Gets Phone Transmitter

THE University of Rochester, Rochester, N. Y., has just been presented with a radio telephone transmitting set by the Democrat and Chronicle and the Times-Union. The set had been built for the first-named newspaper, which at first planned to operate it, but after considering the superior advantages of it for the university, suggested to the second paper that they join in making the gift. The Eastman School of Music of the university will operate the set, broadcasting the programs given in the school's new Eastman Theatre. Excellent entertainment over a wide range should be provided, as the Eastman school is considered one of the best musical institutions in the country.

Song-Leading By Radio

"WHAT next over the radio!" marvels the man who has had lectures, concerts, vaudeville acts, and even musical comedy wafted to him on radio waves.

And from Seattle, Washington, comes the answer. "Community singing, of course!"

During a reception given there this year to Marshal Joffre, Mr. R. H. Vivian, the director of music for Seattle Community Service, sang through the radio telephone, for groups gathered around loud speakers in all parts of the city, each group joining in the songs under the direction of a leader. And not only did Mr. Vivian lead the singing for the people assembled under the song leaders, but he made it possible for those in every home or institution which was equipped with a radio apparatus, to join in the great chorus that was sweeping the city in honor of the French hero. Orphanages, hospitals, and shut-ins had the opportunity of participating in Seattle's welcome to Joffre.

Community Service organizations in other places have made use of the radio, but none in such an unique manner as Seattle. During San Francisco's Music Week a Community Service day was arranged at the radio studio of the "San Francisco Examiner" and a program of heart songs, dedicated to those confined in the hospitals of the city, was broadcast.

Radio Aids Home Makers

JUST as newspapers contain departments for women, so have the radio telephone broadcast programs been giving time to subjects of home interest, such as dressmaking, cleaning, cooking and all the thousand and one problems facing the housewives of America. Competent speakers on domestic subjects appear from time to time on the programs.

Principal Broadcasting Stations

KYW—360 Meters. Daily, 8 P.M. Central time, 9 P.M. eastern time. Westinghouse Station located at Chicago, Ill.

KDKA—360 meters. Daily, 8 to 10 P.M. Westinghouse Station located at East Pittsburgh.

WBZ—360 meters. Sundays, Mondays, Wednesdays and Fridays, 8 P.M. Westinghouse Station located at Springfield, Mass.

WGI—360 meters. Evenings, American Radio and Research Corporation station located at Medford Hillside, Mass.

WGY—360 meters. Tuesdays, Thursdays and Fridays, 7 P.M. General Electric Co. Station located at Schenectady, N. Y.

WJZ—360 meters. Daily, 11 A. M. to 10 P. M. Radio Corporation-Westinghouse Station located at Newark, N. J.

WVP—1450 meters. Evenings, 9 to 9:55 o'clock, except Sundays and Holidays. Signal Corps, Bedloe's Island, New York Harbor.

WWJ—360 meters, Daily, The Detroit News, Detroit, Mich.

KYJ—Leo J. Meyberg Co., Los Angeles, Cal.

KDN—Leo J. Meyberg Co., San Francisco, Cal.

WGR—Federal Telephone & Telegraph Co., Buffalo, N. Y.

WOK—Arkansas Light & Power Co., Pine Bluff, Ark.

WLW—Crosley Mfg. Co., Cincinnati, Ohio.

WOC—Palmer School of Chiropractic, Davenport, Ia.

WLB—University of Minnesota, Minneapolis, Minn.

Stations Broadcasting Music and Speech on 360 Meters

Additional List to Those Previously Published

WSB	The Atlanta Journal	Atlanta, Ga.
WFAA	Dallas Morning News	Dallas, Texas
WEAX	T. J. M. Daly	Little Rock, Ark.
WEAY	Will Horwitz, Jr.	Houston, Texas
WEAZ	Donald Redmond	Waterloo, Iowa
WEAN	Shepard Company	Providence, R. I.
WFAB	Carl Frank Woese	Syracuse N. Y.
WEAR	Baltimore American & News Pub. Co.	Baltimore, Md.
WEAU	Davidson Bros. Co.	Sioux City, Iowa
WEAT	John J. Fogarty	Tampa, Fla.
WEAS	Hecht Company	Washington, D. C.
WEAP	Mobile Radio Co., Inc.	Mobile, Ala.
WEAD	Ohio State University	Columbus, Ohio
WEAV	Sheridan Electric Service Co.,	Rushville, Nebr.
WEAQ	Y. M. C. A.	Berlin, N. H.
WCAZ	Robt. E. Compton & Co.,	Quincy Whig Journal, Quincy, Ill.
KDZV	Cope & Cornwell Co.	Salt Lake City, Utah
WCAV	J. C. Dice Electric Co.	Little Rock, Ark.
WDAD	William Louis Harrison	Lindsborn, Kansas
KDYU	Herald Publishing Co.	Klamath Falls, Ore.
WDAI	Hughes Electrical Corp.	Syracuse, N. Y.
WDAC	Illinois Watch Co.	Springfield, Ill.
WDAF	Kansas City Star	Kansas City, Mo.
WCAY	Kesselman O'Driscoll Co.	Milwaukee, Wisc.
WDAG	J. Laurence Martin	Amarillo, Texas
WDAK	Mine & Smelter Supply Co.	El Paso, Texas
WCAW	Quincy Herald and Quincy Elec. & Supply Co.,	Quincy, Ill.
KDYW	Smith-Hughes & Co.	Phoenix, Ariz.
WDAB	M. C. Sumner & Son	Portsmouth, O.
WKB	Sweeney School Co.	Kansas City, Mo.
WDAE	Tampa Daily Times	Tampa, Fla.
KDYS	The Tribune, Inc.	Great Falls, Mont.
WCAX	University of Vermont	Burlington, Vt.
WDAA	Ward-Belmont School	Nashville, Tenn.
KDYY	Rocky Mt. Radio Corp.	Denver, Colo.
WDAJ	Atlanta & West Point R. R. Co.,	College Park, Ga.
KDZF	Automobile Club of So. Calif.,	Los Angeles Calif.
WEAC	Baines Electric Service Co.	Terre Haute, Ind.
KDZG	Cyrus Peirce & Co.	San Francisco, Calif.
WEAA	Fallain & Lathrop	Flint, Mich.
KDZH	Fresno Evening Herald	Fresno, Calif.
WED	Northwest Kansas Radio Supply Co.,	Atwood, Kan.
WEAB	Standard Radio Equipment Co.	Fort Dodge, Iowa
WEAK	Julius B. Abercrombie	St. Joseph, Mo.
KDZR	Bellingham Publishing Co.	Bellingham, Wash.
WEAI	Cornell University	Ithaca, N. Y.
KDZI	Electric Supply Co.	Wenatchee, Wash.
KDZJ	Excelsior Radio Co.	Eugene, Oregon
KDZM	E. A. Hollingworth	Centralia, Wash.
KDZQ	William D. Pyle	Denver, Colo.
KDZK	Nevada Machinery & Electric Co.	Reno, Nevada
KDZP	Newberry Electric Corp.	Los Angeles Calif.
WEAG	Nicholas-Hineline-Bassett	Edgewood, R. I.
WEAM	Borough of North Plainfield,	North Plainfield, N. J.
KDZL	Rocky Mountain Radio Corp.	Ogden, Utah
KDYX	Star Bulletin Publishing Co.	Honolulu T. H.
WEAH	Wichita Board of Trade & Landers Radio Co.,	Wichita, Kan.
KDZA	Arizona Daily Star	Tucson, Ariz.
WDAD	Automotive Electric Co.	Dallas, Tex.
WDAL	Florida Times Union Co.	Jacksonville, Fla.
WDAN	Glenwood Radio Corp.	Shreveport, La.
WDAQ	Hartman-Riker Elec. and Mach. Co.,	Brownsville, Pa.
WDAR	Lit Bros.	Philadelphia, Pa.
WDAP	Midwest Radio Central, Inc.	Chicago, Ill.
KDZB	Frank E. Siefert	Bakersfield, Calif.
WDAM	Western Electric Co.	New York, N. Y.
WDAT	Delta Electric Co.	Worcester, Mass.
WDAW	Georgia Railway & Power Co.	Atlanta, Ga.
WDAK	Hartford Courant	Hartford, Conn.
WDAU	Slocum & Kilburn	New Bedford, Mass.
WDAS	Samuel A. Waite	Worcester, Mass.
WDAX	First National Bank	Centerville, Iowa
WDAY	Kenneth M. Hance	Fargo, N. D.
KDZD	W. R. Mitchell	Los Angeles, Calif.
WDAV	Muskogee Daily Phoenix	Muskogee, Okla.
KDZE	The Rhodes Co.	Seattle, Wash.
WDZ	James L. Bush	Tulsola, Ill.
KDZW	Claude W. Gerdes	San Francisco, Calif.
KDZX	Glad Tidings Tabernacle	San Francisco, Calif.
WFAC	Superior Radio Co.	Superior, Mich.
WFAD	Watson, Weldon Motor Supply Co.	Salina, Kan.
WFAF	Henry C. Spratley	Poughkeepsie, N. Y.

Radio's Relation to Advertising

ADVERTISEMENTS of the Lackawanna Railroad are featuring the fact that radio telephone broadcasting concerts may be heard aboard the Buffalo Limited and the New York Limited, both of which are equipped with receiving sets.

In the old style railroad "ad," the beauties of the scenery through which the train passed were featured, but now, railroad officials of those lines which have installed radio apparatus apparently believe that the lure of hearing radio music is stronger than that of scenery.

Radio and Racing

DETAILED information regarding the "Kentucky Special," the most important horse race of the season, was broadcast by the Crosley Manufacturing Company, Cincinnati, Ohio, operators of the radio station WLW, during the recent race at Latonia.

The voice of Jack Dempsey (not the boxer of the same name) official caller, was carried from the judges' stand at the Latonia track to the broadcasting station by the wire phone, and there transmitted by the wireless telephone station.

The system worked successfully, hundreds of persons calling up after the race and asking that radio telephone announcement of races be made a permanent feature.

Radio Rings Alarm Clock

ACCORDING to Radioelectricite, the French radio paper, a Frenchman has succeeded in constructing a radio alarm clock. He uses a receiving apparatus tuned to respond only to a call consisting of certain letters sent at a certain speed. When the proper combination of dots and dashes is received, the last signal operates a relay that closes a circuit and rings a bell. If the Eiffel Tower could be persuaded to send its time signals early in the morning the device could be used instead of the ubiquitous American alarm clock to awaken the nation.

Radio Invades "The Village"

GREENWICH VILLAGE, New York's much-advertised artist quarter, where even today candles are esteemed above electric light even by those who can afford the best, has become enthusiastic over the radio telephone. This is a great tribute, as it is about the only modern development that many of the Greenwich Villagers ever have been enthusiastic over, outside of matters of art. 'Tis said that hundreds of Villagers now prefer to listen to the broadcast programs instead of to the "parlor Bolsheviks" who abound there.

Nellie Kounds

A Chat About Radio With

Nellie and Sara Kouns

By Edwin Hall

Sara Kouns

THE first chapter of this little story takes place aboard a huge ocean liner returning to New York from Europe shortly after the outbreak of the great war in 1914.

The famous Kouns sisters, Nellie and Sara, were homeward bound from Europe with members of their family. On the same vessel was the great Marconi, and it so happened that the Marconi party became acquainted with the Kouns group and Marconi himself took the sisters to the wireless cabin of the ship and explained to them the mysteries of the great new science which soon was destined to conquer the world. "The time will come," Marconi told the sisters, "when you will sing into a little instrument and your voice will be carried through the air for hundreds of miles and will be heard by people everywhere."

* * *

How true this prophesy was, everyone knows. The Kouns sisters, themselves, told of Marconi's prediction when the interviewer called to get their impressions of the radio-telephone for the fans who heard them sing from WJZ.

"We had been so impressed by the words of Marconi," said Nellie Kouns, "that when interest in radio suddenly awakened as it did, we were not as astonished as we might have been."

Sing for Music Records

"But the thing," added Sara Kouns, "that did impress us was the fact that we should be among the very first, if not the first, to be asked to broadcast from the station at Newark."

The Kouns sisters are exclusive phonograph artists for a well known manufacturing company and they have confined themselves during the past few years largely to the making of records. They also have appeared on the concert stage and at one time were in vaudeville.

They decided to have some fun with their interviewer when he pleaded with them to put on a record of their own making.

"See if you can guess who is singing and when one stops and the other takes up the song," they urged him. He did his best to guess while the record played, but only revealed his confusion, for except when they were singing together it was impossible to distinguish between the voices of the two sisters.

So alike are the voices of Nellie and Sara Kouns that they are called the "mirror voiced sopranos," each a perfect reflection of the other.

The sisters, remembering the prophesy made to them by Marconi nearly ten years ago, are confident that when the development of the radio-telephone has progressed to a more advanced stage, it will be possible and feasible to transmit the voice half way around the world.

"We feel the time will come," said Nellie, "when people in all parts of America will hear the voice of a Chinese or Japanese girl singing in the far-off Orient."

"Yes," supplemented Sara, "and Italian music too, straight from Italy—and French and German." And then they pictured a rosy scene wherein all the world was a single unit with one common aspiration—the universal desire for art!

And the radio telephone, they say, will be the medium through which this long-sought goal will be attained.

Nellie and Sara Kouns were born in Topeka, Kansas. They are daughters of the late Charles W. Kouns, former general manager of the Santa Fe Railroad. They received their initial music instruction under the watchful eyes of American teachers; then they went to Germany to complete their studies.

Their only object in studying music was to secure the personal pleasure and satisfaction that a knowledge of it brings; the idea of going on the professional stage was far removed from their thoughts and from the thoughts of their father. When they were offered engagements at the Royal Opera in Munich he withheld his consent, and to make certain that they would not yield to the temptation of this splendid offer he made a special trip to Europe and brought them home during the early days of the war. It was on this trip back that the prophesy was made to them by Marconi as related in the early lines of this story.

Debut in Chicago

Yielding to the entreaties of friends and the pleading of the sisters themselves, Mr. Kouns finally gave his consent for them to appear in concert and their debut took place in Chicago.

Then followed a tour across the continent that created a wave of enthusiasm for the sisters. It was at the height of their success that they gave up all their plans in the emergency created by the war, and under the auspices of the Y. M. C. A., went to France to entertain the doughboys.

At the Paris opera, in Nice, Cannes, Monte Carlo and in the Army of Occupation on the Rhine, their voices were heard and they became favorites with the A. E. F. A professional season in England and France followed in 1920 and left in its wake a trail of ever-increasing popularity. In the spring of 1921 they returned to New York. Toward the end of the same year they received a call to come to WJZ and entertain the radio audience, a call which they graciously accepted, to the delight of all who heard them.

Canadians Growing Enthusiastic

CANADA is fully as enthusiastic about radio telephone broadcasting as is the United States. The Winnipeg station has already been heard in various parts of the states, as well as in a large portion of the Dominion.

Radio in Canadian Theatres

THAT radio will play an important part in entertaining the Canadian public in the near future is shown by the fact that the Independent and United Amusements Limited, Toronto, who own and operate the Strand, Regent, Papineau, Belmont, Plaza and Moulin Rouge Theatres have installed receiving sets in all their houses and will give a radio concert every evening.

They have secured the services of a number of artists who will entertain the different audiences at these theatres, the artists performing in the Marconi Company's large new broadcasting station on the roof of the Canada Cement Building.

At the conclusion of the local concert the operators in the different theatres will endeavor to pick up more distant points where concerts are in progress, such as New York, Pittsburgh, Springfield and other distant points where large broadcasting stations are situated.

Mexico Likes Broadcasting

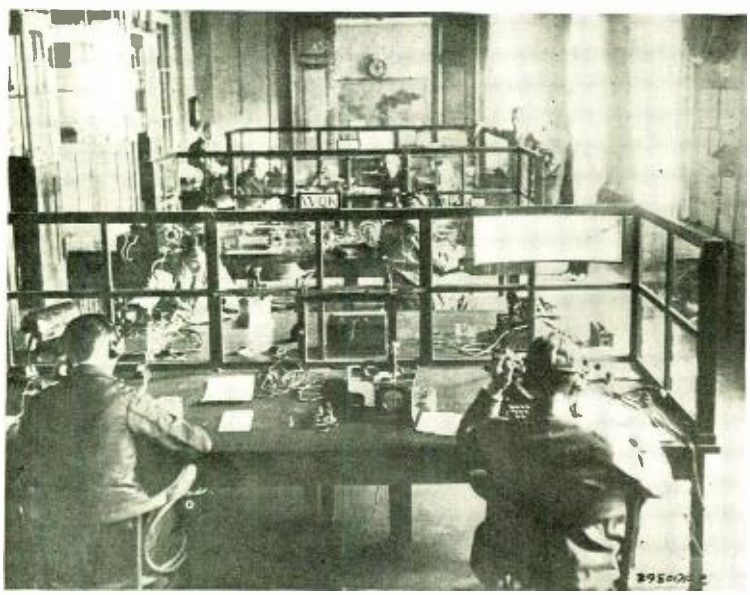
EFFORTS are being made in Mexico to make it easier to secure permission to operate radio telephone broadcasting stations there. At present much red tape has to be wound and unwound in getting permission from the Mexican Government, and so far only about twelve stations have been authorized. Many applications are pending. President Obregon has been asked to establish a special radio bureau to handle the work of licensing and regulation. The stations now in operation in Mexico have done much good work, and sales of radio telephone apparatus are increasing fast. The radio telephone is proving valuable especially in the remote mining districts.

Toronto Paper Opens Station

THE *Daily Star* of Toronto, which has been using the radio telephone transmitter of the Canadian Telephone Co. for broadcasting purposes, now has its own station, CFCA, and is broadcasting nightly programs at 7 p. m. on 400 meters. The station has been heard at a distance of from 500 to 700 miles, using six amperes in the antenna. The set uses four 500-watt oscillator tubes, and a 250-watt tube as a modulator. The antenna is of the T-type, 200 feet long, supported on 80-foot steel towers on the roof of the *Star* building.

Miners Carry Radio Sets

PROSPECTORS and mining men in Northern Ontario are alive to the possibilities of the radiophone, and many camps will this year be brought into touch with the "outside world." Some of those who are hunting for mines are including radio equipment in their outfits, and the far-off haunts of these men of the trail where the feet of women have never trod will ring this year with the finest voices of Broadway. Great stretches of trackless forest will no longer separate these pioneers from the news of the world, thanks to the radio telephone.



Here is the operators' room in the new trans-Atlantic radio station near Berlin, where the traffic to and from the United States is handled. The station has been opened only recently

London Has $10 Sets

SO FAR the cheapest receiving set yet developed in England for use by novices is priced at two pounds, or not quite $10. Due to Government restrictions, broadcasting has been hampered and is just commencing in a limited way, with the result that a considerable demand is being built up for receiving apparatus. The average British amateur, however, buys a few parts and builds his own set rather than buy complete installations.

Radio Fingerprints Will Aid International Police

POLICE Commissioner Richard E. Enright of New York City, who recently returned from Europe, has been much interested in experiments in transmitting fingerprints by radio. He observed the results of a system developed in Copenhagen, and expects that it will do much to make radio, both telephone and telegraph, the aid to the police that it is bound to be. Commissioner Enright's trip abroad was taken for the purpose of arranging closer co-operation with European authorities, as many crimes have an international aspect. With the new radio fingerprint transmission facilities, it will be possible to secure such co-operation with the minimum of delay, as positive identification will be made possible within an hour or two of the arrest of a suspect.

Poland Interested in Radio

THE Polish minister of communications is coming to the United States to study our wireless system. His investigations will form the basis for the operation of the great station being erected at Warsaw, and also for future Polish radio telephone broadcasting activity.

'Tis Correct English

A LONDON literary weekly says "broadcasting" is a new word added to the language by wireless telephony. Such a periodical should rather have referred with pleasure to the fact that the good English verb "to broadcast" has found apt employment for many years.

There is a popular hymn which thousands of Lancashire people sing at Whitsuntide, whose first verse begins, "Sow in the morn thy seed," and ends with "Broadcast it o'er the land." Reference to the Thesaurus confirms the fact that "broadcast" was already in the language, and suggests that in its place we might easily have been afflicted with one of its synonyms. "Widespreading" would have been as good, but neither "divaricating," "diffusing," "dispersing," nor "disseminating" would have hit the mark so truly.

Radio Relief for the Ailing

Hospitals and Physicians Generally Consider Music Important in the Convalescent Period—Its Use Even During Operations—Wireless Telephone Concerts for Improvement of Mental Tone of Patients

By Ward Seeley

Radio telephone music absorbs the attention of the patient during an operation under local anaesthesia

HAVE you ever been ill in a hospital?

Not ill enough to be oblivious of your surroundings, as no one ever is for more than a comparatively few hours at a time, but just ill enough to be kept in your bed.

Do you remember how bored and disgruntled you were, how slowly the hours passed, how you slept as much as you could, just to pass the time away, how you wished you could do nothing but sleep and forget your troubles until it was time to get up and go home?

Perhaps you have been ill at home and had the same experience there.

It was a red-letter day when you were declared well enough to get up, walk about a bit, and see something of the world outside of the four walls that had hemmed you in, prisoned you in body and mind.

If you have gone through a long siege of sickness, as nearly everyone has, you will understand what the radio telephone now means to those who are confined to their beds day after day. It brings the news and music of the world to them. It gives entertainment, diversion, occupation. It actually hastens recovery.

Doctors for years have known that music is beneficial in many maladies. The mind has a powerful influence on the body, and often the patient's own mental condition is the chief obstacle to an early recovery. The body is willing, but the mind, from too long dwelling on misery, is unable to comprehend the fact that health is at hand. The mind after thinking of disease for weeks does not turn of its own accord to thoughts of health.

Radio changes all this. It gives patients the needed healthy stimulus from outside, bringing the happy, cheerful busy world to the ears of the sick, giving them other things to think about than their own condition. In many homes today the radio telephone is a great aid to sufferers, shortening their hours of tedium, lessening the period of their convalescence.

Radio Can Cheer and Heal

"Music can ease the strain of life for a great number of patients, but not for all. It calls up cheerful thoughts and lessens monotony, and it is of enormous benefit to the nervously broken down, to children, and to most surgical cases, for music appeals more to the emotions than to reason.

"People differ, not in opinion, but in stages of intellectual and spiritual development. So some want jazz and some want fugues, and neither is soothed by the music that pleases the other. Music might heal or injure. Wherever it cheers, though, it heals."

—Dr. Alexander Lambert,
Bellevue Hospital, New York City

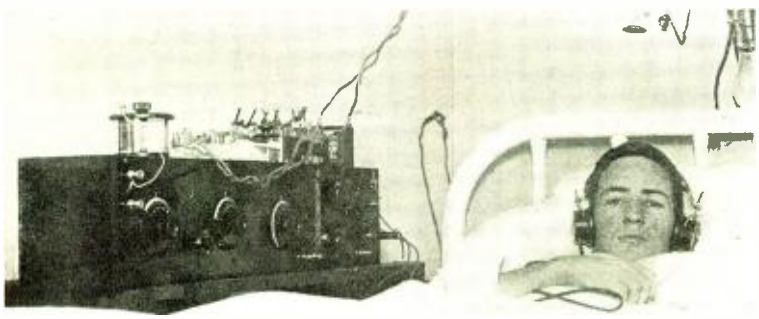
Hence it is that progressive doctors in all parts of the country, and particularly those in charge of hospitals, are eagerly taking advantage of radio.

Dr. W. F. Jacobs, Medical Superintendent of the Cumberland Hospital, Brooklyn, N. Y., said to the writer: "Radio deserves to be ranked with the best mental therapeutic agencies. In fact, for hundreds of cases the radio telephone can be prescribed as the one best treatment."

The Cumberland Hospital is a city institution, most of its patients being charity cases. Since last September Dr. Jacobs has been experimenting with radio for them, having installed several sets at his own expense in the original old hospital, now being evacuated as the new structure nearby is completed. The new building is being completely equipped with loud speakers and connections for headsets in all its wards.

"Think what it will mean," continued Dr. Jacobs, "for some poor devil, friendless, homeless, laid up with a broken back, never receiving any visitors, with nothing to do from one day to another but look at the wall and think. I have put headsets over the ears of many such men, and have seen them transformed in a few minutes from creatures that were just dully existing to the intelligent, interested men they once were and now soon will be again, permanently, and much quicker because of the interest, the life, the health that radiates from radio."

Dr. Jacobs has been a radio fan for about a year, and has gone through all the stages from a crystal set to his present one with radio and audio frequency amplification. He had an interesting experience last Winter, in the days when good headsets were hard to secure. He scoured the city for a headset of a particular make, and finally located one in a large de-



Lester Picker, San Diego, Cal., is helpless in bed with a broken back, but he is a licensed amateur whose call, 6AJH, is well known on the Pacific Coast. The radio telegraph and telephone keeps him cheery during his long helpless days and nights

partment store. The clerk refused to sell it, saying that it was the only one in the store, was "stock" and was not for sale.

"But I've just got to have that headset," said the Doctor. "Who is head of the department?"

The clerk reluctantly named the manager of the radio department, and added the information that he was "hard boiled."

Undaunted, and full of the enthusiasm and determination that are characteristic of him, Dr. Jacobs bearded the lion in his den.

"You have a headset," he declared, "that means life and death to some of my patients. I don't ask you to give it to me, though it is a matter of big-hearted charity, to relieve the suffering of some poor mortals who think that the world has forsaken them. I can prove to them that it hasn't—with that headset. I can show them that it is worth while to get well—with that headset. Whether or not they recover is up to them now, for medicine has done all it can. They will have to do the rest. Radio coming through that headset will induce them to think of the joy of living instead of the pains of sickness: of life instead of death; it will banish their despair and bring them hope, faith and the determination to get well. Radio has done all that for many of my patients, and I want to give it to all who need it. And I have many who need it badly. Will you sell me that headset?"

The manager looked at the doctor. "The headset is yours," he said.

Doctors in charge of other hospitals also realize the great benefits of radio, and, further, its peculiar selective quality, in that by the use of head phones it can be made available only to those who are able. This makes it highly suitable for use in wards, so that patients who can benefit from the daily concerts can listen to them without disturbing others who may be so ill that the music would be of no value.

Easily Adaptable

This feature is to be used in the new Cumberland Hospital, where a loud speaker is to be put in every ward, and beside it a control switch and a jack. In wards where every case can benefit, the loud speaker will be used, while in others in which there are cases of various degrees of seriousness, the ear phones will be used. This system has been in use in the old building for several months, with sometimes startlingly beneficial results. At the time Dr. Jacobs was interviewed the radio apparatus was dismantled for moving into the new building, where a large room has been provided as a control station for the entire radio receiving equipment.

Funds for this installation are being collected privately by Dr. Jacobs, as New York City as yet has not appropriated money for the purpose. The Department of Public Welfare, is enthusiastic, from Commissioner Bird Coler down to the newest interne, and it is probable that in time city funds will be provided, but not after a delay of possibly several years. In the meantime, patients in the city hospitals and in fact in most of the others as well, must rely upon private charity for the radio equipment they need so much.

Work of Charity

Several of the hospitals in New York City already have interested philanthropists in radio, and are installing instruments. The Bronx Hospital is one of them. Maurice Dubin, superintendent, said: "The hospital is negotiating for the installation of a radiophone on the Roof Garden, for concerts to be given to the convalescent patients. We are also planning to have a receiving station in the wards for those who are bed-ridden. In connection with this work we intend to utilize the telephone receivers in order not to disturb patients who may desire to rest.

"I personally feel that radio can be of great service in hastening convalescence."

The Manhattan Eye, Ear and Throat Hospital probably is the best situated of all the New York hospitals, in its radio possibilities, as it already has an annunciator system with loud speakers in all wards and corridors, for calling the doctors. Reuben O'Brien, superintendent, now has a regenerative set with two stages of audio frequency amplification, and the sum of $100 has been provided for the purchase of a loud speaker. This is to be placed in front of the main transmitter of the annunciator system, which thus will spread radio concerts, news and sermons throughout the building. Inasmuch as the patients are well classified in the wards according to the seriousness of their cases, it is entirely possible to provide radio entertainment only to those whom it will benefit. Comparatively little interruption is expected due to the necessity of using the annunciators for calling purposes.

A Complete Installation

Another hospital that will use radio to the full is the Beth Israel, in the center of the crowded East Side. This is being provided with a new building that will have 500 beds, and the plans call for the installation of a radio receiving set with loud speakers in the auditorium, solarium, children's wards and in the open wards. Each private room is to be provided with a headset.

(*Continued on page 44*)

New York City Visiting Committee

105 East 22d Street

To the Editor:

There has recently been organized under the New York City Visiting Committee a committee on music which plans to arrange for regular concerts in the municipal hospitals and almshouses throughout the year. This committee, under Mrs. Russell Hoadley and Mrs. Francis Rogers, has been greatly interested in the possibilities of radio.

While they have decided not to install any mechanism this summer, it is their firm conviction that in the near future every institution will be equipped with radio apparatus. Endless vistas are opened for the bed-ridden and shut-ins generally.

No matter how excellent the medical care, nor how scrupulous the attention to material needs, the average patient in a municipal institution, where visitors are allowed only about twice a week, is apt to be discontented. He feels bored, out of touch with the world, impatient of delay. Imagine the change which a radio receiving station would make in this atmosphere! Without any tiring effort he can feel himself again a part of the world; his thoughts will be turned to something other than his own troubles and he will want more than ever to get well. There is reason to think that the period of convalescence would actually be shortened by the presence of the right sort of radio apparatus.

It is hoped that some generous friend will be inclined to give the necessary funds for installing radio in Bellevue and the other municipal institutions.

Very sincerely yours,

(Signed) MARION R. TABER,
Secretary.

WILL YOU HELP?

Miss Hammond in the stage success "Danger"

IS it possible to successfully give instruction in caricaturing, sketching, etc., via the radio telephone? An attempt was made recently from WJZ

Ruth Hammond

A Rising Young Commedienne and Caricaturist of Ability, Broadcasts Pointers on Her Art, and Extracts from Her Address Are Quoted Below

CAN the radio telephone be used to instruct students in the art of drawing, sketching, or caricaturing?

Snap judgment might make the answer "No!"

But wait—

It is the solution of questions like that which will, in the final analysis, determine how extensive a part radio will play in education.

For instance, could the drawing lesson in the What-not School at Four Corners be supplemented by an instructive lecture delivered from New York by Howard Chandler Christy? by Frueh? by Gibson?

An interesting experiment with this idea was made a short time ago at WJZ.

Ruth Hammond, one of Broadway's beautiful and rising young stars, journeyed out to the Newark broadcasting station and there spoke on the art of caricaturing, how her knowledge of it helps her in stage work and how others can profit by it.

Miss Hammond is a commedienne. Born and educated in sunny California, her career first took her to San Francisco where she held a part in a play at the St. Francis Little Theater. Then followed a year in a stock company, after which her two young eyes peeped from beneath a wealth of blond hair toward Broadway's Gay White Way.

Her first part in New York was in the titular role of "She Walked in Her Sleep." She played, also, in such productions as "The Ouija Board," "The Charm School," "The Skirt," "Danger,"—and this Fall she will be seen in "Weary Wives," a new production.

She has always been interested in caricaturing, and her work along this line has attracted attention. Newspapers from Los Angeles to New York have published her drawings. The *New York Times* published one only a few weeks ago.

This, then, is a brief sketch of the young woman who went to WJZ to prove her contention that caricaturing could be taught, in a way, by radio telephone. Her address follows:

By Ruth Hammond

You all know that a caricature is a grossly exaggerated cartoon-like drawing. You have seen them many times in newspapers and magazines, and, very likely, you have noticed two things: how really like the subject the caricature is, but at the same time how funny or humorous it seems to be. Not every artist knows how to caricature and at the same time it may be said that not every caricaturist is a sketch artist.

Like many other things, caricaturing is not, as many believe, "born in you." I knew how to caricature before I took up my stage work and it was not long after becoming interested in acting that I discovered that the two had a very definite relation to each other.

A caricature is a representation of a person with the main characteristics exaggerated. For example—just suppose you want to draw a caricature of one of your friends. Of course he has two eyes, a nose, a mouth, a couple of ears and some sort of hair—but how are these arranged that he appears to be different from some other friend? After you think you've studied him pretty well, close your eyes, and see if you can remember what impressed you most.

Did he have eyes like the eyes of a calico dog? Was his head shaped like a canteloupe? Was his chin vague—was his hair shiny—did his nose seem to point in any particular direction—were his eyebrows all bristly? For all these attributes, a snapshot will serve the purpose, but if he posses only one — exaggerate it humorously — make it express his personality, for after all, a caricature must express a personality accurately and a complete set of features is not always essential, in fact I often leave out a nose, or eyelashes or eyebrows—they are not expressive in all cases.

For the sake of continuing the example, suppose your friend was a pale lad with horn rimmed spectacles and a timid disposition—his hair stringy and shiny and because of his timidity he draws his head in—sketch him in profile with heavy spectacles and his chin resting on his Adam's Apple and use rather fine lines and don't make them dashing or bold. That would express him. But remember you must know what the characteristics are, what the personality is, before you can hope to express them in a drawing.

Now its the same with acting. If you are going to portray a character on the stage, first you must study the role and determine what kind of a character it is and then emphasize the main characteristics so that an audience in the theatre recognizes it and can get the mood of the play. There is a difference in the manner of expression of caricaturing and acting aside from the difference in mediums.

A caricature is an avowed exaggeration, but an acted characterization is not apparently exaggerated unless it is a ludicrous or eccentric one. It is emphasized rather, but it takes the same kind of close observation and study to prepare for a caricature as for a role in the theatre. Therefore, an actor who has trained his hand to record what his mind thinks, and his eyes sees, should make an excellent caricaturist or vice versa.

Haven't you ever seen an actor give a beautiful performance till he reached a certain scene and then he didn't ring true? It is as if he drew a picture of the character and put one eye in the middle of the forehead. Lenore Ulric's performance of Kiki shows that she is really a caricaturist. Whether she draws or not her work shows close observation and a final exaggeration and emphasis that "puts it over." And Doris Keane should be able to draw a very funny caricature of "The Czarina." Caruso was a great caricaturist and everyone knows he was a great singer and actor.

I'd like to make it clear that the

same observational study is the foundation for a serious portrait or a caricature; for a tragic play or a comedy. It is only the final expression that differs. Ed Wynn could read his lines in a way that would make his audience sob or he can exaggerate and caricature them and make them laugh, as he most certainly does. Charlie Chaplin could wear the robes of Hamlet and "ring true" every minute. Forbes Robertson could exaggerate and burlesque his Hamlet and be as funny as Fred Stone. Mabel Normand could play her roles as pathetically as Lillian Gish—all because their fundamental observations were accurate.

STUDY THE SUBJECT

To illustrate—suppose you were commissioned to draw a very small picture of an automobile. You thought you knew exactly how an automobile looked, but when you start to draw it you find you are not just sure of how the mud guards connect with the body and how the hub looks and how the hood hits the wind shield. However, the drawing is going to be small and rather than find out how these things really are, you "fake" the details and get an effect. Now you take this "faked" drawing and have an enlargement made of it. All the mistakes and faking are readily seen.

So it is with acting. Imagine you are an actress and your part in the play is that of a young girl, a lovable sympathetic character and the hero is supposed to choose you for his bride rather than the other girl whom everyone thought he would marry because he recognized better qualities and finer, truer instincts in you.

You read the part and say, "Oh fine, I'll wear beautiful frocks and hats and smile and that'll be easy." But suppose at the last minute the author decides to have you be a poor relation and wear shabby ugly clothes and unbecoming hats! Could you still maintain the sympathy of the audience? Would the leading man have any reason for choosing you? In other words, were you actually portraying a lovable character, or were you depending on your frocks and cute mannerisms?

To illustrate perhaps more definitely, suppose you place before you a photograph of Lillian Gish. To make a caricature from this photograph study it carefully. Note the expression. The position. The general effect. The expression could be termed infantile, ingenuous, appealing.

So, in caricaturing her, emphasize those qualities. Make a rough sketch, a general outline, taking care that even this rough outline resembles her. Do not try to fill any of the details. Eyebrows will suffice without attempting the eyes themselves.

(Miss Hammond illustrated this herself for THE WIRELESS AGE in a four-panel drawing herewith.)

A tiny dash for a nose, slanted in the right direction. Just the barest outlines, in fine lines. (No. 2.)

Then finish it. (No. 3.) Put in the curls, make the lines a little heavier where needed. Fill in the eyes, still using, however, outlines, two tiny circles for eyes, a little more of the nose, showing the tilt.

There you have what could be called a caricature. But it doesn't seem either simple enough or humorous enough, does it? Again study the photograph carefully. Make sure you have absorbed the *character* of Miss Gish. Then let your imagination have a free rein. Draw her in profile, accentuating the humorous pucker of her lips, the eyes turned toward the sky, and holding some object, a flowerpot, for instance. (as in No. 4.)

A caricature to have any value must look like the subject, no matter how distorted the features may be and a wistful character must provoke sympathy, whether the clothes be beautiful or ridiculous. It would never do to draw a caricature of Jack Dempsey and have one person think it was Bill Hart—and another, President Harding. It would be comparable to playing Little Eva and making the audience shriek with laughter in the death scene.

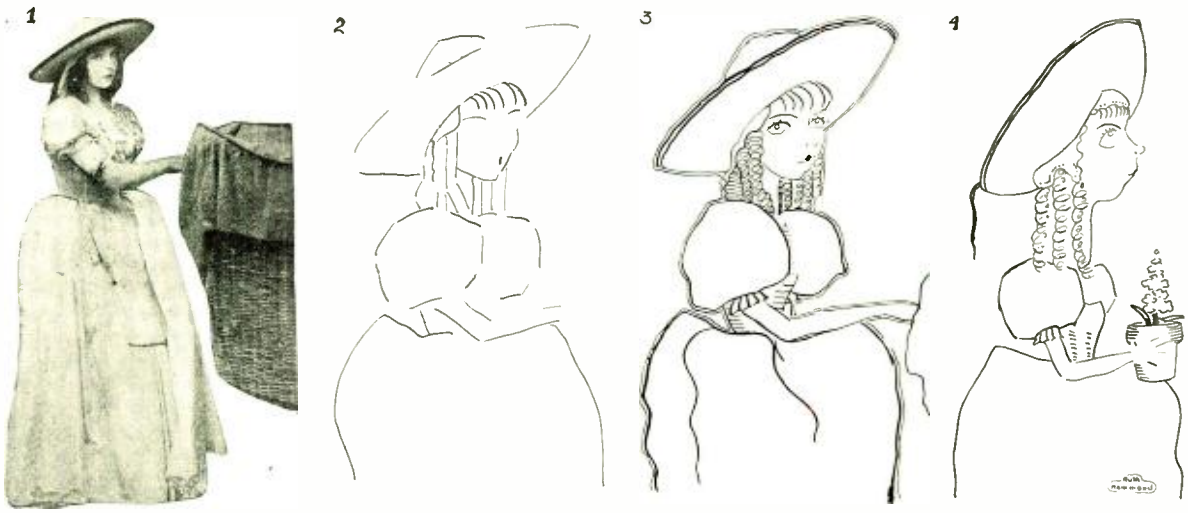
But it is not only on the stage that a knowledge of caricaturing will help. Persons who learn to observe the things that they see, a little more closely possibly than others do, always get more enjoyment out of living and always acquire a finer appreciation of life. Among the many thousands who are listening to me tonight I am sure there are many who have dormant within them the ability to caricature.

I might add that, quite aside from the pleasure that one gets from the knowledge of how to caricature, is the additional satisfaction of knowing that a good caricaturist gets paid and well paid for his work.

WILL CRITICIZE EFFORTS

Do not use your eyes simply to look with. Use them to see and observe with. Try yourself—practice—and then send me, care of WJZ, a sample of your work and I will do my best to give you suggestions that might help you.

Officials of all broadcasting stations are awaiting with interest the results of Miss Hammond's suggestion that radio fans send her samples of their work. If these show results which compare favorably with the drawing Miss Hammond made for THE WIRELESS AGE, officials believe a step forward will have been made in radio history.



Caricatures of Lillian Gish drawn exclusively for The Wireless Age, by Miss Hammond. She believes it possible to give lessons in this art over the radio telephone and in the accompanying article explains the various steps an artist must follow to achieve success

"SUPPOSE a bride doesn't know the difference between a scrambled egg and a kippered herring? It is a simple matter for her to tune in with an expert somewhere and unravel the mystery"

Eddie Cantor

The Funny Man of the Musical Comedy Stage Makes Even H. N. Lee, His Hardened Interviewer, Chuckle

Eddie Cantor in Character

EDDIE CANTOR is funny. He admits it. We all know it. By virtue of his being funny he justly earns what is commonly believed to be one of the biggest salaries in the theatrical world. The said Cantor weekly stipend is made possible because whenever his magic name appears above the theatre it attracts, vastly, the *hoi polloi.*

It was only natural then that those who guided the destinies of radio in its pioneer stages in the East, wanting theatrical headliners to appear, should have found their way to Eddie Cantor. They did, and Eddie Cantor was "put on the air."

The radio audience that night laughed long and loud. They say that if all the applause that was given in the hundreds of thousands of homes into which Eddie's voice went could have been assembled into one mighty roar, the polar bears away up north would have heard it.

Do you remember how Eddie, after he had exuded a few choice songs, ruminated into the microphone: "Let's see now, there must be something like a hundred thousand persons listening to me. If each one of them would send me a dime———"

In the next day's mail which the star received at his home in Mount Vernon —for he gave his real home address to the radio fans—were about four hundred letters and in those letters was assembled the most miscellaneous mass of trinkets, foreign exchange, collar buttons, shoe strings, checks and coins that a man ever was privileged to gaze upon.

One conscientious radio fan sent a check for eleven cents, adding in a postscript that the extra cent was for war tax. Another youth, reeking with humor, sent a check for five cents and the letter with it told Eddie that he had only been able to hear half of his songs and that therefore he felt that Cantor was only entitled to half of the amount that he had, in jest, suggested that the fans send. Every penny that came in in this way through Eddie's jest was sent to the Red Cross.

When the public goes to the theatre it only sees Eddie Cantor across the footlights and never is privileged to go behind the scenes. I wanted to take the radio audience there to meet Mr. Cantor. When I telephoned him in his home at Mount Vernon he suggested that I see him in his dressing room at the Winter Garden on Broadway. A few nights later I arrived at the stage door at 9:45 p. m., which was the hour that he had told me he would be off stage.

"Go right up stairs and turn to your right" said a stage hand when I told him that I had an appointment with Mr. Cantor. I commenced an ascent up an iron stairway and had only reached the first landing when Eddie Cantor himself descended.

"Go right on up to room number five," he shouted to me as he hurried past. "I will be off stage in a few minutes." I thought he said room five, at any rate; but when I reached the proper floor I discovered that room five was not Mr. Cantor's room, but was a room set aside for the exclusive use of the young maidens of the chorus. One of the beauties who had just emerged from room five told me that Mr. Cantor's room was number four, right next door. There I was greeted by his valet, Benny, a good-hearted and polite young colored man.

It was not long before Eddie himself hopped back into the room for a change of costume.

He had been thinking rather seriously of the radiophone for he immediately plunged into the subject vigorously.

He repeated what other stars have told the writer, that his speaking into the microphone had given him the biggest thrill that he had ever had in his life. He pictured the people who must have been listening—the millionaire and his fellow club members, the tenement house dweller, the backwoodsman, the young, the old.

But he did not stay on a serious subject very long, for shortly he was telling me that undoubtedly the radiophone would play havoc in the lives of husbands who telephone their wives that they have business appointments when the said business appointments consist of poker games.

"Why," exclaimed the star, "all the wife may have to do to find out where her wandering husband is, will be to tune in something or other and listen.

"And then there is the wonderful possibility that the radio telephone will help a bride. Suppose a bride didn't know the difference between a scrambled egg and a kippered herring. In such a dilemma she could tune in and ask an expert how to scramble the egg, and what to do to kipper the herring."

Cantor believes that as a medium to disseminate entertainment the radiophone never will become one hundred per cent. popular for he thinks that much of an entertainer's power lies in his physical appearance.

"But as a means of creating interest in persons or things," the star said, "it stands in a class by itself. Of the people who wrote letters to me following my broadcasting, twenty-five per cent. had never seen me on the stage. They assured me that, should the opportunity to do so ever present itself, they would avail themselves of it."

The conversation ended here because Cantor had to appear in another scene of the production "Make It Snappy." While he had been speaking, he had been working away with his make-up and now that the time had come to leave his room for the footlights again, he was the black-face Eddie Cantor who sends his nightly audiences into roars of laughter.

K D K A

How the Nation's First Regular Broadcasting Programs Were Started in East Pittsburgh by the Westinghouse Elec. & Mfg. Co.—A Word Trip Through the Studio

ON October 1, 1920, a meeting of four persons was quietly held at the East Pittsburgh plant of the Westinghouse Electric and Mfg. Company. Neither trumpets nor the beating of drums heralded the little gathering, which time was destined to cause to make radio history.

At the meeting were Harry P. Davis, vice-president; Frank Conrad, an engineer, M. C. Rypinski, sales department, and J. C. McQuiston, manager publicity department.

The story goes that it was Mr. Conrad who called the meeting. He suggested to the other men that the experimental radio telegraph station at the plant be utilized to transmit telephone messages, so he could undertake advanced experimental work on the apparatus of his home station.

Mr. Conrad remarked, it is said, that should such a station be opened to transmit the voice, it would be easier to make home experiments and that the cooperation of all radio amateurs would be secured.

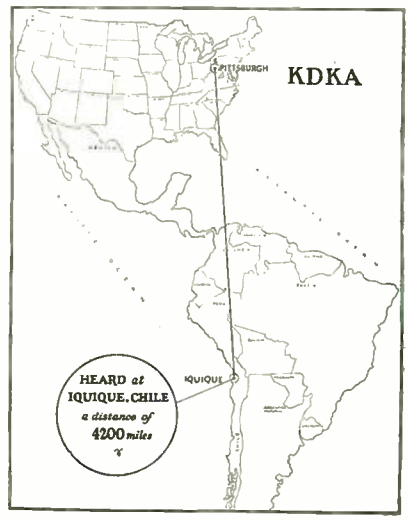
It was Mr. Davis who hazarded the opinion that possibly the general public would be interested in the idea, and he asked what Mr. McQuiston thought. That individual painted the picture of the farmer alone on his farm, far from the theatres, one or two days away from the current newspapers, and he wound up by declaring his belief that the results of broadcasting such as suggested would have an effect of which those at the meeting had little conception.

"But," he warned, "it must be kept up every day in the week, and the programs sent out must be continually improved."

Mr. Davis, so the story goes, looked around the meeting with some little satisfaction, and said:

"We seem to be of one opinion regarding the feasibility of starting a station, and so we'll do it."

Those words brought the now famous KDKA station into being, but it was little thought then that the transmission of presidential election returns from this station, which was then known as 8ZZ, would result in the widespread interest in radio that is now present throughout the country. The persons who were in close touch with the station, however, were quick to realize the tremendous possibilities of radio broadcasting and immediate steps were taken to develop fully this service.



KDKA has had the distinction of being heard in far-off Chile, a distance of more than four thousand miles

Permission was obtained from the Government to broadcast each night, something not heretofore thought of by radio operators anywhere.

A keen foresight was aroused. Radio broadcasting was seen as a means of disseminating entertainment, information and education for thousands of miles; from the big centers of music and art to the outlying districts lacking such benefits; from points where national news develops to lonely, inaccessible places; from educational institutions to isolated communities without the advantages of higher education; from the largest churches of the city to the farm and ranch miles away from the nearest place of worship.

All these possibilities and many more were foreseen and means were taken so as to develop the broadcasting from station KDKA that these many benefits might be obtained. For this reason a history of the development of the programs and the equipment of this, the first broadcasting station to give nightly concerts, is a history of the development of radio broadcasting itself. This statement is more significant when it is known that KDKA was operating for over ten months before another station was installed to give an entertainment every night.

When this broadcasting station was formally opened on the night of December 21, 1920, a handful of records were taken to the "studio," at that time a room which would hardly accommodate more than three persons. It was announced that station KDKA would give a concert, and then the records were played. No announcement was made of the names of the selections, such as is the custom at the present time, and it was left to the operator at the receiving end to rack his brain to recognize the number. This lack was soon recognized, however, and the name of each number was announced.

An evidence of what radio broadcasting could do for the already established sources of entertainment was immediately brought out when the music stores in the district were swamped with requests for records that had been played by radio.

Thus, a direct benefit was obtained by the record makers and the music stores. The reason for this was seen in the fact that most of the records brought to the attention of the public in the past were only the popular ones and that the best records played by the leading musicians of the time rested on the store shelves. Their sales were slow, in comparison with the latest popular music, demand for which was stimulated by being played in every cabaret and theatre. KDKA gave the public the best class of music, even if this did not meet with immediate popular demand.

During the first few months of broadcasting from KDKA phonograph records were used exclusively, and when picked with care were very satisfactory. However, it was thought that the radio enthusiasts would like to hear the local artists, and also some of the internationally prominent musicians who gave concerts in Pittsburgh. Many of the artists of Pittsburgh requested to be allowed to visit the radio station and perform by the new and novel radio method. Of course, the station was at first without facilities to take care of the artists in person, but a piano was obtained and crowded into the radio station. The first concerts were so popular that a temporary studio was built and arrangements were made to establish a permanent studio near the radio outfit. This was the first studio ever built for the exclusive purpose of broadcasting radio entertainments.

It was a room twenty by thirty feet.

entirely covered by burlap in order to overcome the possibility of any echo.

It is now often wondered how it was possible, only ten days after the station opened, to broadcast by radio the services from the Calvary Episcopal Church in their entirety. This was accomplished on January 2, 1921, and was the first service ever sent out broadcast by radio from a church.

Transmitters were installed in the choir loft and for the preacher in the pulpit, these transmitters being connected by telephone lines to the radio station KDKA, which is some ten miles distant. The transmitters picked up the clear tones of the organ, the blending voices of the choir of sixty men and boys, and the resounding voice of the preacher as he delivered his usual sermon.

Of course, the radio operators had to strain their ears in order to hear every word of the minister, Rev. Edwin J. Van Etten, Rector of the Calvary Church of Pittsburgh, but the idea of receiving a church service in the home was so distinctly novel that their enthusiasm could not be expressed in words.

For the next Sunday's service, a different arrangement of transmitters was tried, and all during the week experiments were made to better the service. The organist and the choir, as well as the minister, gave rehearsals several times during the week, so enthusiastic were they.

After the second service, equalling the success of the first, which brought forth many laudatory letters and comments from the radio listeners, the engineers decided that they could still improve the service. From that day until this, the KDKA radio engineers have been working continually on the subject of transmission of church services, and although the ultimate perfection has not been reached, one can well imagine oneself in church, hearing the service direct, so realistic is the transmission.

Where melody heard by thousands in the Middle West is born—the KDKA studio

In order to comply with the requests from so many churches to have services broadcasted by radio, KDKA Radio Chapel was established on Sunday afternoon December 11, 1921. The minister and the church choir visit the radio station on Sunday afternoon and conduct the regular service for the benefit of the radio enthusiasts. In this way, each denomination has its turn, and now it can be said that practically every church of the major denominations has had its opportunity of conducting a radio chapel.

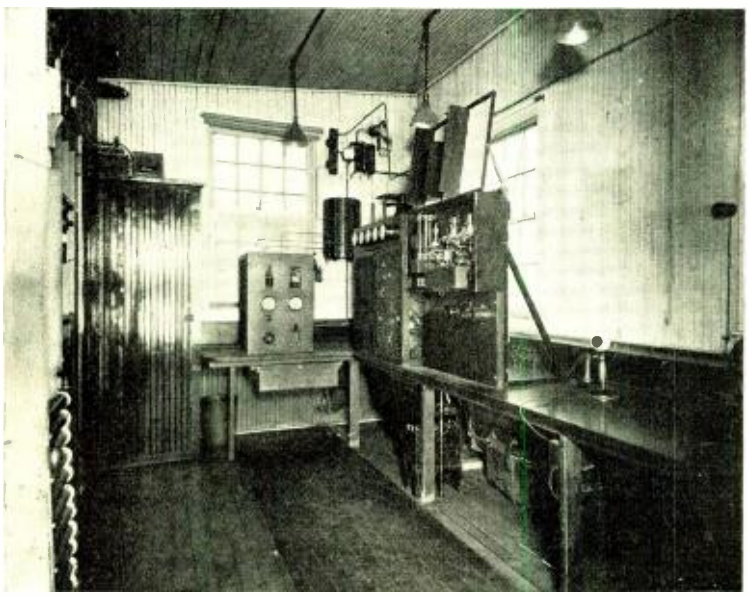
Shortly after the radio station started, arrangements were made with the United Press Association to obtain the latest headlines of the day's news. These headlines are broadcast each evening, and are an added feature to the program. In addition, arrangements were made early with the United States Bureau of Markets, Department of Agriculture, to broadcast the grain, fruit and vegetable and live stock market reports. A review of the New York Stock Exchange was later added to this news report. The value of this service to the city man and the rural resident was early realized, and additions to the broadcasting news service are made from time to time.

And then the children were considered. Special bedtime stories and music were provided, and these are broadcast every weekday night.

The technical equipment at the station is, of course, the most complete. The antenna at KDKA consists of 6 wires, 190 feet in length on 20 foot spreaders. The antenna is supported 210 feet above the ground by a brick smoke stack at one end and by a 100-foot pipe mast on the 9-story building at the other end. The operating room and studio are located on the 9th floor of this building.

A counterpoise, which is a duplicate of the antenna in construction, is placed 110 feet beneath the antenna. This brings the counterpoise about 15 feet below the transmitting set. The down lead from the antenna and the counter-

(*Continued on page* 44)



This photo shows the transmitting apparatus at the Radiophone Broadcasting Station KDKA at East Pittsburgh, Pa.

Leonard--Britton Bout

(*Continued from page* 30)

We have "witnessed" two boxing contests over the wireless, the one last night between Benny and Jack and the heavyweight contest last year between Dempsey and Carpentier.

To all intents and purposes we might just as well have been right at the ringside in both cases, so far as was concerned our ability to follow the scraps blow by blow and get the real thrills that go along with this sort of entertainment. The announcer was very vivid in his descriptions as the bouts progressed and we could hear plainly the great cheering of the crowds as well as the bell at the ringside.—HENRY E. MARSCHALL, *East Orange, N. J.*

I for one should like to have more of this nature, for it is very interesting, especially in large fights between well known boxers.—L. D. MUDGETT, *Shirley, Mass.*

It was certainly great—one of the best things I have ever heard on my outfit, and I have heard some pretty good things. I could hear the announcer distinctly all over the room through the phones, hear the gong between every round and the applause would nearly deafen you. There was quite a bit of static but the announcer's voice came in good and plain and as I say perfectly understandable. I was in from the second round and was sorry it ended in such an abrupt manner. Had I known it was going to be broadcast I should have been on the job from the beginning. The announcer surely did good work in the contest and it was next thing to sitting by the ringside—in fact, I enjoyed it better and there was no trouble in imagining you saw the match. so well did the announcer give every detail.—I. H. KATTELL, *Binghamton, N. Y.*

Jack Britton, Welterweight Champion, who retained his title

While listening in on my radiophone Monday evening, I happened by chance on your broadcasting the Benny Leonard fight. I want to tell you how wonderful it all was. Your man who broadcast was really wonderful. It seemed as if I was right there at the ringside and saw it all. I could hear the gong sound and the cheers of the crowd and also the whistle as plainly as if I were there. —J. W. CADDEN, Treasurer, The Plaut-Cadden Company, *Norwich, Conn.*

Please permit me to say that my wife, little boy of seven, and girl of twelve and myself all enjoyed the splendid broadcasting of the Britton-Leonard fight from the ringside. Everything came in clear as a bell. We could hear the gong and the cheering of the mob, the announcer. etc.—ALBERT L. PLESSIS, *Flushing, L. I.*

My family, my friends and myself were very careful and anxious listeners and we enjoyed every word of it. I may say that my nerves were at the same pitch as if I had been sitting in the first seat of the Velodrome, the report was so realistic.—DR. JNO. J. PECKELIS. *Newark, N. J.*

The Britton-Leonard contest was followed round after round by five interested listeners through the medium of a simple crystal set. Mr. White's enunciation was perfect and his descriptions were very clearly given.—E. M. JOHNSON. *New York.*

There was a crowd of us listening in and we heard each word perfectly—heard the gong plainly at the beginning and ending of each round—could easily distinguish the noise of the crowd at the Velodrome, and we could even make out the voice of Mr. Humphreys, the announcer.

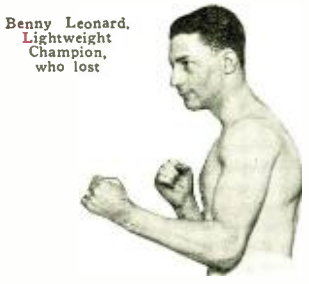
I think the plan of broadcasting boxing matches is wonderful and is the next best thing to being present at the ringside. You can count on my vote and the vote of my friends as being enthusiastically for it.—LESTER GABRIEL, *Rye, N. Y.*

We received the broadcasting of the Leonard-Britton fight in New York with perfect clearness. As we are located in extreme northern New York about twenty miles from the Canadian border we consider it remarkable.—NICHOLVILLE HOME TEL. CO.,
C. D. Babcock, Owner and Manager.

The description of the fight was very clear and it is the hope of the many listeners that were guests of my son last night for a repetition of the next big fight.

My son, being a cripple, gets a wonderful amount of enjoyment from all returns.—DANIEL J. FULLERTON, *Brooklyn, N. Y.*

Have had a radio outfit for several months and have enjoyed your concerts and the various efforts you have made to entertain your audiences. I have often thought of writing you to express my appreciation but somehow have never gotten to it. but today I feel so enthusiastic about the ringside report of the fight and want to tell you that a small audience in my rooms enjoyed it to the limit and we wish to express our thanks and hope that you will have sufficient encouragement from you audience to do it again and often. —DR. A. G. LANE. Clinical Director, *New Jersey State Hospital at Morris Plains.*



Benny Leonard, Lightweight Champion, who lost

Just a line of appreciation of your efforts in so clearly and carefully pronouncing each word of your report of the contest last night. You certainly handled your end of the affair in splendid shape and it was a very enjoyable evening all around. I could hear the many cries of the crowd, etc.. which was very interesting.—ANDREW WALLACE, JR., *Brooklyn, N. Y.*

It certainly was a dandy entertainment. The family enjoyed it immensely.—J. V. FINAN, *New York.*

I had four of my neighbors in, and they also enjoyed the service you so kindly rendered.

Keep it up, it's fine.—W. J. DONOVAN, *Newark, N. J.*

The announcer's description of the fight was perfect. I trust more sporting events will have your consideration for broadcasting.—UDO M. REINACH, Secretary Schulte Retail Stores, *New York.*

The returns were very realistic, due to the wonderful and competent way the announcer made his delivery of the fight direct from the ringside. Radio will become dearer and closer to us as the years go by, if this class of broadcasting is lived up to. At times you could almost hear the crowd cracking the peanut shells and with cheering of the crowd and the ring of the gong all one had to do was to shut his eyes and be simply carried to the fight, to feel as if he was at the ringside. "I want some more."—CHARLES H. TISSERANDY, *Newark, N. J.*

While listening to you broadcasting the Benny Leonard vs. Jack Britton fight Monday night I wanted to tell you it was so good that it seemed to me that I was right there.

I am crippled and cannot go out and I enjoyed it very much and I think that you cheer other shut-ins like me.—FRED BAECHLER, *Newark, N. J.*

(*Continued on page* 44)

"I Take My Pen in Hand to Tell You—"

Correspondents Report Their Pleasure and Profit in Broadcast Programs. Each Home Finds New Reasons for Listening In. Gratitude Moves Many to Express Their Appreciation in Written Words of Thanks

Our little girl has to go to bed early at night and of course it is impossible for us to trot off to places of amusement. There are thousands of others in the same boat and I am sure that the radio programs sent out by you have been the means of making the evenings spent at home much more enjoyable to those who take advantage of them than they ever were before.

GEORGE MACARTHUR,
Washington, D. C.

I have 320 children somewhat under my care at the Leake and Watts Orphan House at Yonkers, N. Y., and I have recently organized a Radio Club. After our brief business session of last evening I connected up two pair of head sets and each member of the club had several chances to listen in. The entertainment was greatly enjoyed by all, and the entire radio club instructs me to convey its thanks and appreciation to WJZ. Later, when we get a larger receiver and loud speaker our entire family of several hundred children will be able to have the entire program.

ROBERT S. TUCKER,
Yonkers, N. Y.

Last week while you were playing that snake charming music, my outfit went dead, and when I looked at my aerial I found a snake on my lead-in, so you see music hath charms. The snakes are full of electricity—who knows they might have receivers.

J. L. MCPHERSON,
R. F. D., Shelton, Conn.

We are middle-aged people to whom the movies do not appeal and it is a real pleasure to sit quietly at home in the evening and listen to good music and interesting talks such as you are sending out, especially as my husband's eyes will not allow him to read much in the evening.

MRS. E. W. BEACH,
East Orange, N. J.

Send your impressions in the form of a letter to The Wireless Age. Be sure to tell about your more interesting and unusual experiences. Write on one side of the paper, not over 300 words. Address them to Letter Editor, Wireless Age, 326 Broadway, New York City.

In order to show my appreciation and encourage this new and most wonderful discovery, I will be glad to subscribe $25.00 if you can get nine others to do the same, to donate a big radio machine to some orphan asylum in New York. Seems to me this could be "sold" to the "fans" by an announcement over your service.

JOSEPH A. KLEIN,
New York.

Just a word to let you know that I have received your radio concerts recently and was pleased, only I could not hold you on account of other cities nearby operating at same time. We hope to hear your concerts again. I have a two-step amplifier and receive concerts from KDKA, WPB,WGY, WWJ, WCX, WGR, also from NOF Naval Station at Anacostia, D. C.

ARTHUR LEE ROSS,
Port Elgin, Ont., Canada.

Please accept thanks for the very excellent radio programme which my family and some friends had the pleasure of listening to last evening. This town is situated in the Ottawa Valley, about two hundred and twenty-five miles north-west of Montreal, but the transmission was perfect and left nothing to be desired. I only fitted up my apparatus on Saturday last and your concert of Sunday night was the first we had the opportunity of listening-in on.

E. A. DUNLAP.
Pembroke, Ont., Canada.

I think your concerts are very good indeed; you speak very plain. Could you tell us where we can get a bulb? We cannot hear your concerts now as we have no bulb. We are very anxious to hear your concerts, too, as they are very good. I always enjoy them as I am only eleven years of age and I just love music. I have a brother and mother and father who enjoy the concerts very much.

MADELINE HAGEN.
Brooklyn, N. Y.

Having just taken the receivers from my ears, I wish to say that merely writing a letter to you can't come within a thousand miles of expressing the joy and pleasure I find, also the rest of my family, in being privileged to sit night after night and listen to such grand concerts and such entertaining and instructive talks.

It surely is the wonder of the age as it hardly seems possible that with a few feet of copper wire wound on a pasteboard tube and a few other little insignificant things one is able to hear a male quartet humming a few miles away, as I heard tonight. It's almost uncanny, but it's a fact.

I met with considerable opposition at first, on account of expense, and the time devoted to the construction of the bunch of junk (apparently) which reproduces the entertainment every night, but now almost every time I want to listen in mother has beat me to it, and of course now dad has to wait. My kid goes to sleep every night with the receivers on his head, then Dad sneaks in and listens to the tag end. Its great, wonderful!—and I wish to personally thank you or whoever is responsible.

C. G. SMITH,
East Orange, N. J.

At my home here in Clifton we have four simple crystal sets that have received several different radio stations. Three sets are installed in bedrooms and one in the living room. While convalescing from scarlet fever —for which reason I dictate this letter—I am enjoying listening to WJZ's broadcasting in detail. It seems as though you are using a wonderful opportunity to put over things to the public that they would not listen to otherwise. The "Milk Bottle" talk was fine. I like your idea of religious service on Sunday afternoons, and wish there could be even more of the good sacred music.

WILLIAM A. ROBBINS,
Clifton, N. J.

Radio Relief for the Ailing

(*Continued from page* 36)

This radio service will be part of the hospital treatment, and will be given without extra charge.

L. J. Frank, superintendent, states: "The effect on the patient is bound to be good, and will in my opinion facilitate his recovery. It will be of special value to those patients who will be in separate rooms, as it will obviate lonesomeness when there are no visitors. It will also be of help to cases of chronicity, where the patients are required to remain in the hospital for a long time."

The New York Post-Graduate Medical School and Hospital likewise intends to utilize radio. S. H. Wadhams, executive officer told me: "Steps have been taken to install a radio service for the use of the patients in our wards. How extensive this installation will be will depend upon the generosity of the benefactor who has volunteered to pay for the installation. You may depend upon the Hospital's interest in the possibilities of the radiophone as an assistance in solving a feature of the nursing problem that confronts it."

Dr. A. J. Barker Savage, superintendent of the Broad Street Hospital, told me that a complete radio installation is to be made in the new building for which the hospital recently secured funds. "We want to do anything that will add to the patients' happiness," said Dr. Savage, "and radio will do it as nothing else can. I am very much in favor of it." The hospital is located in the financial center of New York City, and its list of directors is an imposing one, including some internationally-known names of prominent financiers. The expense of the radio equipment for the new hospital will be borne by the directors, who pledged their support after listening to a vigorous plea by Dr. Savage at a recent meeting of the board.

Many of the Government hospitals in which are wounded and disabled veterans consider radio to be vital in improving the mental condition of their patients. The Fox Hills Hospital was one of the first to utilize radio, securing a Signal Corps set, and other hospitals in all parts of the country followed suit. The local posts of the American Legion in many cases raised the funds for the radio equipment. In El Paso, Tex., the Veterans of Foreign Wars only recently provided the William Beaumont Hospital there with receiving equipment.

Probably there is but one handicap to radio from the doctor's point of view. That is the fact that the best and most interesting concerts are broadcast after eight o'clock at night. Several doctors told me that this was just the hour when they expected their patients to be settling for a long sleep. "Give us more concerts in the afternoon," they pleaded, in substance. "The phonograph records are fine, and they come over well, but the major interest is in the personal performances that take place in the evening. In many cases the effect on the patient is well worth an extra hour or so of sleep, but if that effect could be had in the afternoon instead of the evening it would be even greater."

Which is respectfully submitted here to the broadcasting stations, with the hope that they may increase their already great humanitarian work for those who are ill.

K D K A

(*Continued from page* 41)

poise lead are made up of 8 strands of No. 14 copper wire equally spaced around 1½ in. diameter wooden spacers. The natural period of this aerial system is approximately 412 meters. A series condenser of .0005 mfd. capacity is used in series with antenna and sufficient loading inductance added to obtain the desired wave length of 360 meters.

A series condenser is shunted by the radio frequency choke coils of 10 millihenries inductance in series with a megohm resistance, to drain off any static charge that might accumulate on the antenna when insulated from the ground by the series condenser. The high frequency resistance of the antenna system at 360 meters wave length is approximately 12 ohms, a large percentage of which is radiation resistance. The antenna current at 500 watts is 6.5 amperes and at 1 kw. 9 amperes.

The power equipment used at KDKA consists of two 2 kw. motor generator sets with 250 volts D. C. motors. The generators are of special design for 2,000 volts D. C. employing two armature windings and two commutators permanently connected in series.

Radio Helps Sell House

WHEN he found that a house in Dallas, Tex., while in good condition, was not modern enough to attract good bids, a real estate operator there installed a radio receiving set and advertised that it would go with the house. Advertisements in the papers brought many replies, and he sold the house at a profit.

Leonard-Britton Bout

(*Continued from page* 42)

Our entire family listened in. Andrew White's announcing—amidst the continual uproar and din of the enthusiastic boxing fans assembled at the Velodrome—was perfectly audible. We thoroughly enjoyed his introduction and discussion prior to the commencement of the contest; that is, his comments as to the notables present and other information such as Jack Dempsey's Palm Beach Suit; his detailed and intelligent point-to-point presentation of the championship contest itself; and his final announcement of the most unfortunate conclusion of the contest. In fact, we "ate" every word that came to us over the phones!—BEATRICE E. WEISS, *Newark, N. J.*

On behalf of the radio fans of the New York Fire Department, permit me to congratulate you. It was an excellent description, vividly described, and those who were fortunate enough to possess a wireless equipment in the different fire houses were highly elated over the success of this feature of your broadcasting.

Trusting you will experiment further along this line, I remain—VAL FENDRICH,
Chief, Bureau of Fire Alarm Telegraph,
City of New York Fire Department.

We received your broadcasting of the Leonard-Britton fight very clearly and distinctly. After I put my hat on to go to the store, I walked 100 feet and a young man called out of a window to me that Britton had won. I went two blocks to the bakery and two men were having coffee, also an argument over Mr. Haley's decision of the fight.—MR. AND MRS. GRANT, *New York.*

I beg to take this opportunity of complimenting you on the very excellent broadcasting of the details of the Britton-Leonard fight. I received every detail perfectly. I could even hear the whistle and gong and the cheers and comments at the ringside.—FRED N. BUNGER, Director, *Lutheran Hospital of Manhattan.*

On behalf of about seventy-five or more enthusiastic fight fans who gathered at our place of business last night to hear the returns of the Leonard-Britton fight, we wish to thank you and those responsible for the broadcasting of this most interesting event.

The manner in which the bout was described was indeed very interesting and with the exception of the fact that we could not actually see what was going on, it was expressed among those present that it was the "next best thing to seeing the real fight."—D. A. SANDERS, *Nyack, N. Y.*

We want to compliment you in the highest phrase on the clarity of your announcer, whose enunciation is splendid and whose nerves must be of cast iron to broadcast in the cool manner of his delivery. At the time, in both places, were other receivers than ourselves and our guests were highly enthused and I am sure they all will be "fans" due to this spendid work on your part.—R. V. COLTON, Pres., H. SCHWERIN, Secy.,
Vernart Mfg. Corp.

What Radio Means to the Blind

Institutions in All Parts of the Country Tell The Wireless Age of Radio's Immense Value to Them—Great Field for Radio Fans' Charity—Every Blind Person Should Be Within Reach of a Receiving Set

THERE is just one big charitable thing that the readers of THE WIRELESS AGE can do and that is provide funds for the installation of radio receiving apparatus in their local institutions for the blind. Radio for the blind is a humanitarian enterprise carrying benefits such as no other modern activity possesses for them, and every blind person should be able to profit to the fullest extent from it.

Such was the conclusion when Ward Seeley's article, "Radio Blesses the Lives of the Blind," was submitted for publication in the July issue, and ample confirmation has come since then. Many organizations for the blind have written their appreciation and told of their great desire to bring the music, news and entertainment of the world into the lives of their people by radio.

From all parts of the country have come new tributes to the service of the radio telephone to the blind, who find that for the first time in all history they can be just as up-to-date and well informed as sighted persons, and at no annoyance to others.

What is probably the most progressive and best known of all institutions for the blind is the Pennsylvania Institution for the Instruction of the Blind, at Overbrook, Pa., which has been doing some quite remarkable educational work. O. H. Burritt, principal, writes as follows:

We have no means of knowing just how many blind in Philadelphia and its environs have installed radio receiving sets, but we do know that a number of them have done so and that a very considerable number would welcome the installation of receiving apparatus that would permit them to keep in touch with current events and listen to music, lectures, sermons and all material that is being broadcasted. You can readily see that the radio receiving apparatus is a great boon to blind people and will keep them in touch with the movement of modern life.

An extremely important factor in making this invention available for blind people is to bring it within their reach financially; for a great majority of blind people are themselves poor, or are members of families that have little to do with.

So far as this school is concerned, we have been looking into the possibilities of installing a receiving apparatus that will meet our needs. We haven't gotten very far with the plan; partly because we have not yet worked out a satisfactory method of installation; and, partly, probably chiefly, because of the cost of installation and maintenance.

It is probably true that radio may prove to be a greater boon than the invention of Braille type. However, I doubt this statement. The truth seems to me rather to be that the invention and perfection of radio apparatus is a very helpful supplement to the embossed page. It is also probably true that, granting the perfection of radio apparatus and its production at a reasonable figure, a larger number of blind people can, through this medium, be just as up-to-date as any one else—which is utterly impossible under the existing conditions because of the expense and time involved in the production of embossed literature.

We have a blind population in this institution of two hundred. We are very much interested in the installation of radio receiving apparatus and shall install such as soon as we can find a satisfactory outfit that is within our means.

This excellent letter is typical of the situation in the great majority of organizations working with blind people. Lack of funds prevents them from immediate realization of their desire to give their people the great benefits of the radio telephone. The several institutions that already have receiving sets are enthusiastic. S. M. Green, superintendent of the Missouri School for the Blind, St. Louis, writes as follows:

We installed a radio receiving set in February and have found it of the greatest possible interest to our pupils. It helps to solve the one ever present problem of keeping the blind in touch with current events.

Another school that has been provided with apparatus is the Connecticut Institute for the Blind, Hartford, whose superintendent A. L. Curado, writes:

We have a large size Westinghouse wireless outfit with Magnavox and two steps of amplification which has proved very satisfactory and has given a great deal of enjoyment to some of our blind people.

Blind girls in the New York Lighthouse for the Blind, which has just been presented with a receiving set, are fascinated with it

We also suggest that some special method of teaching the average blind person the international wireless code be discussed in your paper.

In reply to the last paragraph of this letter it was pointed out that the Marconi-Victor wireless code instruction records are ideal for teaching the blind.

Several schools are now installing instruments, and have not as yet had time to operate them. The Florida School for the Deaf and the Blind, St. Augustine states:

We are now installing two receiving radio sets in this school for the benefit of our blind people. We hope to have these sets ready and in operation before the opening of the next term of school.

From the northern border of the country comes almost the same word, H. J. Menzemer, President of the Montana School for the Deaf and Blind, Boulder, writing:

We are a small school and do not feel that we can afford a very expensive outfit; but we do hope to install one during the coming year and this, we hope, will take the place of newspaper reading, and also the place of concerts of which our little town affords all too few. We have twenty-eight in our Blind Department.

In Iowa, the Iowa College for the Blind, Vinton, is considering an installation, and is still studying the possibilities, particularly financial, for F. E. Palmer, superintendent, has no doubts of the great assistance radio is to the blind. He writes:

I am very much interested in the proposition of installing a receiving set at the Iowa College for the Blind, and I shall recommend that such installation be made providing the cost is not too great.

We have about one hundred and fifty people here who would take advantage of such a service, and I feel sure that it would be of real service to the blind.

(*Continued on page* 96)

What Newspaper Editors Say

Press Comment Shows Public Attention Is Focused on Programs Rather than on Mystery of Radio Itself

ARE people more interested in the mysteries of wireless itself, or in the material broadcasted via the wireless telephone?

An interesting question, likely to provoke debate whenever asked. It has been asked many times recently in the nation's press, many editors have commented upon it. The opinion of the majority of them seems to be that the people now are more interested in what is being given them over the radio telephone, than in the radio telephone itself.

There was a time, they say, and not many months ago, when the reverse was true, but the novelty has worn off, they add, and such an attitude exists no longer.

This confirms the opinion of the writer of the article on the successful broadcasting of the Leonard-Britton boxing exhibition in New York City, which appears in this issue of THE WIRELESS AGE. He maintained that in the course of his observation of New York crowds he was impressed with the fact that the people were more attentive to the results of the boxing match than to the radio telephone.

But the *Bucyrus (O) Forum* believes the opposite is true. Headlining an editorial "A Radio Mystery" it says:

What the radio fans really are interested in, is the mysterious wireless itself, rather than what they hear by Hertzian waves.

The wireless has a basic and universal appeal because it is closely allied with the supernatural, even the uncanny.

The history of wireless began 70 or 80 years ago with the experiments in electromagnetic induction by Faraday, an Englishman, by trade a bookbinder.

BIRTH OF RADIO

Heinrich Hertz, German professor, came along later and in 1886 made amazing discoveries about an electric spark bridging a gap or break in a wire.

Scientific minds immediately began working on the problem of making the electric wave jump thousands of miles instead of an inch or so.

People discussed the sanity of Sir William Crookes when, in 1892, he predicted the coming of actual communication by wireless.

In 1901 Marconi, brilliant young Italian, sent the first wireless messages across the Atlantic—the letter "S," in code.

Many readers will recall the wireless telegraph craze that followed among boys—also their antiquated equipment including the coherer and decoherer, which few youthful radio fans of 1922 ever heard of. Radio equipment now in use will be just as obsolete, 21 years hence.

Assuming the other attitude a writer in the *Detroit (Mich.) Farmer,* declares that as the radio telephone gradually assumes its place "in the world of activities we will come to be more and more dependent upon it."

He writes in part:

In 1897, just twenty-five years ago, Marconi made the remark in reply to a query that if sufficient power were obtainable and a large enough antenna erected it might be possible to transmit messages a distance of twenty miles through the air. Today there are boys in the United States, some of them as young as twelve and fourteen years who think very little of carrying on a wireless communication with their friends four and five hundred miles away.

When the radio telephone, and especially the telephone broadcasting stations first came into use there were only a few amateurs and the operators of the so-called commercial stations to listen to the music and lectures that were thrown out into the air. From the very first the concerts and programs have been of the highest order and well worth listening to and the added interest of knowing that they have come hundreds of miles through space made them all the more entertaining. Today there are nearly one hundred high powered radio telephone broadcasting stations which serve the public, wherever they may be, with music, lectures, weather forecasts, news of the world, base ball scores, church services, etc., and what was in the beginning merely an experiment or an interesting form of amusement is fast becoming almost a necessity. Some say it is merely a fad that has taken the country by storm which will die out in time, but this is not true. It was bound to come as soon as the radio telephone reached the proper state of perfection and now that it has come it is here to stay. As it gradually assumes its place in the world of activities we will come to be more and more dependent upon it. It may be a good many years before the radio telephone is used to any great extent for inter-communication in the manner of the wire telephone of today but it will be of increasing importance as a means of communicating news, entertainments, business affairs, etc., from central broadcasting stations.

Launching into a descriptive opinion as to what the future of radio holds, the *Ashtabula (O.) Beacon,* paints a picture of the various uses to which radio will be put.

Editorially it says:

It would require a most active imagination to see what the radio will do in the future. The infant colossus has already bridged continents and seas and threatens to become a part of the existence of every American family that can afford a cheap and simple receiving mechanism.

With the manufacture of tiny receiving sets no larger than watches and purses the possibilities of the contrivance stagger the serious mind and provide a glorious field of fancy for the imagination. It has already been suggested that the henpecked husband and the small boy will lose the small privacy absence from the domestic hearth now affords. Equipped with an ear-piece they will be constantly under orders from the family's directing genius at home.

Managers will develop baseball into a sort of outdoor chess by keeping in constant liaison from the bench with men on the field, and the rule that bars coaches from the gridiron cannot hinder directions by phone. Mothers visiting of an evening may croon a lullaby to a still yowling babe at home, and taxi drivers be entertained by conversations from the tonneau in the darkness of night.

The possibilities of radio leaves most of us in such a state that we dare not contradict even the wildest predictions made and we expect to read every day of something more surprising than anything yet made public, of what wireless can do.

Assuming the popular attitude that people now have "developed" to the point wherein they take an active interest in what is being broadcast, the *Berkeley (Cal.) Gazette,* prints an editorial telling "What Radio is Good For." It gives as its opinion the following:

ONLY SENDERS LIMITED

With everybody going in for the radio telephone fad, it is well for the public to get clearly in mind just what the radio is good for. Secretary Hoover has pointed out its limitations along with its advantages. The wireless phone, he explains, will never be used generally for purposes of communication between individuals, as the ordinary telephone is. Such use would be impossible without individual wave-lengths in every case, corresponding to individual wires, and there are not enough different wave-lengths to go around. It is necessary to divide the wave-lengths among large groups and interests, if everybody is to be taken care of, and that bars promiscuous conversation.

Aside from government use, however, there is left a definite and broad field for wireless use. It involves "the spread of certain predetermined material of public interest from central stations." This will be limited to news, education, entertainment and commercial purposes and other matters that may happen to be important to large groups at the same time.

Senders, therefore, must be limited. But receivers may be unlimited. The "broadcasting" will be done from certain licensed and controlled centers, and anybody who wants to, may buy a receiver and "listen in" to whatever interests him.

"THE radio audience is no different than the concert, opera or vaudeville audience. It is composed of the same people and whatever pleases them out of their homes will please them in their homes"


Carolyn Beebe

Carolyn Beebe

Founder of the New York Chamber Music Society Tells Paul S. Gautier of Her Faith in Radio

THE fame of the New York Chamber Music Society had spread rapidly throughout the country within the past year so that when it was announced that Carolyn Beebe, founder of the Society and herself a noted pianiste, would play over the radio telephone, the radio public listened unusually attentively. Following the performance of Miss Beebe at WJZ hundreds of letters of appreciation of her work were written.

It has not been long since chamber music, including even the string quartet and the trio, was the most neglected of the tonal arts in the United States. As the pioneer of chamber ensemble, Miss Beebe has done much to completely draw away the veil of prejudice which formerly surrounded this branch of music.

Of the radio performance itself of Miss Beebe and the resultant pleasure which it gave, little need be said here; the satisfaction it produced, as those who listened in know, was the same satisfaction that always comes from hearing a true artist.

But it is of interest to note here the comments and the opinions of Miss Beebe about the radio telephone. Miss Beebe believes that the radio telephone is an accurate transcriber of music; in other words the tone transmission is perfect.

"For that reason," she told me, "I believe that radio will become valuable to art."

And when a statement of this kind comes from a woman who loves art as much as Miss Beebe and who knows music as well as she does, it embodies as high a recommendation of the value of the radiophone to society as could possibly be made.

An Adjunct to Music

No true artist ever has or ever will place anything else on a par with or above his or her art. So that in her few words I was made to understand that the head and founder of an important society recognized in the radio telephone a permanent and useful adjunct to music.

"Friends of mine who listened in on one of the nights when I played told me that even the faintest trill was audible," she said. "One friend living about forty miles out of New York did not know that I was to play on the evening that I did.

"She knows my work very well and despite the fact that she had not seen the announcement of my name on the program she recognized my playing immediately and confirmed it by looking at the daily paper. This illustrates to me how truly the artist's efforts are produced over the radiophone.

"This holds true of course alike for both the singer and the player of an instrument. Radiophone broadcasting will fit in especially well, I believe, with the work of the New York Chamber Music Society, which regards itself as an educational force. Possibly I should explain just what the New York Chamber Music Society is. It consists of eleven solo artists who give solo and ensemble programs. The ensemble members include all combinations of piano, string and wind instruments, in duo, trio and quartette arrangements, up to and including eleven instruments. The organization has a record of giving over three hundred concerts in three seasons and everywhere the critics have pronounced the work of the society as the height of musical art.

"All the musicians of the ensemble are members of the New York Philharmonic Society and include Scipione Guidi, first violinist, and Gustave Langenus, claronetist, both of whom have broadcast over the radiophone; and Arthur Lichstein, Nicholas Kouloukis, flutist; Joseph Kovarik, violinist; Bruno Labate, oboe; Cornelius Van Vliet, violon-cellist; Anselm Fortier, double bass; Maurice Van Praag, horn; and Benjamin Kohon, basoon.

"When I conceived the idea of starting an American ensemble organization," Miss Beebe continued, "there were many persons who warned me that the repertoire would be above the people's heads. In some instances no doubt that was so, but the popular enthusiasm over our works has proved that America's musical taste is far higher than is commonly supposed.

"I had always loved ensemble work and I feel that one must be proficient as a solo artist to succeed in that field. To keep the unity of the ensemble one must have artists of unusual rank and so with the collaboration of the artists named I organized the Chamber Music Society. To my delight I found that the public, instead of disliking the programs, took just the opposite attitude. Invariably the appreciation of the audience was the greater, the better were the works which we offered.

"I believe that the small ensemble is a more acceptable form of music to the average listener than the conservative string quartet or trio. The combination of wind and strings is more colorful. Our work consists largely, in a sense, of ear training, that is, of accustoming the listener to hear the clear colors and the various timbres of instruments of the small ensemble.

"I maintain that the radio telephone will win public appreciation possibly a little more quickly than it would otherwise, if, in the broadcasting programs, the theory around which our organization is built is put into practice. The radio audience is no different than the concert, opera or vaudeville audience. It is composed of the same people and whatever pleases them outside their homes, will please them within their homes.

"Chamber music will eventually find its place in the future with the radio public. I want to emphasize very strongly for those who control radio broadcasting that they should not overlook this point when the work of building up future programs commences."

The Nimble Wit of New York City Cartoonists

YOU CAN'T BLAME JEFF FOR WANTING SECURITY

—*Fisher in N. Y. World*

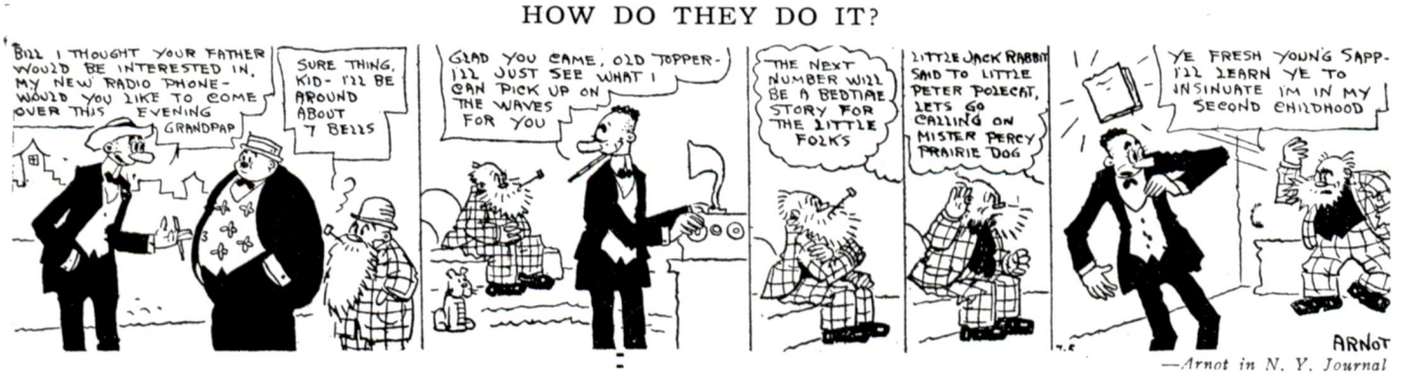
WHEN A FELLER NEEDS A FRIEND

—*Briggs in N. Y. Tribune*

SOMEBODY ON THE WIRE

—*Segar in N. Y. Journal*

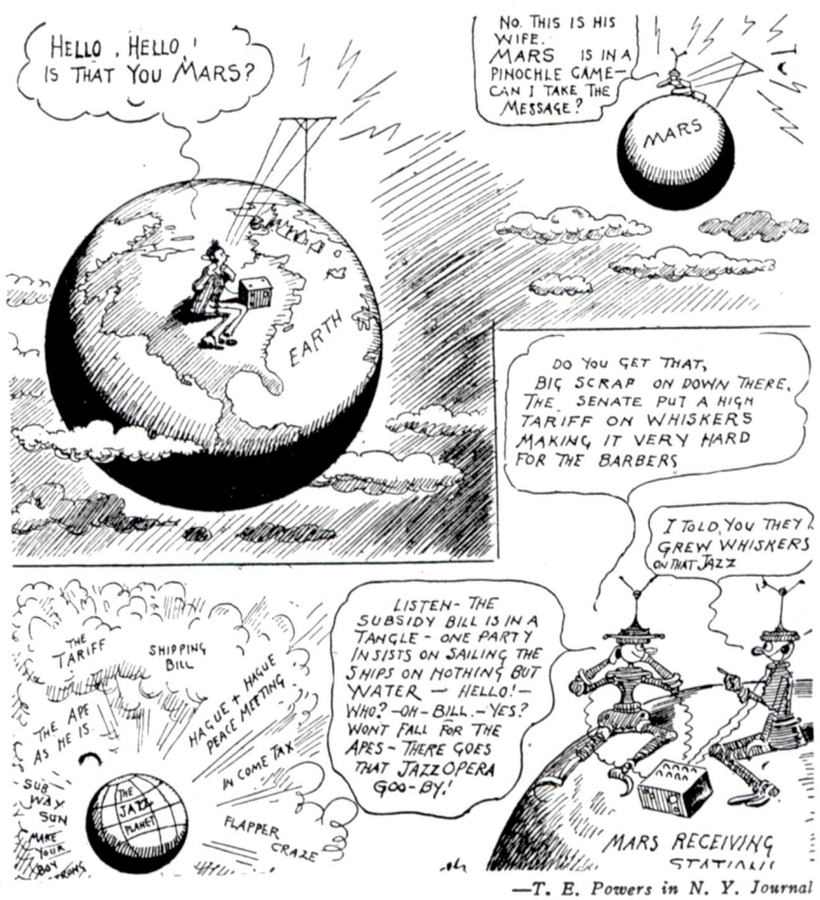
HOW DO THEY DO IT?



—*Arnot in N. Y. Journal*

Is Ever Concentrated for a Barrage on Radio

GOSSIPING WITH MARS



—T. E. Powers in N. Y. Journal

JUST LIKE A MAN

—Knott in N. Y. American

RURAL RADIO

—Kessler in N. Y. Globe

Witching Wireless Waves Whirl Wittily

Our Own Broadcasting Station

This station broadcasts programs for all those troubled with insomnia. It transmits on a wave length varying from 1 to many more than 1 meter. The radio audience should not request information as to the exact wave length, for that would take the romance away. Letters of appreciation of our program should be addressed to the butcher (enclosing the unpaid bill) or to anyone else, except us.

SUNDAY

7 P. M. Señor Morris Coney, the motion picture producer, who specializes in short reels, will speak on "The Manufacture and Distribution of Films in One-Meter Wave Lengths."

8 P. M. A sermon by Dr. Gessitt, subject, "Why, And If Not Why, Why Not?"

The bedtime story will be given tomorrow night, weather permitting. 9 P. M. The Russian Folk Dancers—illustrating the latest Fox-Trotsky. The new Lean-In-Limp will be demonstrated. 10 P. M. "Berth Control," lecture by Dapper Dan, a well-known Pullman porter.

MONDAY

7 P. M. Mme. Iawanna Ukanavva, coloratura, will present a program of musical selections, among which will be that pathetic ballad: "Don't Apologize, Dear, I'm From Hoboken, Too."

8 P. M. Watermelon eating contest. Winner to take the seeds. 9 P. M. Address by Joe Doaks on "How Old Is a Turtle, and Why?" with impersonations by Mr. Doaks, illustrating the various steps in the growth of turtles.

TUESDAY

7 P. M. Fight returns direct from fireside. This is a remarkable demonstration, being the first time a description has come direct from the scene of a domestic battle. Names of the contestants will be broadcast at 6:59 P. M. Mrs. Tom Jenkins and Mr. being the likely contenders, with preliminaries by Harry Thompson and his strife. Realistic, blow by blow, including a description, throwing of a piano at the respective husbands, every note of which will be audible. 8 P. M. Intermission to talk it over and repair all instruments broken by the battle.

9 P. M. Returns from the New York Stock Exchange, including sharp reports, as bucketeering brokerage houses go to smash.

10 P. M. Debate by radio: "Resolved: A Radio Wave Is a Permanent One." Negative side by the Association of Beauty Parlors. Affirmative by Yewand Eye.

ANY DAY

Noon to midnight. Interference Ike Sparkoil will broadcast his familiar old song, "How Happy I Could Be With Ether Were 'Tother Dear Stations Asleep." Between verses Ike will demonstrate his ability as an operator by sending the following message at a speed of three words a minute:

QST QST de IKE QRM QRT
yours, IKE.

As an added attraction, this message will be sent simultaneously in all wave lengths. No extra charge for this feature.

Midnight to noon. Interference Ike Sparkoil will repeat his program.

HIGH FREQUENCY.

It is generally conceded that Dr. Charles P. Steinmetz, nominated for N. Y. State Engineer, ought to poll a good many volts.—F. P. A. in *The N. Y. World.*

THE BASEBALL GAME

—*Pittsburgh (Pa.) Times*

Our Radio Fourth

(With Apologies to Collier's.")

"Well, sir, the Fourth of July ain't what it used to be," said Uncle Henry, hanging his headset on a hook and taking another chaw of tobacco. The Cub Reporter sat before him on the edge of a chair. He had just asked the famous patriot's views on the contribution of radio to the Safe and Sane Fourth.

"Time was," continued Uncle Henry, "when only the bravest of the brave could go through a Fourth of July celebration unburnt by punk, squibs and powder in its many gay forms. The Fourth claimed its thousands of killed and wounded. Most of us came through the day with at least one major burn, and a whole battalion of captain, lieutenant, sergeant, corporal and private burns, wounds, punctures an' lacerations. To say nothing of the rattle in our ears from the explodin' giant crackers and the rumble of the oratory that crackled all over the village green.

"Them was the good old days," Uncle Henry sighed. "Only the fittest lived to see the sun go down.

"Just look at us now," he complained, "it's so tame that they's nothin' to do but hang out a flag and sit in the breeziest winder listenin' to a speech and a lot o' music by radio."

"Land sakes," interrupted Aunt Mariah, who was knitting industriously by the other window. She wore a single receiver headpiece, preferring to keep one ear open for gossip.

"Land sakes, Henry, how you go on. Many's the Fourth of July I've sat up all night nussin' you, and the arnica and witch hazel and bandages I put on you an' all the neighbors, would start a hospital, so it would. It's a good thing, so it is, that we can celebrate by this here rady-phone and spend the day in peace and quiet. Why, I remember one Fourth when . . . . listen, Henry, ain't that just grand?"

But Uncle Henry didn't hear her. He had put his headset on his ears and was listening happily, rocking back and forth gently.

When Whimsical Wisdom Winks

The Radio Lover to His Love

BY S. E. KISER

Dear, are you sure your rheostat
And amplifiers are just right?
Your variometer—how's that,
And are your variocouplers tight?
I'm doing all I can, my sweet,
To make myself distinct and clear;
I love you only, I repeat—
Don't mind that; it was static, dear.

I'm glad you get me better now;
Your lattice was at fault, no doubt;
I wish I dared to tell you how
You've caused my fears to flicker out.
Your amperage is mighty high,
At least to me it seems to be;
Please, dearest, won't you tell me why
You broadcast so reluctantly?

I'll tell the world, and gladly, too,
That you're my precious binding-post;
Of all the tuning signals, you
Affect my filament the most!
You have me coiled; my batteries
Are at your service for all time;
Restrict my wave-lengths as you please,
I'll still consider you sublime.

If as your grid condenser I
May serve, I'll gladly do my part,
And if your honeycomb tunes high,
I'll get you, anyhow, sweetheart.
Please let our hook-up follow soon,
Our dials set for ecstasy,
And we will gladly keep in tune,
From atmospheric troubles free.

—*N. Y. American.*

Make It Safe for Husbands

To the Radio Editor of The Post:

An experience I had the other day suggests to me an improvement in radio that must be made before radio can be truly useful to all families.

My wife called me up at my radio station, VG, and asked me to bring home a loaf of bread. This occurred in the busiest hour of the day. Had she called me up on the regular telephone I would have upbraided her severely for her thoughtlessness in calling me up at the wrong time.

But over radio I could not speak to her in that way, because all the neighbors who have radio sets would have heard it.

Therefore, I had to swallow my anger, as the saying is.

Thus, you see, radio interferes with the normal family life. It should be made safe for cussing, so that a man can tell his wife what he thinks of her without everybody in town hearing him. I hope something can be done about it.

Yours truly,
VILLAGE GOSSIP.

Al Segal in the *Cincinnati Post*

Maybe Assistant Secretary Roosevelt was afraid the lady politicians would not ring off if he let them use the navy's wireless.—*Indianapolis Star.*

"Through it all," the Times says of the Philadelphia girl who listened to the radiophone while undergoing an operation, "the patient entertained the nurses with laughing comment on the 'good execution' of the artist who was transmitting Chopin for her." What do you suppose some of her laughing comment was? Probably she said, "Chopin, eh? Ought to be Choppin'."

—*N. Y. World.*

WONDERS OF RADIO

—*N. Y. Globe*

Wise Crack-les

L. C. G. writes in to ask if Lightning Bugs cause static. He says his friend Ed advised him to close down his station during the Summer, because the heavy crop of these bugs on Long Island would cause unfavorable atmospheric conditions.

Ed is wrong. Lightning bugs don't cause static; they cause earthquakes.

* * *

Contributes Frank L. Velten, of Brooklyn: A very sophisticated, bobbed-hair young lady was talking to two wise young men on a trolley last night. The conversation drifted to radio and weather.

"Oh, yes, of course," said the y. l., "all the thunder storms we have had this month are directly due to radio broadcasting."

"You betcha," chimed in the y. m. "and lightning too."

QUESTIONS AND ANSWERS

Dear Editor:

When are we radio fans going to hear a lecture by Henry Shallow? I think he would be very interesting on the subject of "Mussels and How to Make Currents Out of Them," or, "Is Politics a Shell Game?" Another subject might be, "How Vibration Improves the Health of Tourists." Please persuade Henry to give these lectures.

HOPEFUL.

Answer: Confidential radio advices inform us that Henry Shallow is now engaged in making his first real automobile. Until that long and hazardous task is completed he will not be available for the broadcasting studio.

* * *

Dear Editor:

I hear that Lee Jay D. Woody has written a lecture entitled "Pipe Lines to Profits, or Why My Bank Account is Tubular." When will we hear this?

ANXIOUS.

Answer: This lecture has been submitted to the censor. He still has it.

WORLD WIDE WIRELESS

New 1 K.W. Phone Transmitter Heard Across 2,100 Miles

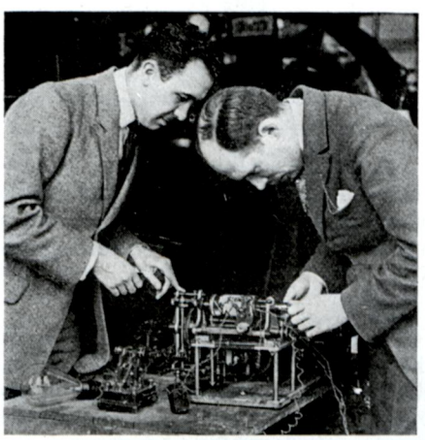
STRIKING results in radio telephone transmission were secured June 26, when the new 1,000-watt phone transmitter designed by the Radio Corporation of America and installed on the S. S. *H. F. Alexander,* was heard perfectly in San Francisco while the ship was moored to a dock in Honolulu, 2,100 miles away. The transmitter is the new instrument designed especially for ship use, which was described in THE WIRELESS AGE of last June. Its first long-distance voice performance more than justified the predictions of the Radio Corporation's engineers and other experts that the new set would do startling work. The fact that the record was made during the Summer and over a stretch of ocean that is particularly pestered with static disturbances make the performance all the more remarkable.

The phone transmitting test was preceded by considerable code traffic between the steamer and station KPH of the Radio Corporation at San Francisco. When the traffic had been cleared a phone test was suggested, as the code had been coming across with exceptional clarity. Neither station thought that it would be possibly to secure perfect results, and only hoped to hear an occasional word. However, the first "Hello" of John J. Slater, the steamer's operator, was heard in San Francisco. After he had said "If by any chance you are picking me up, confirm by key, then come back with voice," San Francisco reported by code that voice reception had been perfect. Code then was abandoned and voice communication used. Weather reports were exchanged, and finally the operator at the Golden Gate connected his receiver to a land wire running to the San Francisco office of the Radio Corporation, where the voice from Honolulu was heard over the ordinary desk telephone.

The officers of the Radio Corporation are highly elated over the new record. It promises much for the immediate future, when, as more and more steamships are equipped with this apparatus, ship to shore and ship to ship telephone conversations will take place over long distances, and eventually become as commonplace as the land telephone now is. All passenger liners will be so equipped as soon as the demand on the part of the traveling public makes this advisable. With the new equipment it is possible for passengers on liners to talk directly with their offices and homes on shore, ending the separation from business and the family circle formerly entailed by a sea voyage.

Exceptional Distance Work on the Pacific

SOME exceptional distance work was done by commercial spark transmitters on the Pacific during June. On the 15th the San Francisco, Calif., station of the Radio Corporation, KPH, worked with the S. S. *Tahiti,* enroute



Gaston Tohanneau and Marcel Touly, French engineers, work on a device for transmitting pictures by wireless, which tests show soon may be commonplace

from Sydney to San Francisco, while the ship was still 19 days out, a distance slightly over 5,000 miles.

On June 23, KPH copied eight messages from the *Tahiti,* while the vessel was 3,295 miles out. The ship's operator reported that the signals of KPH were frequently heard while the vessel was at Sidney Harbor, N. S. W., Australia.

The transmitter at KPH is a 5 K. W. non-synchronous rotary spark set, and the transmitter on the *Tahiti* is a 2 K. W. non-synchronous rotary spark set.

Anatolia Uses Radio

ANATOLIA now is in communication with the rest of the world by wireless. A new station has been opened at Kaisariye, which sent its first message to Moscow. The Angora government is to open another station at Mersina for communication with European capitals.

Unveil Roll of Honor to Marconi Operators

WHEN, on June 21, a Roll of Honor was unveiled in Marconi House, London, in honor of the Marconi operators who fell in the war, the ceremonies were broadcast by wireless telephone. Wireless operators on ships in British waters stood by at noon to give the broadcast ceremony the right of way. The bugle calls of the Last Post and Reveille were sounded by six bugle boys from the training ship *Exmouth.* Mr. Godfrey Isaacs, managing director of Marconi's Wireless Telegraph Company, delivered an address prior to unveiling the roll, which contains 348 names, of which 316 are ship operators who were drowned when their ships were sunk by enemy submarines.

Mr. Isaacs said in part:

"We are proud of these great deeds performed as they were by young Marconi men acting upon their own initiative in the face of death, and we are certain that no records of the war show deeds which reflect greater credit upon the nation or any individual organization.

"It is gratifying to note that among the surviving members of the office and sea-going staffs are several recipients of honors, decorations and awards. These also bear witness to work well done in the cause of civilization and humanity.

"In exposing to your view the names of your late colleagues I feel sure that this memorial will be an incentive to each one of us to follow the high standard of national and personal duty, which was established by those whose memory we here perpetuate."

Gerard Swope Heads General Electric

GERARD SWOPE has been elected president of the General Electric Co., Schenectady, N. Y., succeeding E. W. Rice, Jr., who thus realized his wish to devote his time to engineering and research. Mr. Rice has been made honorary chairmen of the board of directors. As in the past he has been responsible for many important developments in the electrical art, it is expected that with his new leisure he will be able to bring still more important plans to fruition. Mr. Swope, the new president, is president of the International General Electric Co.

Radio Beacons Being Developed for Airplane Use

USE of radio direction signals for the guidance of airplanes is being developed both in the United States and abroad. In the United States, the Air Mail Service, which recently received an appropriation of $1,900,000 for extending its routes, is co-operating with the Signal Corps, and radio beacon stations are to be established along all mail airplane routes. Landing fields are to be provided with a special transmitter, using an antenna in the form of a coil so designed that the signals radiate from it in their maximum intensity at an angle of 30 degrees from the ground. An airplane in flying over the transmitter would notice when the signals were at their greatest intensity, as it cut through the cone formed by the waves emitted at the 30-degree angle. By flying back and forth several times it would be easy to locate the exact position of the field, even in fog and storm, and descend safely.

In Europe, where passenger-carrying planes operate on schedules as regularly as railroad trains, the radio beacon is being used, especially for cross-Channel work, enabling pilots to take the most direct line of flight.

New Lake Steamer Installation

THE Radio Corporation of America has just installed a new radio telegraph and telephone transmitter on the *City of Detroit III*, which sails on the Great Lakes between Buffalo and Detroit. This is the latest installation purchased by the Detroit & Cleveland Navigation Co., which was a pioneer in equipping Great Lakes steamers with radio apparatus, having first experimented with it in 1902.

Goniometer Proves Value

A NEW and striking demonstration of the value of radio goniometric stations in New York harbor was given recently, when the *Oropesa* of the Royal Mail Steam Packet Line was guided safely up the channel in a dense fog. For three days previous to reaching the coast the ship had steamed under reduced speed on account of the fog. When it got within range of the U. S. Navy radio compass stations at Amagansett, Fire Island, Sandy Hook and Mantoloking, the captain asked for a position report, from which a course was laid for the Fire Island lightship, so accurately that two hours later the vessel passed within sixty yards of the lightship. The course was then changed for Sandy Hook, and the ship soon docked safely. Captain Le Brecht said on docking that he would have been many hours late if it had not been for wireless assistance, and that he believes that in time a wireless course across the ocean will make navigation safe, free from danger of steamers straying out of the east and west bound tracks.

Fishermen Install Phone Sets

THE radio telephone is to be used extensively in directing the operations of the big fishing fleets sailing out of Gloucester, Mass., to the Grand Banks off Nova Scotia. Several of the fishing vessels have been equipped with receiving sets, and a powerful transmitting station is being erected in Gloucester, at the expense of a co-operative syndicate of ship owners. By using the radio telephone from shore to ship, the skippers on the Banks will be advised of market conditions, and the ship owners expect to profit largely by bringing their ships to port when prices

Chicago riders on the "L" enjoy the radiophone music during tests with apparatus aboard the trains

are most favorable, instead of having them come in haphazard, as at present. In addition, the receiving sets on the ships will provide entertainment for the crews. The fishermen have been wishing to use wireless for years, but have been unable to do so, as operators could not be secured. Now that the radio telephone has made voice communication possible by wireless, the fishermen can have the advantages of radio, which they need so much.

German Traffic Growing

NEW records in radio service have been made by the Drahtlose Ueberssee-Verkehr, A.G., or the Overseas Wireless Co., of Germany, operating stations at Nauen (POZ) and Eilvese (OUI). Traffic through these stations has been steadily increasing since they were opened for commercial messages. In August, 1919, the entire business for the month amounted to only 100,000 words, but on March 16 last 50,000 words were transmitted in a single day.

R.C.A. Makes Tubes Available for Ship Work

RESPONDING to the call of humanitarianism, the Radio Corporation of America has for the first time permitted the use of its vacuum tubes on competing ship stations. A new receiving tube has been designed especially for ship use, and will sell for $10. It will be a great improvement over the crystal detectors now in use, and will make sea travel safer, which was the reason that the Radio Corporation decided to allow their use on ships. Heretofore, the corporation's tubes have been limited to amateur and experimental use, and the sale of tubes to commercial stations competing with the Radio Corporation's own stations was refused.

The present exception in favor of ships was made in response to a humanitarian plea by the United States Shipping Board, which pointed out the fact that radio is a vital safeguard at sea and that each ship should possess the highest type of apparatus. The corporation, in responding to the plea, drew up a special contract for licensing ship stations under its controlling tube patents. Among other conditions the contract forbids the use of the tubes on shore. The new sea tube was designed especially for conditions on board ship, and resembles the Radiotron.

Use Radio Currents to Control Street Lights

USE of "carrier current," a current flowing at radio frequencies, for the control of city street lamps has been found to be practical, and no doubt in time the electric street lamps of American cities will be radio-controlled. Tests at Lynn, Mass., and Little Nahant, four miles away, made by radio experts of the General Electric Co., demonstrated recently how the Little Nahant lights can be controlled from the power house at Lynn, over the same wires that carry the lighting current.

The method used is a development of the radio industry. At the power house a high-frequency generator, using a vacuum tube, was used to generate radio-frequency waves, which were placed directly on the low-frequency feeder circuit running to Little Nahant. Relays there responded to the radio current, and operated switches that turned the lights on or off. By varying the frequencies and the tuning of the relays, it is possible to effect independent control of various parts of the same circuit. The cost of installation is small, as the equipment consists only of the radio transmitter at the power house, and a relay switch at each control point.

Army and Navy Share Arlington Station

THE temporary radio station of the Signal Corps, U. S. Army, at Washington Barracks, has been abandoned, and the Signal Corps now shares the big Arlington station with the Navy. The Army eventually will use two transmitting sets, one with 10-kilowatt power, and the other with twice that amount. The latter set, on 3,000 meters, will reach as far as Omaha, Neb. For the present the Signal Corps is using a 2 K. W. transmitter at Arlington, on its regular traffic on 2,650 meters, with control from radio headquarters in the Munitions Building. The Navy continues to operate two sets at Arlington, but will be able to lend the Army its 100 K. W. spark set when necessary, and also its arc set.

Clifden Replaces Poldhu

THE famous Marconi wireless station at Poldhu, Cornwall, Wales, has closed, and MBD, the call for which ship operators have listened eagerly for the last 19 years, no longer is heard. Traffic formerly sent throughMBD now goes through MFT, the Marconi station at Clifden, Ireland, which has taken up the famous Marconi commercial and press service. Poldhu made wireless history, having been the first high-power wireless station to be built, under Marconi's direction, and having sent the first message across the Atlantic, on December 12, 1901. The future of the historic station is uncertain; probably experimental work will be carried out there.

Swedes and Finns Want Ship to Shore Stations

BUSINESS men who travel back and forth over the Baltic Sea between Finland and Sweden soon will be able to keep in touch with both countries by means of the wireless telephone, plans for the service having been approved by the Swedish Telegraph Administration and the Abo (Finland) Chamber of Commerce. Consul Leslie A. Davis, at Helsingfors, Finland, has reported to the Consular Service that the Gesellchaft fur Drahtlose Telegraphie of Berlin proposed to install the necessary equipment. The Stockholm authorities quickly expressed a desire to secure the advantages of the system, and at Abo negotiations were opened with the Finnish Ministry of Trade and Industry for a concession. When the system is in operation it will be possible for telephone subscribers connected with the Swedish and Finnish telephone systems to call a radio telephone central and through it talk with passengers on steamers in the Baltic, or with residents of cities over their home or office telephone. At the same time that this radio development is under way, big plans for submarine telephone cables are being made to link all countries in the Baltic region.

British Police Study Radio

SCOTLAND Yard, England's secret service headquarters, is experimenting with wireless, both telephone and telegraph. as a means of appre-

Almost under the shadow of famous Notre Dame cathedral on the banks of the Seine, the Paris police experiment with a new radio-equipped motor truck

hending criminals. Receiving apparatus has been installed at the Yard, and tests have been made in transmitting details of crimes and criminals. Strangely enough, but few of the 58 outlying county constabularies are connected with headquarters by wire telephone, and it is thought that wireless will relieve this situation. It is expected that a wireless police net will be spread over the country. Confidential reports will be coded and then sent by wireless telegraph, while descriptions of wanted criminals will be broadcast by voice to all who have receiving instruments. The details are still being arranged, but it is expected that radio will play a large part in the British police system.

Denmark Reports Icebergs by Radio

AN iceberg reporting service has been established by radio in Denmark. Reports are broadcast whenever necessary by the coast station at Blaavand, at 12:20 and 10:20 p. m. These give the positions, size and estimated course of such icebergs as have been observed in Danish waters.

Nauen Radio Station Being Re-Designed

THE wireless telegraph station at Nauen, near Berlin, Germany, is being reconstructed and greatly enlarged in order to secure improved working conditions with the United States and South America. Additional capital amounting to 25,000,000 marks has been secured, and work has been started. The antenna system is to be considerably altered, seven new 210-meter (689-foot) masts being planned to take the place of four existing masts. Two sets of aerials are used, one for trans-Atlantic work, and the other for communication with European stations. Both these have been entirely distinct, and at right angles to each other, to prevent interference, but under the new plans it is expected to effect central control of the antenna circuits by means of switches that will enable the many strands of aerial wire to be grouped electrically to suit the varying needs of the traffic. The antenna is 2,484 meters long, or about a mile and a half. The present power plant, using high-frequency transformers of from 130 to 400 kilowatt power, is being re-designed, and also much work is being done in developing and improving high-speed sending and receiving mechanisms.

Chapultepec Station Reopened

RADIO communication between Mexico and Chile has been resumed, the powerful station at Chapultepec, Mexico, having been put in operation once more. The first messages exchanged were between President Obregon of Mexico and President Alessandri of Chile.

Coming Radio Shows

CLEVELAND, Ohio, is to have a radio and electrical show August 26th to September 4th, in the Cleveland Public Auditorium. More than 200 display booths have been arranged, and space has been taken by dealers, manufacturers and technical schools. Prizes will be given to school children for the best home-made receiving sets. Special exhibits will be made by the Army, Navy and the Boy and Girl Scouts.

APPLICATIONS and space diagrams for the coming electrical exhibition in Salt Lake City, October 2nd to 14th, already have been distributed by A. M. Jackson, manager of the Rocky Mountain Electrical Exposition, from his offices at the Kearns Building, Salt Lake City. The exposition will be exceedingly elaborate in decorations, including a large illuminated arch. The Rocky Mountain Electrical Co-operative League is fostering the event. Radio companies are expected to show many interesting displays.

Radio Communication in Russia

Pre-War Development, War-Time Uses and Future Requirements and Opportunities Described by the Former Chief of Russian Radio Communication

By Col. I. Mouromtzeff

THE name of Russia is as significantly connected with the birth of Radio Telegraphy as is the name of Italy, for Russia and Italy were its independent birthplaces. Indeed, Russia claims first place in point of time. A. S. Popoff, a Russian professor, having constructed a receiver for electromagnetic waves a year before Marconi announced his famous invention. Each worked without knowledge of the other's achievements. Popoff, however, had in view the use of his discovery as an indicator of atmospheric disturbances.

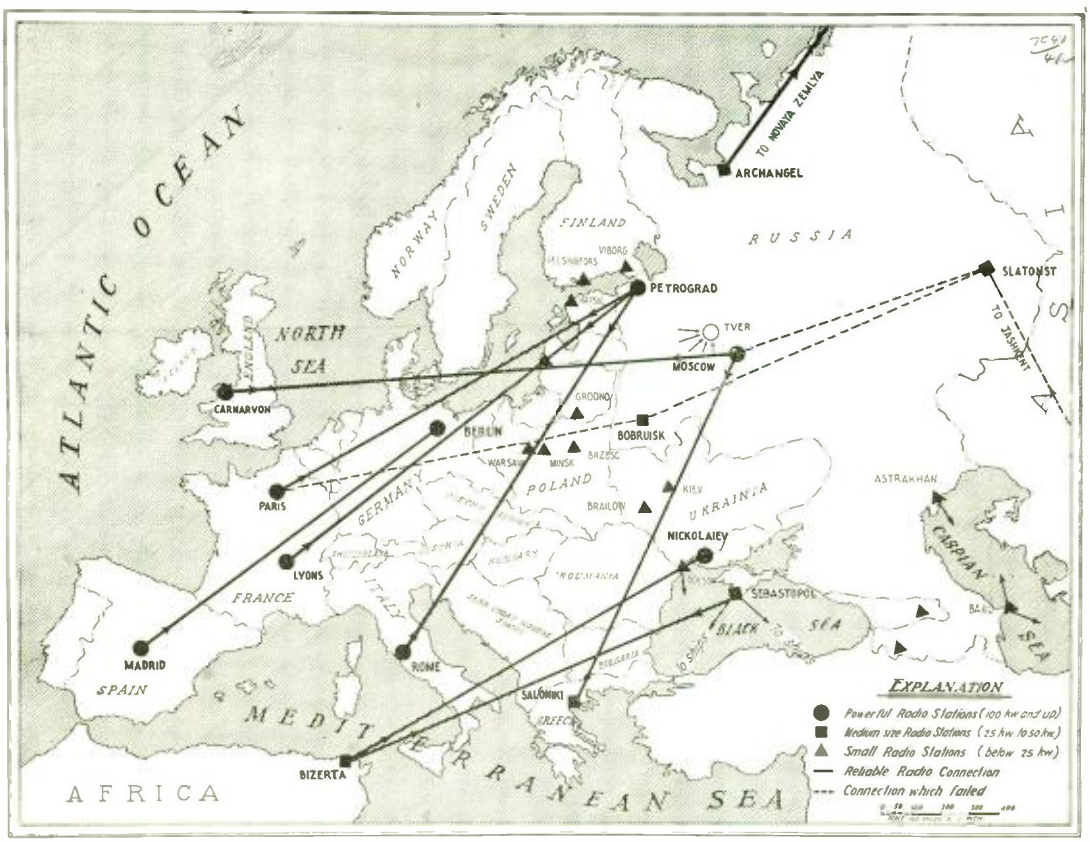
For a long time (until 1909-10) the Russian Government, staggering under the burden of an enormous budget for the upkeep of a vast army, was unwilling to spend money for development along technical lines. This was especially true of something that seemed of so little practical importance as radio telegraphy which then was looked upon as a modern toy and a very expensive one. The same attitude was observable in other countries, the general conception being that radio telegraphy could be of little service except on ships. Even in this case real faith in it was not expressed until 1909, when the sinking of the *Republic* proved its value.

Ship Installation

Thereafter, many Russian ships were provided with small radio sets. Among them were included all the different makes that were on the European market at that time: Popoff-Ducrete, Marconi, Arco-Slaby, and Telefunken. In all the huge Russian army, however, there were in 1909 only two radio companies. Each company had six radio field stations that had been delivered by the Marconi Wireless Co. during the Russian-Japanese War away back in 1905.

Aside from the mobile army equipment, Russia had only a few land stations, at St. Petersburg, Viborg, Kiev and several in the Far East, but their establishment and location were not in accord with any comprehensive plan. They were limited in range and were not of national importance.

The chief characteristic of the radio stations built prior to 1910 was the low frequency of the spark, or, as it was called in Russian, the "crackling" spark, generated by the Brown double-waved transmitter. The granular coherer, combined with the regular Morse recorder, was used as a receiver, but about the end of 1910 the telephone receiver was introduced, following the invention of Marconi's magnet detector, Schloemilch's electrolytic detector and then the contact, or crystal detector. Messages that were



Map of Europe showing war-time Russian radio telegraph stations and their relation to each other and the rest of the continent

sent by "crackling" spark transmitters were greatly disturbed by atmospheric discharges, the latter being of course a great detriment to radio communication.

In 1910 the Russian Government, following the example of its future allies and enemies, began to give more attention to the development of radio telegraphy but almost entirely along military lines. First, a large number of field stations were provided for the army. Later on a system of permanent stations was planned for use within the country and measures also were taken to establish radio communication with France.

MUCH EXPERIMENTING NECESSARY

During the development of the Russian army field radio apparatus the stations were reconstructed many times in endeavoring to solve the very difficult problem presented by Russian distances. Each radio unit had to have a range of 250 versts (170 miles) yet it could not exceed a maximum weight of twelve poods (432 lbs.) for each of the three two-wheeled carriages used to carry the complete equipment of the field station. When its mobile stations finally were rendered throughly practical the Russian Army had the most perfect field-radio of that time, which could move easily on the bad roads of its future theatre of war.

The transmitters of these new field stations worked with the quenched spark, producing a musical note of 400 to 2,000 vibrations per second. Oscillations were generated by the impulse circuit, based on principles introduced by professor Wien. This permitted a certain independence from mutual interference of working stations and also gave some freedom from atmospheric disturbances.

TELESCOPIC FIELD MAST

The Russian field mast is worthy of special mention. It was of the telescopic type, and was made of steel piping. It could be easily altered in height within a maximum of 25 meters or 75 feet. Many different designs of telescopic masts had been offered to the Russian radio specialists, and after tests they adopted the Fajance mast because of its light weight and its extension mechanism, which was on the outside and could be easily taken care of. It consisted of a worm drive with a handle, conic gears and a long-toothed wheel on the top of the lowest link of the mast. This wheel drove out the inner links one after the other by means of a series of perforations along the length of the mast.

At first it appeared as though the holes in the mast would make its use impossible. The slightest wind would whistle through the openings and the sound produced was as though a giant fife were wailing its grief. The howls could be heard for miles around and spread anguish and dejection among the peasants. This difficulty was soon overcome, however, by making the mast turnable within its bearings, so that the holes could be turned away from the wind, when even the strongest gale produced no sound.

Field stations were used in the Russian Army during the war on a big scale and many times the service they rendered was priceless. As one of many instances it may be mentioned that in the battle of November, 1914, when the entire Fifth Russian Army near Sodz was cut off from the other armies by General Mackenzen's troops, the only connection with Russian Headquarters for about four days was by means of radio. As a result of radio-arranged strategic moves, the Fifth Army escaped from its predicament and a German Army corps had narrow escape from capture.

AIDS IN QUELLING REVOLT

In 1916, the Kirguiz tribes (nomadic inhabitants of the steppes in Russian Middle Asia), revolted and spread destruction throughout a wide region. Telegraphic communication between several cities was completely cut off. A number of field radio stations were sent under military guard and successfully maintained communication for a month or so, while the revolt was suppressed.

The field stations were frequently used, also, for other than military purposes. For instance, the coast-guard service on the White, Baltic and Black Seas found them invaluable.

The most powerful fixed stations of the Russian Army were planned for Chita (Transbaikal), now seat of the Siberian Bolshevist government, and Tashkent (Turkestan). Each was of 100 kw. power. The comparatively small Caucasian stations played a prominent part in the manoeuvres of the Caucasian armies during the war, but the others were not ready before 1915 and even 1916, so that they played little or no part in the life of old Russia. However, the important result of the use of radio for military purposes was that the indifference toward radio telegraphy was overcome. Familiarity with it spread and many business people realized its usefulness for commercial purposes.

As a result, a number of stations were built in the far North, at Archangel, on the islands of Novaia Zemlia, and Vaigach. These gave reports of ice-movements in the Arctic Sea. Stations in the Far East, in the Kamtchatka and Anadyr peninsular regions (at Petropavlovsk, Ochotsk, Anadyr) assisted the daring explorers of that rich but distant and wild land.

In 1910 a station was erected at Bobruisk (near Minsk) exclusively for connection with the Eiffel Tower station in Paris, but the first attempts to communicate were not successful. This may be readily understood, because the total power of the Bobruisk installation was not above 40 kw., which was entirely insufficient to cover the distance of 2,000 kilometers or 1,200 miles between the two stations (vacuum tube transmitters, detectors and amplifiers did not yet exist). Besides, there were many mistakes in the design and construction of the station. In 1914 it was decided to abandon the old structure completely and to build a new 150 kw. station in the same location. This was never done, however, as the outbreak of the war brought about the settlement of the problem of foreign communication in a different way.

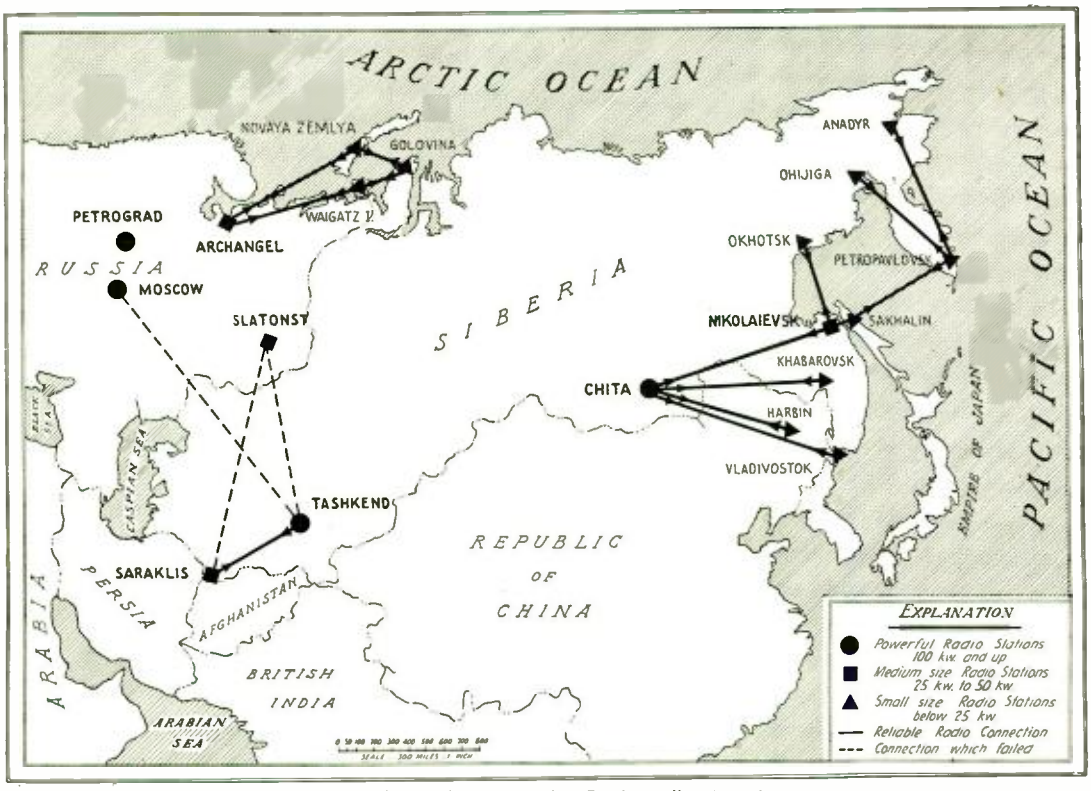
Another powerful station for communication with foreign countries was planned for Nicholaieff on the Black Sea. It had 100 kw. power, but it was not put into operation until several months after the beginning of the war, and in the end it served only for the local needs of the army in the Ukraine, being too far removed from the center of activity.

All these stations were delivered either by the Russian Society of Wireless Telegraph (after 1912, under financial control of the Marconi Wireless Co.), or by Siemens & Halske.

STATIONS AT TSARSKOE SELO AND MOSCOW

The great World War broke out on August 1, 1914. For several days previous to that event, the Russian Government had been gravely concerned about communications with France. The two cables connecting Russia with Western Europe were owned by neutral companies, but that very "neutrality" appeared dangerous. Fortunately, complete apparatus for a big radio plant had just been made in the factory maintained by the Russian Wireless Society. It had been tested by military radio specialists, a temporary tower and antenna having been constructed for that purpose. On the initiative of the military authorities, the Military Electric School took charge of the property and on the same night the exchange of messages with the Eiffel Tower began. The first news of the declaration of war by Germany was sent to France from this station, commandeered on the eve of the war.

Everybody realized, however, that a hastily-constructed plant erected under an emergency could not be depended upon. Consequently, the Government intrusted several radio specialists with



Map of Asia, showing the war-time Russian radio telegraph nets

the task of establishing adequate and reliable radio-communication with the Allies. At this time, alternators with an abnormal number of cycles were not obtainable in Russia; D.C. generators could be obtained on special order only after considerable delay. Nevertheless, with assistance of the Russian Society the difficulties were quickly surmounted and one of the most powerful radio-stations of that time, with nine towers, each 360 feet high, was ready within four and a half months from the time the decision was made. In December, 1914 the Emperor Nicholas II was able to send his Christmas congratulations to the President of France and the King of England by wireless.

TVER TESTING STATION

One of the stations was erected at Tsarskoe Selo, the residence of the Czar, twenty-two versts (14½ miles) from Petrograd; the other at Moscow, in the heart of Russia. In addition, a special receiving station was built at Tver for testing and observation purposes. Tver is on the railroad between Petrograd and Moscow.

The Tsarskoe Selo and Moscow equipments were practically identical in design from a radio-electrical point of view. The arrangement was as follows:

A huge storage battery of 6,000 Tudor lead cells fed the condenser oscillation circuit. The total voltage of the battery was 12,000, the maximum current 25 amperes. To make the task of the personnel easier and for convenience in recharging the battery, it was subdivided into twelve separate parts of 1,000 volts each. The subdivisions each had a charging dynamo driven by a 22-volt D.C. motor. When the transmitting key was pressed, all twelve generators were connected in series by means of twelve corresponding automatic carbon relays, and connected in parallel with the battery. Thus the condenser was charged by both the batteries and the generators. When the key was released, the relays switched the generators to their corresponding sections of the storage battery. In that way, the storage battery received charging impulses in the intervals between the dots and dashes of the Morse code. The battery capacity was such that the transmitter could work at full power for about two hours when using only the storage battery as a means of primary current supply.

The oscillating circuit consisted of glass plate condensers of ½ mfd. capacity, silver-covered, copper-pipe, self-induction coils of large diameter and a solid revolving disk-discharger with twelve teeth, modeled after the discharger of the big Carnarvon plant.

INVERTED L ANTENNA

The transmitting antenna, of the inverted L type, was supported by wooden towers 120 meters, or 360 feet high. Nine towers were used at the Moscow station and seven at Tsarskoe Selo. They stood in two rows.

The wooden towers were erected for temporary use only. At Moscow they were replaced by iron towers in July, 1915 but they remained at Tsarskoe Selo until the end of that plant, December, 1919.

UNIQUE WOODEN TOWERS

The construction of the wooden towers, being original, deserves mention. Four parallel vertical tree-trunks, about 20 inches in diameter, were erected on a concrete base and were placed with a few inches clearance between them, forming a square. Iron tie-rods and bolts kept them together and reinforcing wedges, put between them, supplied a tension that gave greater solidity to the whole tower. The desired height was gained by adding the necessary number of trunks. A small crew of trained men could assemble such a tower in two or three days.

Cross arms served to support the transmitting antenna, of the cage type. A number of wells, 20 feet deep, provided the necessary ground for the transmitter. In addition, a counterpoise of many thick parallel wires was buried in the ground, one foot beneath the surface.

The receiving part of the station occupied a small structure, separate from the transmitting room. A single wire, stretched on top of the towers,

served as receiving antenna. There were two of these, each with its own receiving apparatus so that two different messages could be picked up at the same time. The telephone receiver was generally used in picking up messages, although it was possible to receive them on phonograph records. The crystal detector and vacuum tubes were used in various combinations.

Power for the plant was delivered by Diesel generators. Four Diesels of 150 HP. each, with corresponding 220 volts D.C. dynamos were used at Tsarskoe Selo and two Diesels of 450 HP. each were used at Moscow. Each plant had one generating group held for reserve, the working power being 450 HP. in both cases.

The storage battery of 800-ampere hours could be used for the short time work, instead of generating groups. The same battery also supplied energy for various secondary uses, such as lighting, pumping, etc. Every device could be manipulated and controlled from the receiving house. Both plants were operated exclusively by officers and privates of the Military Electric School. Many of the privates received their only electrical and mechanical training after being drafted into the army when the war began.

War-Time Radio Activities

Throughout the war, up to the Bolshevist revolution in November, 1917, the Tsarskoe Selo and Moscow stations successfully maintained communications with the Allies. Both stations, together with the Tver testing station, were under the supervision of the Chief of Radio-Communication. Special wires connected the chief's office in Petrograd with each station, making them independent of the State telegraph lines.

As a rule, Tsarskoe Selo was in connection with Lyon, France, and Coltano, Italy, while Moscow was communicating with Carnarvon, England and eventually with Salonica, the headquarters of the army in the Balkans.

Tsarskoe Selo used a normal wavelength of 5,000 to 6,000 meters, while Moscow worked with a wave-length of 6.000 to 7,000 meters. The acoustic pitch of the transmitter was given by 400 oscillations per second, produced by the revolving disk-discharger, which had twelve teeth and made 2,000 revolutions a minute.

Exchange of messages was carried on during periods set by special arrangement between the Allies and communications proceeded practically uninterrupted within the schedule hours except on the night when Germany made her declaration of war against Russia. She then tried to prevent the transmission of that news from Russia to France. But even then, in spite of the attempted interference, messages were duly exchanged. This was accomplished by means of a quick change in wavelengths, the arrangement to provide against such a contingency having been made in advance. Of course such changes are an inconvenience to a large station and force it to use wave-lengths which are not always to its advantage.

The daily average of words was about 4,000 for Tsarskoe Selo and little less for Moscow. Besides the messages in cipher, there were open messages consisting of communiques from Headquarters, meteorological news and astronomical time signals. The number of words transmitted and received could have been considerably increased if the automatic Wheatstone transmitter had been used.

From the very beginning of the work of the Allies, the daily traffic demonstrated the perceptible influence of topography upon the strength of the signals. Thus, while the messages between Lyon and Tsarskoe Selo were heard with great distinctness, those between Lyon and Moscow were very poor. A glance at the map will explain the reason of this. The straight line between Lyon and Moscow passes through the Alps and the mountains of Bohemia, while between Lyon and Petrograd the country is much more level. The Carnarvon and Coltano signals were heard with equal ease in Tsarskoe Selo and Moscow, although Moscow had the advantage in communicating with Carnarvon as it had a larger aerial.

In order to make the radiated energy as large as possible, both an earthed ground and a counterpoise were placed in the antenna circuit. It was found that the maximum of oscillating energy in the antenna could be obtained by cutting the inductive resistance into one of these parallel branches and ascertaining its most favorable size.

Much trouble was caused in cold weather by hoar-frost and ice. They are the real plagues of both the radio and wire telegraphing in some parts of Russia. The coating of frost and ice on the wires of an antenna increases its effective resistance and it was even more serious when the ice would accumulate to a thickness of several inches, thus increasing the weight of the antenna and threatening the safety of the towers. This caused especial concern when the high wooden towers were tried for the first time.

Therefore, on cold days particular attention was given to the antenna. At the first signs of hoar-frost accumulating, the antenna wires would be shaken by means of the hoisting cords but when there was a quick formation of ice, it was necessary to lower the whole antenna and the ice would be knocked off by hand. Later it was found that the antenna wires could be heated by an electric current. A few minutes after the current was turned on, the coating of ice would drop off in large sections, doing away with necessity for lowering the wires.

Recognition of the importance of the wireless telegraph in public affairs had just begun to spread among Russian officials when the revolution put a temporary end to its development.

Radio Necessary in Future Development of Russia

Generally, one may say without fear of contradiction that wireless will occupy an important place in the future development of Russia.

Russia is 10,000 kilometers in length from East to West and 3,000 kilometers from North to South, or 6,200 miles by 1,860 miles. Within this area are many wild and, under ordinary conditions, almost inaccessible regions. These spots often contain stores of treasures, concealing great riches. In many instances the climate and topography of the country make the erection and maintenance of wire telegraph lines impossible. For instance, the greatest gold mines of pre-war time were located in the Yenissei Taiga (virgin forests in the region of the river Yenissei), where the several thousand souls that made up the working population were completely cut off from the rest of the world for six or eight weeks every Fall and Spring. The intervening country was absolutely impassable.

For many years explorers have endeavored to navigate the Arctic Ocean along the Siberian coast. Shipping is absolutely necessary to the exploitation of the riches that Siberia contains, but to a great extent it awaits the time when a radio telegraph net is spread along this coast. The first steps in that direction have already been taken. Three stations have been built, one at Novaia Zemlia, one at Vaigatch and one at Yamal Peninsula, but these are all but lost in the vast expanse of the coast, and in fact barely touch Siberia at the northwest.

There is still another highly important field in which radio could be invaluable to the new Russia. Russia is pre-eminently an agricultural country. Consequently reports of probable weather conditions and market prices are very important to all parts. There are many places which cannot be reached in time except by radio. This is especially true after several years of general disorganization. It is only too evident that a main factor in Russia's recovery will be the radio telephone, the latest achievements of which are so brilliant. A number of broadcasting stations would keep the remotest corners of vast Russia in close touch with the rest of the world.

Lakes-to-Coast Voyage Has Thrills

Scenery, Accidents, Fishing and Radio Make the Trip Notable for the Operator on the U. S. Shipping Board Vessel *Lake Harminia*

By Julian K. Henney

ONE day I sauntered down by the docks at Cleveland to watch the busy tugs puffing laboriously around, and to listen to the waves of muddy Lake Erie swishing against the blue-gray hulls of two Shipping Board steamers tied to the wharf.

"Where are you bound?" I shouted at a greasy individual in faded blue jumper, evidently a member of the below-decks crew.

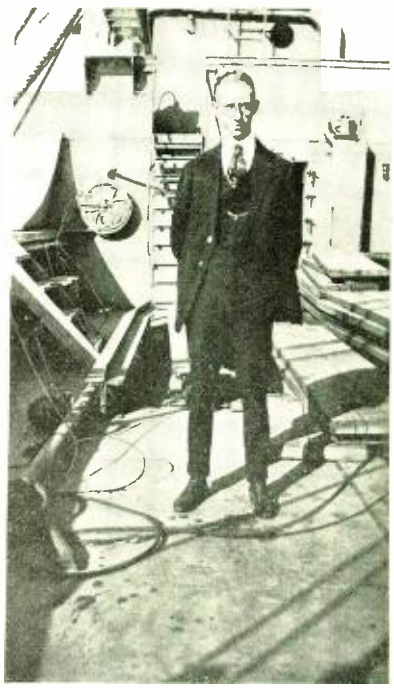
"Boston, I guess," was his disinterested answer.

Now Boston meant that the steamer would have to go out the St. Lawrence, a voyage I had always wanted to make. Perhaps, I thought, there are other Shipping Board steamers; some might even need wireless operators, so I hustled to the Radio Corporation office, and applied to Superintendent Nicholas of the Great Lakes' Division for a ship.

Two weeks later he sent for me and assigned me to the *Lake Harminia,* a new vessel, which was to sail from Superior, Wisconsin, for the coast. Another pleasant surprise was in store for me at Cleveland. I was to have company on the trip to Duluth and Superior. Keuhni, an operator friend, was to take the *Lake Glaucus* from the Globe yards where the *Harminia* was being finished.

We were told to hurry to Duluth, but it took a long time to pump eighteen cars of heavy oil into the steamer through a one-inch hose with a wheezy engine that threatened to expire at each breath.

When the *Lake Harminia* had taken her last supplies, the Skipper came aboard, and when the compass had been adjusted, paraded us over a good part of the west end of Lake Superior. Then we tied up at a grain elevator in the Duluth-Superior basin to have sixty thousand bushels of wheat shot into the hold. The next morning the rest of our ninety-odd thousand bushels came aboard, bringing us down to the maximum depth with which we could get past Cove Island into Georgian Bay.



Safe on deck—operator and antenna

The two days' trip across cold Lake Superior and down the winding St. Mary's river gave me ample time to test the radio equipment on board.

A wireless operator's life aboard such a steamer as the *Lake Harminia* is a pleasant one. The radio room was a large, well-lighted and ventilated cabin on the afterdeck across from the chief engineer's room. The panel and desk took up but a small part of the large cabin, which provided a cozy haunt for all the ship's officers. The bunk room was equipped with three bunks, but as I could use only one at a time, I could shift around according to the weather and the movement of the vessel. Electric fans in both rooms, clothes closets, brass Seth Thomas clocks that actually kept time, curtains at the port holes—all this and more proved to me that a radio man's life was not so bad as I had sometimes found it. The motor generator was in the engine room with a push button near the receiving tuner to start it, so that the whine of this high-speed, 500-cycle generator did not bother the operator while receiving.

Late one afternoon we anchored off Cove Island at the entrance to that winglike projection of Lake Huron, Georgian Bay. A fog had come down on us as we attempted to steal past the sentinel-like island, forcing us to lay up until the next morning. The next day we tied up at a grain elevator at Port McNicoll, around the corner from Midland, VBC., and a fishing party was organized among the officers. By noon our party of Isaac Waltons had pulled nearly a hundred fish from the blue waters near the ship.

These views were taken while going through the famous Welland Canal between Lake Erie and Lake Ontario. The latter lake is dimly seen in the distance

Early on the next morning the elevator men were ready to drop their long proboscis-like chutes into the hold to take out our wheat. The elevator gear got mixed up with the aerial in the process with the result that I made an impromptu trip up the mast. Forgetting that the aerial might be as heavy as myself, and not realizing that I could not snub a steel cable as I could a rope, I unloosened the wire rope. When the last turn was taken off, whist! I started up the mast; the wires started down. Had it not been for two sailors nearby I might have suffered more damage than a pair of bruised hands.

Coming out of Georgian Bay we passed Cove Island at midnight. The *South American* called shortly before asking about weather conditions in the Bay. She, too, had been running through fogs from one of the lakes to

Quebec's waterfront dominated by the Citadel and the Hotel Frontenac

far-famed Thousand Island district was not dimmed by the weather.

Taking a pilot at Ogdensburg, we entered the first of the St. Lawrence locks shortly after noon, passing on the cement base of the rear lock gate, so that when the water was let out, the steamer sat down on her foot, figuratively speaking.

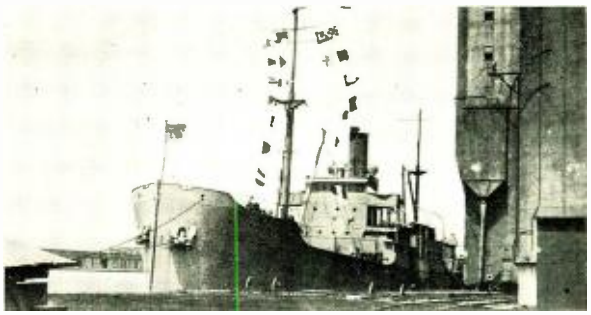
Another Shipping Board Steamer coming up behind us in the gathering dusk had heard the noise, had seen us list, and soon radioed asking if we needed assistance.

"A week in dry dock," was the concersus of opinion.

Two tugs came for us in the morning, towing us through the last of the Soulanges Canal, then through the Lachine Locks. Aided by a third blue, red and white stacked tug later in the day we were finally pulled into Montreal shortly afterward, thirteen hundred miles from the *Harminia's* home port, a city she would never visit again.

For the next ten days we sat around in intense heat, in an evil-smelling slip, watching repair men grapple with a

A trophy of war, the S.S. "Greiffenfels," a former German liner now under British flag, at Montreal



The "Lake Harminia" docked at Port McNicoll, waiting to discharge her cargo. The flags celebrate July 4

another. The evening of the next day we passed the many lights of Detroit. On account of the thick weather, the Skipper anchored as soon as it grew dark. A message to the Marine Post Office at Detroit failed to get any results, but the music that came floating over the aerial a half hour later appeased the crew.

The short distance through the canal between Lake Erie and Lake Ontario proved to be like the old road to Rome—long and tedious. The steamer had been built as large as possible, and in the small canals and locks she was hard to manage. Even the eight hundred tons of coal were insufficient to keep our head up in the wind. The slightest breeze threw us around until the clank, clank, of the propeller on the stony bottom forced us to tie up. Messages went back to Cleveland, "Tied up in strong gale near St. Catherines."

After a long siege with the canal and its locks it was good to steam out into open water once more, and then to enter the beautiful island-dotted waters near Clayton and Alexandria Bay, which were passed in a cold drizzle, yet the magnificence of the around the Rapid Plat rapids that tumbled beside us or left us peacefully puffing along while they hurried in a welter of foam around the rocks and islands. At supper time we anchored in a small widening of the river called Garbage Lake by our uncomplimentary mate, an incongruity that I could not understand.

Just as we were clearing the last of the forty-eight locks, and mates, engineers and deck hands were eagerly looking forward to Montreal and the end of canals, and were congratulating ourselves on the progress, when, Bang! three distinct thuds reverberated through the ship. The last jar was so sudden and accompanied with such a decided list that I went out of my chair, up against the outer wall.

The captain was shouting; so was the mate and the pilot, and by the time I had the receivers off my ears a dozen of the crew were running wildly up and down the lock wall. A glance out the wireless room revealed the stern of the vessel high in the air, the aftercabin more or less wrecked, and a disabled rudder post and quadrant hanging loosely like a broken arm. In some manner the rudder had caught job that was evidently too large for them.

Finally, I jumped on a Canadian Pacific train, traveled past Lake Nipissing, Algonquin Park, through the rocky wilderness of the north to the Soo from where I went by "bus" to Les Cheneaux Islands for a fishing trip to last until the rudder would be fixed.

After receiving word that the steamer would sail soon, I went back to Montreal to find that the boat had been in Quebec for nearly two weeks. Arriving in the city at night I found only French speaking people, and discovered too late that I should have worked a bit harder on my school languages. Over the phone I learned from an English-speaking operator—may her days be blessed!—where to find the steamer, across the river from Quebec, and three miles from there. Stumbling over the many labyrinth-like tracks of a dry dock and ship yards, I finally walked the plank of the *Harminia* to find the second engineer arguing with the mate that "Sparks" had jumped the ship.

We bid goodbye to drydock, finally, one month after being towed into

Views among the Thousand Islands, the unsurpassed Summer resort of Americans and Canadians along the St. Lawrence as it issues from Lake Ontario

Montreal with a wrecked rudder. The next day we made a trial trip around the harbor, had our compass adjusted again, and at 2 o'clock sailed past the Isle of Orleans bound for Chatham, New Brunswick, for a cargo of pulp wood.

The St. Lawrence began to show signs of its greatness as soon as we had passed the Falls of Montmorency, which are higher than Niagara, and beautiful in the afternoon sun. The river increased in width, and the shores became higher and more rugged, and soon the fresh water became salty. Toward evening we passed the mighty promontories that guard the entrance to the Saguenay River, and at four in the morning we dropped our pilot at Father Point, the spot where the great *Empress of Ireland* sank a few years ago.

During the night the receivers were bothered some by static, but signals of ocean-going vessels were not scarce. Once I heard one send a long string of supplies that some one would need for the long Winter soon to fall on the inhabitants of that north country, and an hour later heard the same message being repeated along the river from point to point like a distant echo.

The evening of the next day we ran into a heavy northeast sea off Pluris Point that tumbled the *Lake Harminia* about like a cork. When the darkest of St. Lawrence nights came down on us, the captain slowed down and drifted and coasted slowly along the shore until daybreak should allow him to make sure of his position.

Late in the afternoon we dropped the hook in the mouth of the Mirimichi River, patiently waiting until the pilot should come up in his sail boat to take us up to Chatham, fifteen miles away. We rode at anchor off the village that night, and in the morning moved to the

Journey's end. Ships at anchor in Portland Harbor, Joaziero in foreground

pulp-wood dock. Here I saw the tall masts of a Canadian high-power station at Newcastle, VAL, I believe. We took a thousand cords of wood at this port while the chief and I went trout fishing in the wilds behind the town. While here I watched a German steamer under a British flag burn at the dock, and saw a four-masted hooker from Norway unfurl her sails and fly away like a huge white butterfly.

Clearing for Portland, we followed the southern coast out through the Gut of Canso to the Atlantic. In the evening the receivers were filled with a medley of notes ranging from the pure tone of the *Mauretania*, MGA, to the buzzsaw of a lonely Jap trying to get through the jam to WSE. Before Arlington time, 1IAA, 2JU, and 2NF came buzzing in with their low-toned, low-wave sets. It seemed like home to hear those 200-meter fellows pounding away, and when NHR at Cleveland came roaring in louder than NBD at Bar Harbor, the Lakes didn't seem so far away as I had thought.

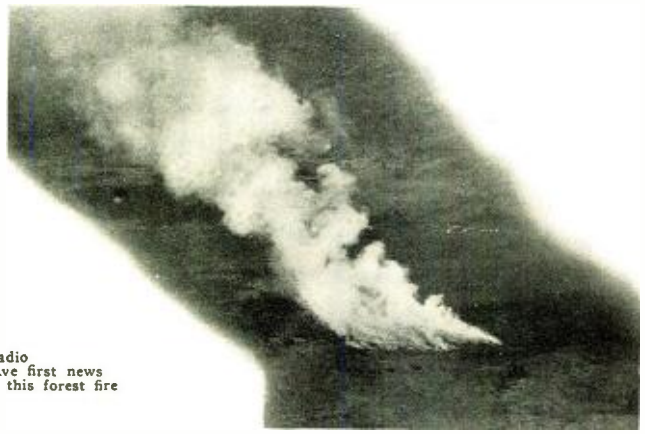
The following day was spent blundering south in a fog that came down early in the morning. We were off Cape Sable, but because of some oversight the captain did not have a book dealing with the Canadian fog whistle characteristics. A message to VCU brought the captain the information he needed to proceed. During the morning we nearly ran down a lone fisherman who had anchored in the fog off the Nova Scotia coast. Once we scraped a black buoy that marked a reef, and once were too close to a white vessel that rushed at us out of the mists and then flitted past like a bat at night. At noon I worked PUH, the *Joaziero* of Rio, who was coming across from England with a cargo of chalk.

Several times I secured an answer to my QTE request from Bar Harbor enabling the captain finally to clear the Cape and head across the Bay of Fundy for Portland. Here we anchored, and I decided that night as we watched the *Joaziero* drop anchor near us that radio life aboard such a steamer as the *Lake Harminia*, and on such a voyage as the Great Lakes to the Atlantic coast was a great life.

New Equipment for Army Airplanes

AIRPLANES in the service of the United States Army are to be equipped with radio apparatus of new and advanced types, including combination telegraph and telephone sets. The installations are of three types, designed for the three different types of airplanes, the pursuit, observation and bombing planes. Development of the new radio apparatus has been in the hands of the Signal Corps Radio Section, and although the plans have been drawn and bids called for, no public description of the apparatus has been released by the Signal Corps. It is said, however, that it is far in advance of present sets.

The largest and most powerful set, known as S. C. R. 135, will be carried on bombing planes, and will have a radio telephone radius, plane to ground, of 75 miles, and a telegraph range of about 200 miles. S. C. R. 133 is designed for the most speedy pursuit planes, and has a telephone range of 5 miles, S. C. R. 134, for observation planes, will have a range of about 10 miles. These sets all use a trailing wire for the antenna, and the metal parts of the airplane as a ground. Army experts consider that the new instruments will practically revolutionize radio for airplane use.



Radio gave first news of this forest fire

Radio Telegraphy Is Great Aid in Fighting

Forest Fires

A Radio Observer Tells of His Work

By M. V. Chesnut

FIRE!

Fire in the forests that guard the cultivated fields of the Western states! The trees are threatened, and that means catastrophe, for with the woodlands rests assurance of an equable distribution of rainfall over a wide area of fertile farming land. Let these trees burn, and the farms that now supply an important percentage of American foodstuffs would dry and harden into another Sahara.

Fire! An airplane patrol detects it while still a small blaze; a bush fire, but one that may involve a hillside. The observer in the airplane notes the arising smoke, spots its position on the map before him in its celluloid cover, and puts his fingers on the key.

DAR TEH DAR DEH DAR.

And back to the radio-observation airdrome goes a short message that says in code, about as follows: "Bushes afire in XYZ valley point about 145 north 72 west."

The operator at the airdrome copies the message and hands it to a telephone operator, who quickly consults his map, finds the location of the fire, and telephones to the nearest Forest Ranger. The latter goes quickly to the spot, summoning aid if necessary.

And once more the vital woods have been saved, and with them the cultivated fields that depend upon them.

Such is the procedure at the High River Air Station, typical of all the others. This station was established last year for the fire protection of the forests on the Eastern slope of the Rocky Mountains, and radio plays an essential role in the work. Regular observation trips are made each day, lasting from two to three and even four hours, and if it were necessary for the airplane to return to headquarters every time it sighted a fire, much valuable time would be lost with the conflagration meanwhile growing to much larger size.

The radio station and airdrome are situated forty miles east of the Rockies, and are apparently in an ideal location from a radio standpoint, judging from the transmitting ranges obtained. The aerial is a four-wire umbrella type and is supported on a 185-foot steel mast. Four down-leads are taken from the mast head and led to the transmitting room.

The station's transmitting equipment consists of a 2 kw. synchronous spark set with a daylight range of 600 miles on 900 meters. Current is supplied by a generator driven by a gasoline engine.

During the tests that were made to determine the range of this set a vessel was heard sending traffic to KPE (Seattle). When the ship signed off, it was called, and its position asked. The reply showed that it was three days out of Seattle, a third of the way across the Pacific, bound for Yokohama. This long-distance transmission probably released some profanity aboard ship, for just as the key was pressed to acknowledge the ship's message the gasoline tank ran dry and the current stopped.

While the operator ran out to one of the De Haviland airplanes to "milk" it of some gasoline the irate ship's operator called VAW (High River) again and again, finishing up finally with a string of QRA's and WHO's without getting a sound in reply until the gasoline engine had been started again.

An aircraft type of C. W. and phone transmitter with a power input of 100 watts is also installed in the ground station and operates with excellent results. Owing to the large aerial, it was at first impossible to transmit on amateur wave-lengths in the usual manner with the original apparatus. This difficulty was finally overcome by using the "syphoning" system, i. e., very loose coupling. With this method, using a sustained wave, the radiated wave-length is that of the closed circuit, regardless of the period of the aerial system. Concerts broadcast from this transmitter on a wave-length of 360 meters have been heard as far distant as Chicago, 1,600 miles away. Great credit is due to the amateurs of the southwestern states, whose detailed reports and helpful criticisms were of assistance in bringing this radio telephone transmitter up to its present efficiency.

Radio observer in DH-4 airplane, about to start on his daily forest patrol. The man on the ground has his hand on the 600-volt generator that supplies current to the radio transmitter

Receiving Equipment

The receiving equipment is of the very latest type, and consists of a seven-

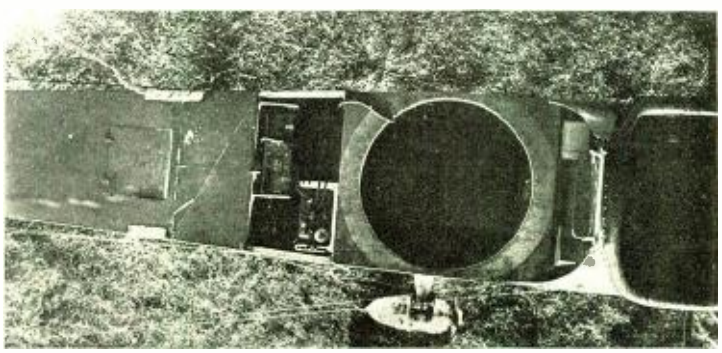
valve radio-frequency amplifier with a wave-length range of 600 to 5,000 meters. The use of regeneration is optional, and it has been found possible by regenerating to receive even 200-meter signals, with no great loss of efficiency. However, in copying the reports from patrolling aircraft, a syntonizer is used as an external heterodyne, in preference to regeneration, owing to the ease of tuning this circuit. This simplicity of control is no small factor, for the C. W. signals from the patrolling aircraft "swing" considerably when the airplane encounters rough weather, owing to the changes taking place in the wave-length of the trailing aerial of the transmitting airplane. Every time an airplane dips into an "air hole" the antenna has a crinkle put in it, thus changing its fundamental length.

Mountain scenery affords remarkable views from above, but the air over these ranges is "bumpy," the varying pressures and cross currents tossing the airplane as on a stormy sea

Airplane Equipment

The airplanes are all fitted with C. W. transmitters, some using a 100-watt type with a modulating attachment for telephony, and the remainder using 40-watt types on straight C. W. All the transmitters use the standard British R. A. F. circuit that has become almost universal on airplanes.

There is just one danger created by the radio set on an airplane, and that danger is run by the men on the ground. The antenna consists of a single trailing wire, which is wound on a small winch and is lowered only when the machine is safely off the ground. It is supposed to be wound up again as the pilot prepares to land, but the radio operator who is new to aircraft work usually forgets to crank up the antenna in the excitement of getting back home after the first few flights.



Looking down into the radio cockpit. The wind-driven generator is shown on the starboard side. Transmitting and receiving equipment is seen in the space aft the cockpit. Boxes of spare tubes are carried in the forward compartment

The two-pound lead weight on the end of the antenna comes down first, hits the ground with a thud and bounces like a foot-ball. By the time the weight has come down again, some of the wire itself is twisting and curling along the ground, ready to wrap itself around the whole ground staff and hold them for the attentions of the weight, by now parted from the wire and hitting only the high spots. Rather than be one of those spots, the ground staff either tries to keep both feet off the ground at the same time, or makes for the mountains, 40 miles off.

The inevitable question asked by amateurs who visit the airdrome is: "How do you get your ground connection while in the air?" Prospective visitors are hereby advised to think twice before asking that question as the staff is "fed up" on it. The answer now is likely to be that the operator throws out a sky-hook and uses a cloud!

Naturally, the counterpoise system is used. Every airplane, whether radio-equipped or not, is fitted with copper strips connecting all the metal parts of the machine to the engine bed. This is done to afford a safe path for electricity generated by friction, and as a protection against differences of potential that may be encountered while flying through clouds. The network of metal ribbon not only prevents sparks but makes an excellent counterpoise for the antenna of the radio set.

The best results are obtained when the transmitter is connected at the nodal point, or in other words, in the electrical middle of the radiating circuit; therefore, the length of the lowered aerial should be just sufficient to balance the capacity of the counterpoise. Fortunately, in the type of aircraft used, the wave length of the system when thus balanced is approximately 900 meters, the official Aircraft wave assigned by the Berne convention.

Receiving equipment is installed in some machines, but is not generally used owing to the hardship of wearing headphones. The radio-observer must wear the phones under a tight-fitting flying helmet, and in spite of sponge-rubber and pneumatic ear-protectors, the pain in the ears becomes unbearable during a three-or four-hour patrol. One-way communication is customary, for if the receiving operator on the ground is alert, there is little or no danger of messages being missed.

Personnel

The radio staff of the High River station consists of a number of radio-observers headed by the wireless officer. The latter is a skilled radio-technician who is responsible for the maintenance of the ground station, and is in charge of all experimental work.

The radio-observers are required to have some knowledge of photography in addition to their radio and eyesight qualifications.

An early question that had to be answered was whether a photographer could be trained in radiotelegraphy as quickly as a radiotelegraphist could be trained in photography. After careful consideration, the authorities decided that radiotelegraphy was the more skilled of the two trades, and radio operation was chosen as the primary qualification, photographic instruction being given to those needing it.

Each man is responsible for the equipment in his machine, and is required to inspect and overhaul the radio gear before every flight. When

not on flight duty they also operate the receiving station on the ground.

Operating Conditions

Every morning of the Summer months two machines leave the airdrome, one flying south to the international boundary and the other north to the Clearwater district. Each airplane carries a pilot and radio-observer. The radio is in constant use during the patrol, transmitting position, weather and engine reports, and detailed observations on the humidity of the forests, with the consequent fire danger.

The observer keeps a sharp look-out for forest fires, and on spotting one, immediately transmits the location and other details to the ground station, where it is telephoned to the waiting forest rangers in their huts. Subsequent messages report the extent of the damage and the progress made by the fire-fighters. It is customary for the observer to photograph the fire also, in order to confirm his estimated location and for filing reference.

The location of every camp spotted within the Government forest reserves also is wirelessed to High River and filed there, so it behooves the camper to be mighty careful with matches, cigarettes, and camp fires, as fires originating in their vicinity will quickly be brought home to them.

There is always a fly in the ointment. Though the life of an aircraft wireless operator is very pleasant on the whole, the special hoodoo of his existence is the "bumpy" weather encountered above the mountains. The poor "Op" is tossed around in his cockpit like a pea in a baby's rattle, one hand clutching his key and the other clinging to any nearby strut or stay. It is most amusing to listen in on the ground to the stuttering Morse of an operator on his first flight in bad weather. Only a man gifted with a wonderful imagination will ever read it!

It is a rule of the station that no transmission shall take place while the 'plane is changing direction, the reason being that the trailing antenna forms a half-loop during the turn, increasing the wave-length by several hundred meters at times, making it impossible for the receiving station to be kept tuned in.

Radio compass stations are needed in connection with this forest and mountain work. If compass work were practical, a pilot could hover above a forest fire while several compass stations obtained bearings, thus fixing the location of the fire beyond all doubt. Unfortunately, it has been found impossible to utilize the radio compass in the Rocky Mountains, owing to the errors introduced by the irregular masses of rock. When on board ship, the radio compass has to be corrected by a certain amount at each point of the compass, to allow for deflection of signals by the body of the vessel. This is a known and constant error at each degree, and does not vary as there are no other objects near by to introduce unknown factors.

At first it was thought that a similar factor of error could be worked out for each airplane, but it was quickly found that the character of the land over which the machine flew had an influence on the directional quality of the signals, the effect being far greater than that of the body of the airplane itself. Tests showed that the error might be plus 60 when the machine was 40 miles away, and minus 12 at 60 miles distance, though the airplane had flown in a straight line and the bearing had not changed in the slightest. Radio direction-finding therefore had to be abandoned, regretfully, and fires still are located on maps carried by the observers.

Plans have been drawn up for substituting telephony for the straight C. W. during the 1922 fire season. The machines will carry 100-watt radiophones and regenerative receivers, and a high-powered radiophone has already been installed in the ground station. At the time of writing, this transmitter is broadcasting music every Tuesday and Friday evening, and has been heard in Honolulu. With such a range, it may safely be predicted that Western amateurs will listen in this Summer to some highly edifying conversations between VAW and the the storm-tossed, air-sick operators aloft!

Station of a forest ranger, seen from the air. The rangers here are ready in a moment's notice to fight distant fires reported by the radio patrol

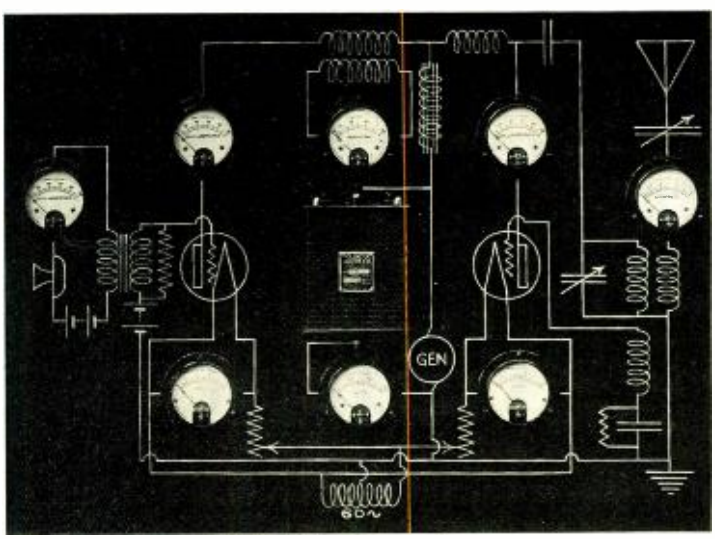


Diagram of a continuous wave transmitter, completely equipped with indicating instruments exhibited by the Jewell Instrument Company at the recent Chicago Radio Show, held in the Leiter Building

Some Measurements of Telephone Sensitivity*

By Miss Helen H. Smith,

Assistant Physicist, Bureau of Standards

THE general problem of the study of radio transmission between a sending station and a receiving station includes as one of its most important features the measurement of intensity of the signals produced at the receiving station. Since in nearly all radio receiving stations a telephone receiver is used in the production of sound from electrical power received from the transmitting station, most methods of measuring the intensity of received signals involve a consideration of the telephone receiver.

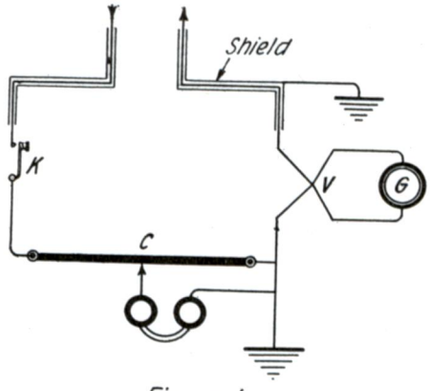


Figure 1

Fig. 1. Diagram of testing circuit.

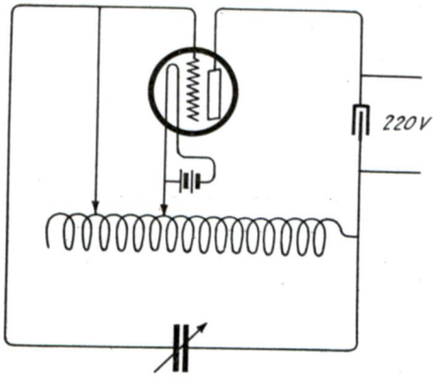


Figure 2

Fig. 2. Oscillator producing vibrations in testing circuit.

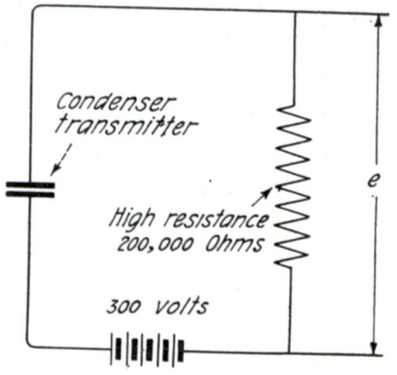


Figure 4

Fig. 4. Condenser transmitter diagram

Certain methods involve definite assumptions as to the properties of the telephone receivers, such as a linear proportionality between the current through the telephone receiver and the intensity of the sound produced by this current. In addition, some radio transmission experiments in which signals were received from both spark transmitting stations and modulated undamped-wave transmitting stations have called particular attention to the need of studying the response of telephone receivers to currents having various wave forms.

The method most commonly employed for measuring the intensity of received radio signals is the "shunted telephone method." This has been described by Zenneck, and adapted to autodyne or oscillating audion receiving circuits by Austin. In this method the telephone receiver is shunted by a variable resistance which is reduced until the signal is just audible. The intensity of the sound when the shunt is disconnected is given by the ratio of the current through the telephone receiver to the current required to produce the just audible signal.

Experiments to Determine the Current Necessary to Produce a Just Audible Signal

Preliminary work was done on the establishment of a standard just audible sound, using current of sine wave form. This standard is taken as the least audible sound at which dots and dashes can be distinguished from one another when the current is thus interrupted to produce signals of the radio code. This standard just audible sound then determines the voltage which must be applied to a given telephone receiver in order to produce the standard sound.

Variable Behavior of Human Ear

A pair of Western Electric Type P-11 telephone receivers was taken, more or less at random, although it was a pair which the observers in the laboratory had termed good. One of the two telephone receivers was connected in a circuit diagramed in figure 1. Power was supplied to the circuit of figure 1 from a transformer (not shown) in the oscillating circuit of figure 2.

The measurements immediately showed the variations in any standard thus defined solely with reference to a human ear, and for this reason are presented here. The human ear varies in sensitiveness from time to time depending upon the physical condition of the individual and upon the conditions under which observations are made. The results obtained by one observer are shown on the graph, figure 3. At the time the observations were made, and before the results were calculated, the conditions under which the observations were taken, were carefully noted. The results vary, and the point to be emphasized is that the variation is not necessarily in the sensitiveness of the receiver or change in any of the apparatus, but it is in the ear itself; the wide variation represents the importance of the personal factor in the

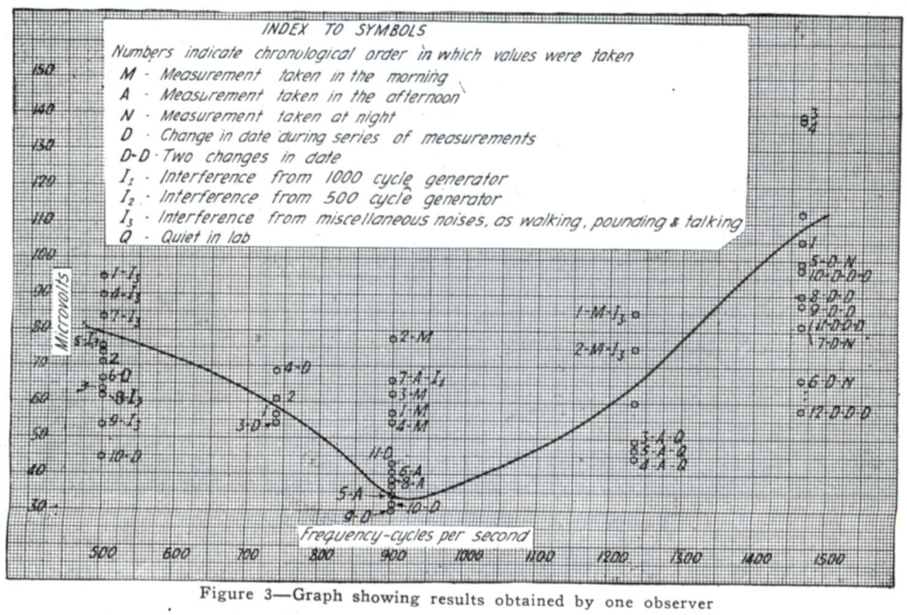


Figure 3—Graph showing results obtained by one observer

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measurement. The results may be easily analyzed; the graph shows that the ability to listen increases until the ear becomes fatigued, after which time the results show a continued increase in the voltage necessary to produce a sound audible to that particular ear.

USE OF CONDENSER TRANSMITTER AS AN ARTIFICIAL EAR

On account of the variable behavior of the human ear, it would be an advantage in many measurements of signal intensity and telephone sensitivity to have a mechanical or electrical system which would be responsive to sound input and give an indication on the scale of a galvanometer or similar instrument. Such an artificial ear is the condenser transmitter which has been described by Wente. The condenser transmitter is especially useful for the comparison of sounds, although by proper calibration it could also probably be used in the absolute measurement of sound.

The condenser transmitter is, first of all, a condenser of two parallel plates with air as the dielectric between. The rear plate is of heavy gold-plated steel and forms the back of the instrument. The forward plate is of very thin steel, stretched to its elastic limit, which is used as a vibrating diaphragm. This arrangement presents a typical air-damped vibrating system with high stiffness and damping provided by the air film between the plates. The narrower the air film, the more sensitive the transmitter to pressure upon the diaphragm when the condenser is charged with voltage of 200 to 300. When such a condenser is set in the circuit shown in figure 4, the effect of impressing upon the diaphragm the sound waves from a human voice or from a telephone receiver is to cause the diaphragm to vibrate, changing the capacity of the condenser periodically at a frequency corresponding to the frequency of the sound. The result of this change in capacity is to produce an alternating potential drop across the high resistance. Thus, the condenser transmitter performs qualitatively the same function as a telephone transmitter, with the important exception that the alternating potential drop across the resistance for a given amount of sound energy, by proper adjustment of the damping film of air and the area of the diaphragm can be made nearly independent of the frequency. Thus, it provides an unvarying "ear" of uniform sensitivity at any frequency, which can be used to measure or compare sounds in terms of an alternating potential drop. Since this alternating potential drop for small sounds was quite small with the condenser transmitter used in this laboratory, it was amplified by a 4-stage, resistance-coupled amplifier, and its magnitude then indicated by the output from the amplifier through a carborundum detector and a DC wall galvanometer. The relation between the deflection of the galvanometer and the intensity of sound applied to the condenser transmitter is thus quite complicated, but a calibration of the galvanometer reading in terms of the intensity of the sound is unnecessary, if the system is to be used only in adjusting the two sounds to equal intensity.

The circuit arrangement is shown in figure 5. Many preliminary experiments were made upon this circuit before an arrangement could be devised in which the deflection of the galvanometer would correspond consistently to the sound input to the transmitter for all frequencies.

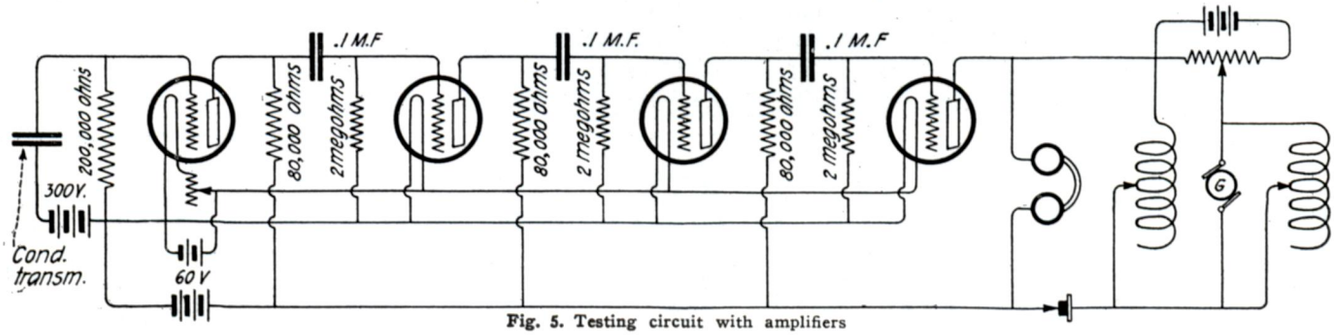
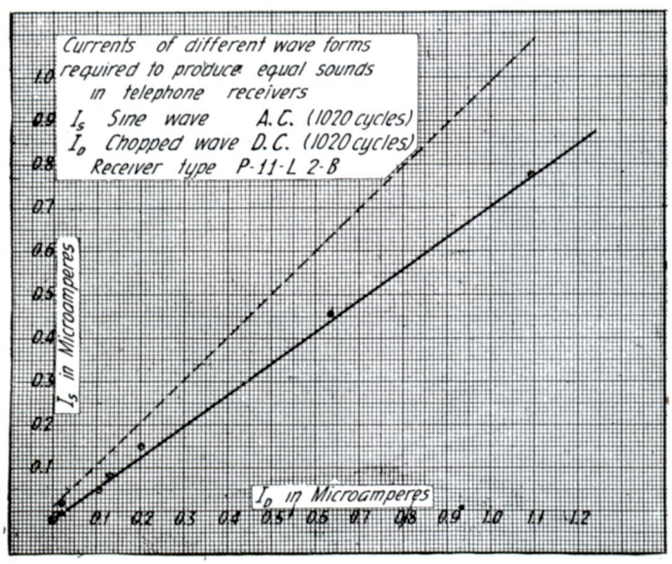
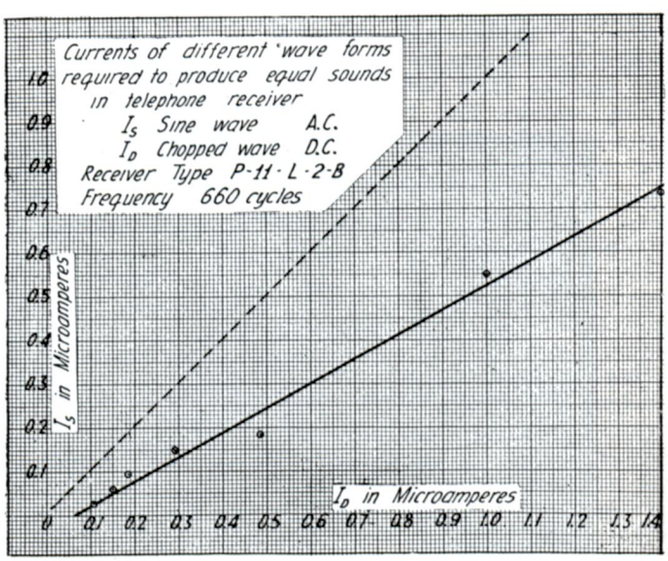


Fig. 5. Testing circuit with amplifiers

Two different kinds of relative measurements were made. (1) Sound produced in a telephone receiver by alternating current of approximately sine wave form was used as a standard of comparison. Measurements were made of the current in the same telephone receiver but of other wave forms to produce equal sound. Figures 6 and 7 show the currents to produce equal sounds in the telephone receiver L-2B. The currents compared were of approximately sine wave form and rectangular wave form respectively. The following table gives the ratio of sensitivity for pulsating currents to sine wave currents at different frequencies to produce equal signals.





Figures 6 and 7—Graphs showing currents of different wave forms required to produce equal sounds

(*Continued on page* 96)

Selective Receiving System Employing Multiple Detectors

A SELECTIVE receiving system employing multiple detection has been designed by Harold W. Nichols. It is based upon the principle that when a receiving station adapted to co-operate with a low-power or "weak" transmitting station, receives energy from a high power or "strong" transmitting station, interference results, the measure of which is determined by the intensity of the signal current received from the "strong" station relative to that from the "weak" station and to some extent upon the relative frequencies of the waves radiated from the two transmitting stations.

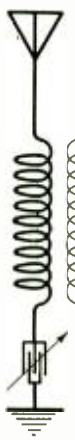


Figure 1

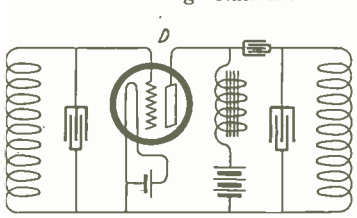


Figure 2

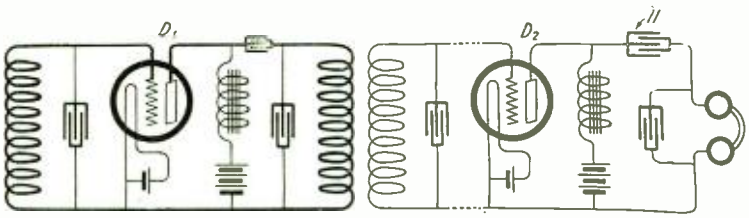


Figure 3

Circuit diagram of the selective receiving system using multiple detectors

Hence, when two such stations employ frequencies which are close together on a percentage basis, i. e., the ratio of the frequency of the interfering to selected waves is large or that of the difference—frequency relatively to that of the desired waves—is small, selection at the receiving station of the signal currents radiated from the "weak" transmitting station is extremely difficult with the arrangements heretofore devised.

This circuit employing multiple detection provides an arrangement which is selective of a current of low intensity compared to a strong interfering wave of frequency relatively close to that of the current to be selected, and means for eliminating interference due to a current of large amplitude relative to that of the current which it is desired to receive.

Advantage is taken of the fact that because of the curved characteristic of most detectors, including the vacuum tube type, if a speech or other signal modulator carrier current is impressed on its input circuit there will be present in the output circuit the signal modulated first even harmonic of the carrier frequency and by tuning the output circuit of the detector and the coupled input circuit of the next detector to this first even harmonic considerable selectivity will be obtained.

With this circuit the carrier wave received is impressed upon the tuned input circuit of a detector device from the output circuit of which the first even harmonic of the carrier frequency is selected and applied to the input circuit of a second detector device from the output circuit of which, in turn, the second even harmonic frequency of the carrier wave is selected. This process may be continued for any desired number of stages and the detected audio-frequency signal current of the last stage is supplied to a telephone receiver or other indicator. The various stages may, if desired, be connected by amplifying devices.

The operation of this system may be understood by reference to figure 1 which diagrammatically illustrates a simple circuit arrangement embodying a multiplicity of stages of detection. Figure 2 shows a two-stage detection arrangement and includes a high frequency amplifier, the amplifier and detectors being shown diagrammatically, and figure 3 shows an arrangement involving three stages of detection, and a plurality of stages of amplification for both the high frequency and the audio frequency currents.

Referring to figure 1, an antenna, tuned to the frequency of the incoming waves is inductively coupled to a resonant circuit also selective of the carrier frequency, which is connected to the input terminals of the detector D. The detector herein shown, by way of example, as a three-element vacuum tube has included in its plate circuit a selective circuit tuned to the first even harmonic of the frequency of the incoming carrier waves.

Inductively associated with this circuit is a resonant circuit tuned to the same frequency as the plate circuit of D, which is connected to the input terminals of detector D-1, whose output circuit includes a circuit selective of the second even harmonic of the carrier frequency. Current of the harmonic frequency selected by the output circuit of D-1 is transferred to a similarly tuned input circuit of D-2, by the transformer interconnecting them and is impressed across the input circuit of this third detector.

As herein indicated this may be a detector or other stages of detection may be introduced, in which event a similar circuit to the input circuit of D-2 will be connected across the input of a succeeding detector and its output circuit will include a resonant circuit tuned to a harmonic of the frequency of the input circuit of D-2. Finally, a selective circuit tuned to the same frequency as that included in the output circuit of the detector which precedes the last detector shown will be included in the input circuit of the last detector, the output current of which will be impressed across the signal indicating device shown in the diagram as a telephone receiver.

Heating current for the filaments of the detecting tubes may be supplied from a single source or a separate battery for this purpose may be associated with each filament. In like manner plate current for the tubes may be provided from a single source or a separate battery may be associated with each tube output circuit as herein shown.

In either case, retard coils and blocking condensers should be inserted in the output circuits of the tubes to prevent short-circuiting of the source or sources of supply of plate current and the flow of direct current from said sources to the selective circuits associated with them. The blocking condensers are designed to permit the flow of the variable currents to said tuned circuits while preventing the flow of direct current thereto. In this, as well as in the following figures, a condenser may be used in shunt to the receiver for the purpose of by-passing any high frequency current, that is, any current of carrier or like frequency which may be present in the receiver circuit.

It may be stated that multiple detection is more selective than single detection and for large frequency differences between the current transmitted by the station whose waves it is desired to receive and the interfering station, a large number of stages of detection is more selective than a lesser number, or apparently than the heterodyne intermediate frequency method; but for a small frequency difference a large number of stages is less selective than a small number.

Duplex Radio Transmitting System

THEODORE R. BUNTING has recently described a radio transmitting system which provides electric circuits that will permit two messages to be transmitted simultaneously and independently by one antenna. This is accomplished by causing two oscillating currents of different frequencies to flow between the antenna and ground systems without interference with each other.

Two parallel radiant circuits consisting of the same antenna and ground are used, and between them are two electrical circuits each of which includes a tuning inductance and an impedance circuit composed of an inductance shunted by a capacity, each impedance circuit being tuned to the frequency of the opposite radiating circuit. The two radiating circuits are tuned to oscillate at frequencies sufficiently different to render negligible the impedance of each impedance circuit to the oscillating current of the radiating circuit of which it is a part. These parallel radiating circuits, combined with means to compensate each impedance circuit for any change in the value of the electrical constants of its correspondingly opposite radiating circuit can be used in a duplex radiating system with undamped or continuous waves, the frequency of which is modified to accomplish signaling.

In the accompanying drawings, figure 1 shows diagrammatically a radiating antenna circuit for duplex radio transmission. Figure 2 shows the same combined with two oscillating circuits having the same or different sources of power, but generating different high frequencies. Figure 3 shows diagrammatically a duplex radio transmitting system using continuous waves, with means for altering the values of the constants of the two radiating circuits independently, and simultaneously compensating for such alterations.

Referring to the drawings A and B are the impedance circuits, and C and D tuning inductances, said impedance circuits and tuning inductances being inserted in the branches of the antenna-earth circuit.

In figure 2 oscillating circuits are shown each comprising a primary inductance, a condenser, a spark gap, E; a transformer or telegraph keys, and a common source of alternating electric energy, though the system contemplates the use of either a common or different sources of alternating electrical energy.

The operation of the system is as follows: When the operator closes one of the keys, the AC energy is transformed to the secondary winding, whence it is converted into high-frequency oscillating currents in the circuit including capacity, inductance and spark gap, the electrical constants of which are of such value as to make these oscillations of the same frequency as the radiating circuit to which it is coupled by the primary and tuning inductance C. The presence of the impedance circuit B prevents the oscillations of the radiating circuit from being interfered with by the presence and electrical condition of the opposite radiating circuit. The arrangement, however, contemplates any method for generating damped oscillating currents whereby damped oscillating currents of different frequencies are independently caused to flow in the duplex radiating system.

Referring to figure 3, a generator of high frequency continuous or undamped oscillations F is connected in series with a capacity between the antenna and earth. A source of electric energy is connected through the telegraph keys to the electromagnetic contact closers G, H, I, J, which control the value of the tuning inductances and the use or non-use of the additional capacities, which are included in the impedance circuits. Any device electrical or mechanical, may be used to control the value of either the inductance or the capacity of the impedance circuit simultaneously with the change in the tuning inductance of the opposite radiating circuit, so that the frequency of said impedance circuit shall be maintained coincident with the frequency of the wave radiated by the opposite radiating circuit.

The operation of the system described in figure 3 is as follows: Continuous oscillations of two different frequencies are normally flowing in the duplex radiating system, and signaling is accomplished by independently modifying the frequencies of the radiated

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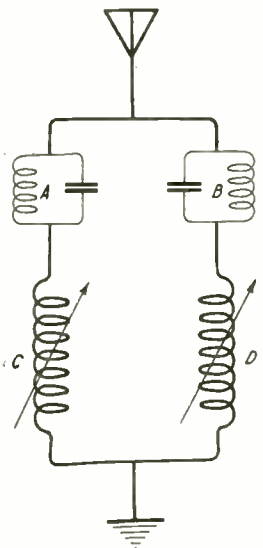


Figure 1

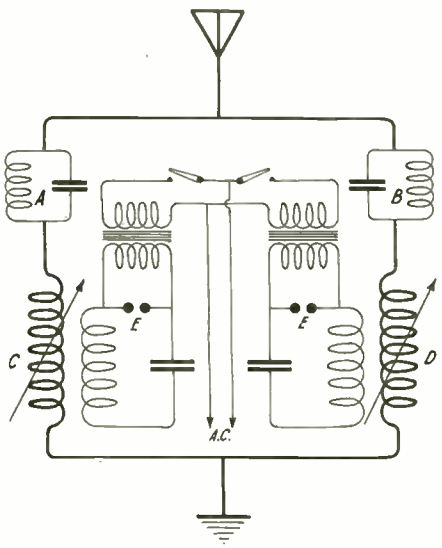


Figure 2

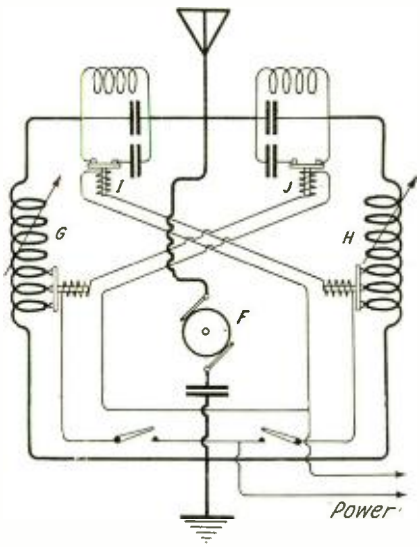


Figure 3

Wiring diagram of the system of duplex transmission on a single aerial and ground

Oscillation Generator of Constant Frequency

A MEANS for generating oscillations, the intensity of which is independent of small changes in the impedance between the output electrodes of the evacuated vessel, so that approximately similar evacuated vessels may be used in the oscillation generator without producing any change in the high frequency output has been developed by Edward O. Scriven.

It is well known in the art that a vacuum tube repeater of the vacuum tube type may be made to oscillate by providing a feed-back connection from the output to the input circuit of the device, and by providing a condenser suitably placed in the tube circuits for tuning to the desired frequency. One type of such a generator is described by Hartley for oscillation generators. The output, however, from such a generator is not constant for a given setting of the condenser and the feed-back connection, but depends upon the electrical values of the other elements of the oscillator, such as the impedance of the vacuum tube and the voltage of the direct current source.

For the accomplishment of this object a path of high impedance is embodied in the output circuit of an oscillating tube for the direct current from the source of voltage for the output circuit, and a path of low impedance for the resultant oscillations. The path of high impedance, preferably composed chiefly of a resistance, should be of such a value that the space current remains practically constant irrespective of the condition of oscillations, and of slight changes of the output voltage source or of the impedance between the output electrodes of the evacuated tube. If the direct current remains constant, it follows, therefore, that the alternating current developed will have the same constancy. If, now, a circuit of low impedance, preferably composed chiefly of a resistance, is provided for this alternating current, which impedance is not changed by change of frequency, an alternating voltage of constant amplitude may be obtained from this impedance which may be impressed on suitable receiving or transmitting terminals, such as the input circuit of an amplifier, or the terminals of an outgoing line.

It has also been found that, due to this constancy in the space current, the frequency generated by the oscillator for a given setting of the condenser also possesses the same constancy and is made practically independent of small fluctuations in the voltage or the electrical values of other elements in the circuit.

The output, however, from such a generator is not pure, as high harmonics are present in addition to the fundamental oscillation. It is possible to increase the intensity of the harmonics from such a generator to such an extent that they may be comparable in intensity to the fundamental. This may be accomplished by providing for the high frequency oscillations of the generator, a path, the impedance of which increases with increase of frequency. The drop of potential across this impedance may then be impressed upon suitably tuned circuits, so that the various harmonics and the fundamental may be separated from each other.

By the two arrangements described vacuum tubes of approximately similar characteristics may be employed in connection with a given tuned circuit to generate oscillations which will be constant in intensity and frequency for all the tubes. Such a constancy is of especially great importance when the generator is associated with a system containing tuned circuits, for, on substituting one tube for another, no change need be made in the tuning of the circuits, since the frequency will remain the same.

For the better understanding of this circuit, reference is made to the accompanying diagrams, in which figure 1 represents an embodiment of this design from which a constant output may be derived, and figure 2 represents an embodiment which may be employed as a harmonic generator. Each vacuum tube in the drawings has a reference character beside it to indicate its function. Thus, "A" indicates that the vacuum tube is an amplifier, and "G" indicates that the tube is an oscillation generator.

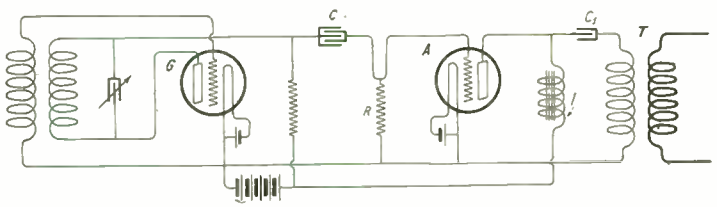


Fig. 1. Constant output oscillation generator

In figure 1 the oscillation generator, taken in connection with inductance coils and shunted capacity, constitutes an oscillator which generates oscillations of a frequency determined largely by the tuning of the closed circuit including the inductance and capacity.

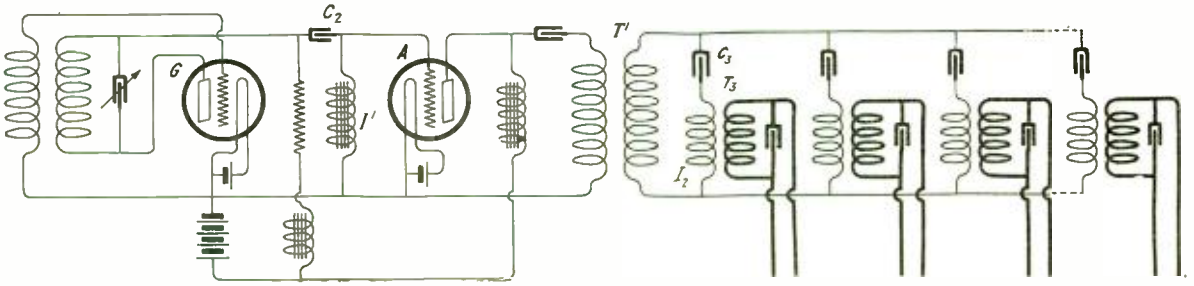


Figure 2—Circuit diagram of the harmonic generator

The source of voltage for said generator, has its negative pole connected to the filament and its positive pole connected through the high resistance to the anode or plate. This resistance is of such a high value that the direct current flowing through it is practically constant and less dependent on the frequency of oscillation or of slight changes in the impedance between the output electrodes or other elements of the vacuum tube circuit. A path of low impedance for the oscillating currents between the anode and the filament is provided by means of the con-

denser C and the resistance R. The condenser C, has preferably a large capacity, and has consequently small impedance, so that most of the impedance of this path is due to the small resistance of R. The impedance of this resistance is independent of the frequency of the oscillations generated, and therefore, since the space current remains constant, the amplitude of the alternating voltage across the terminals of this resistance is constant; and this voltage drop may be employed, as shown, to impress the generated oscillations upon the input circuit of the amplifier A. The amplifier oscillations in the output circuit of A may, by transformer T, be impressed upon any suitable receiving or transmitting terminals. The amount of voltage impressed on the amplifier may be regulated by means of the adjustable contact X. This amplifier A, has the peculiar characteristic that it will allow current to flow through it in one direction only. Consequently, although it functions to amplify the oscillations from the generator G, and to impress them upon the outgoing circuit of T, it will not allow current to flow in the opposite direction, that is, from the outgoing circuit back to the oscillator. The outgoing circuit, therefore, cannot react upon the oscillator to produce distortions in the wave form of the oscillations generated due to fluctuations or changes of the load in said circuit.

Condenser C is inserted to prevent the direct current from passing through the side circuit containing the small resistance R. The source of plate voltage may be also used as the output battery for the amplifier A. A choke coil I, is preferably inserted to prevent the oscillation currents from passing through the battery-circuit. Similarly, a condenser C^1 prevents the direct current from flowing through the primary winding of the transformer T.

In figure 2, similar to figure 1, there is an oscillation generator comprising a vacuum tube, the feed-back connection between the inductance coils; and the shunted capacity, and across the output terminals of the vessel is connected the high resistance and the source of voltage. A path for the high frequency oscillations is provided by the shunt, comprising the inductance and capacity C^2, connected across said resistance and source of voltage. The drop of potential across the terminals of inductance I^1 is impressed on the input circuit of the unilateral device A, which is inserted to prevent any reaction of the outgoing circuit upon the oscillation generator. The amplified oscillations in the output circuit of A are impressed, by transformer T^1, upon a system of tuned circuits. Since the impedance of the inductance I^1 increases with increase in frequency, it follows that the harmonics generated by the oscillating tube G are emphasized considerably more than the fundamental, so that the secondary of T^1 contains the fundamental oscillation and its harmonics in approximately the same order of intensity. If now the capacity C^3 and inductance I^2 are of such values that only oscillations of the fundamental frequency may pass through, then the circuit tuned to the impressed frequency will receive oscillations of only this frequency by the transformer T^3. If the next succeeding capacity and inductance are tuned to the first harmonic, then this tuned circuit will receive oscillations of only the frequency of that harmonic. Similarly the next tuned circuit may be made to receive oscillations of only the frequency of the second harmonic and so on for other circuits tuned to the higher harmonics. The device, therefore, serves as a harmonic generator, and the harmonics derived therefrom may be employed for any purpose desired, such as serving as carrier wave oscillations for low frequency signals in a system for communication.

Radio at Shriners' Convention, San Francisco

THE official inauguration of the biggest and most complete radio event ever attempted on the Pacific Coast was effected at 3 P. M. Monday, June 12, when George Filmer, general chairman of the 1922 Shriners' convention, formally set in motion the wheels of the show that was held in connection with the convention.

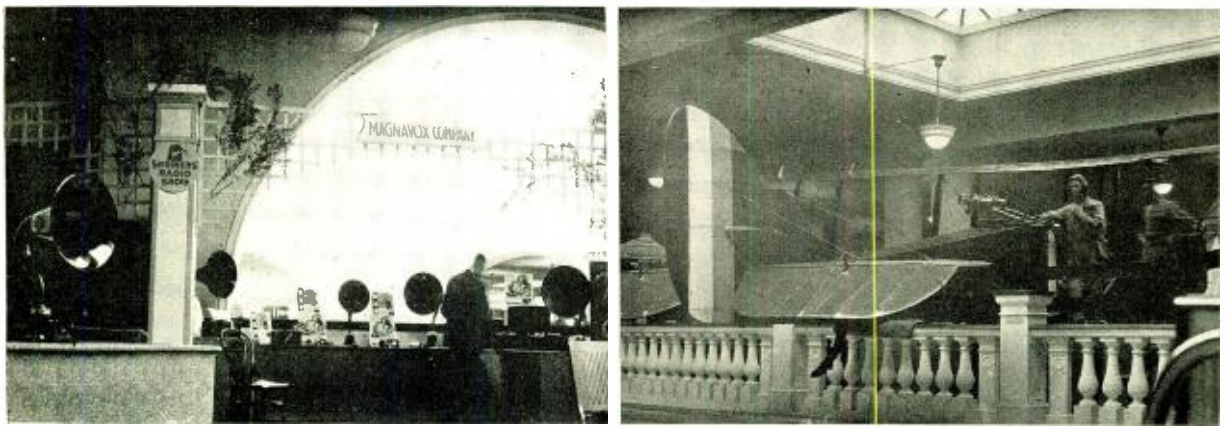
Approximately fifty exhibitors had concession booths on the exposition ground, which is located on the third floor of the Emporium, one of the large department stores in San Francisco. The booths were individual in design and were finished in decorations emblematic of the Shrine. They were constructed around the bannister of the dome and were so located that they were visible from the main floor of the Emporium.

The products shown to the public embodied everything in the radio line. Among the exhibits which interested the radio fans generally were the radio compass, designed by Dr. Frederick A. Kolster of Palo Alto, which was exhibited by the Federal Telegraph Company; the Government display booth in charge of Major J. F. Dillon, United States Radio Inspector for the Sixth District and the radio-equipped scout airplane which was exhibited by the Army Service.

The scout plane, with capacity for two passengers, was suspended in the center of the dome of the Emporium. Receiving and transmitting radio apparatus in the machine was kept in operation continuously.

As an added attraction to the radio exposition, a continuous vaudeville show and four moving pictures were given throughout the week. Two of the films were along radio lines and two showed the points of interest in California. All of this entertainment was free to the Shriners and the public.

The Emporium's five radio contests, which were run in conjunction with the Shriners' radio show, furnished much entertainment for radio fans. Silver cups were awarded the winners of the five classes. Both men and women were entered in the contests which included one for code-speed reception.



Two views in the Shriners' Radio Show. At the left, the Magnavox booth; right, radio-equipped scout plane suspended from center dome

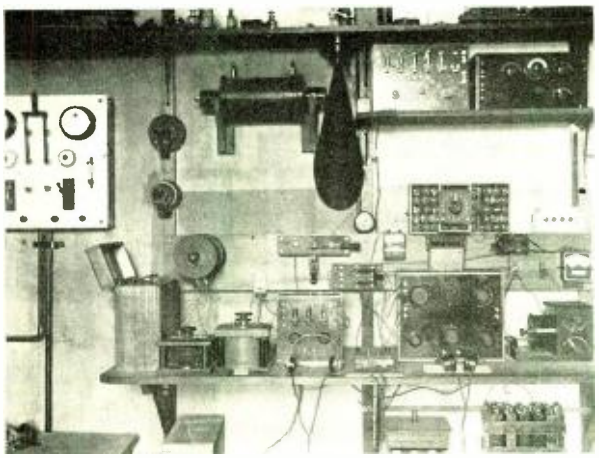
Amateur Activities in Australia

By J. S. Kemp

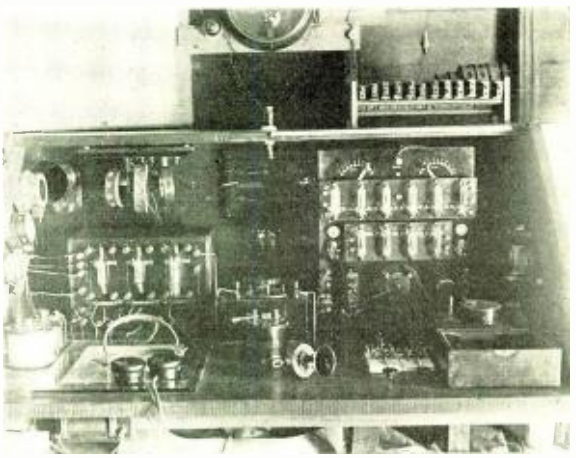
THE field of the amateur operator in Australia at present is very limited, being confined to reception only. To the general run of amateurs, transmission is strictly forbidden. Transmitting licenses are issued only to individuals and organizations, who can show good reason for holding them. If an amateur desires to carry out transmitting experiments he must obtain special permission from the Radio Inspector for a limited period. Our energies must, therefore, be directed to the development of the receiving apparatus. Being so restricted makes us a little envious of the privileges allowed American amateurs.

In each of our Capital Cities we have established a Wireless Institute to promote and guard our interests generally. At various times during the year lectures on matters dealing with wireless telegraphy are given by responsible persons, and also a series of outings are arranged to various ships, and other places of interest to amateurs. Recently with the permission of the Radio Inspector, a competition in receiving C. W. Tonic Train, and Telephony, was held under the auspices of the N. S. W. Division of the Wireless Institute of Australia. Each competitor was provided with a special set of log sheets, and schedule containing particulars as to prizes, rules, order of the transmission, etc. The signals were transmitted on a wavelength of 1,400 meters from Mr. Maclurcan's station at Strathfield, Sydney.

The results of the competition were on a whole very satisfactory, excellent work being done by the various competitors. This competition was the first of its kind ever held in Australia, and it is hoped will be the forerunner of many more, doing much to foster the spirit of enthusiasm and interest amongst amateurs generally. In my own locality there are about a dozen amateurs within a radius of a mile, also a radio club with a roll of about thirty members. This club possesses a transmitting and receiving license but owing to restrictions transmission has not been carried on. Nearly all these stations are fitted with the latest receiving appliances, and it is possible, using only one valve, to receive many American high power stations easily. A couple of stages of amplification increases signal strength to such an extent that signals are read a fair distance from the phones. The photographs of two amateur stations in operation in my locality are included with this article. The transmitting and receiving set belonging to Mr. C. D. Maclurcan, and the receiving set only, to Mr. F. Leverrier. Mr. Maclurcan's station consists of a tube transmitter and a three-tube receiver.



F. Leverrier's station, Sydney, Australia, equipped with resistance-coupled frequency amplifiers



Amateur station of C. D. Macluran, equipped with a ten-tube transmitter and three-tube receiver

The transmitter is shown to the right of the photo and consists of ten Marconi V24 tubes, five of which are used as oscillators and five as modulators, connected on the "shunt" or "Heising" system. The high-tension voltage is supplied by a small 600-volt generator, driven by a quarter horsepower induction motor. The filament current is supplied by means of a step down, transformer from 240-volt A. C. mains. By manipulating various switches on the panel it is possible to use the set either as a radiophone, C. W. or buzzer modulated transmitter, and transmit on all wavelngths up to 1,400 meters. Excellent results have been obtained with this set, signals being heard in Melbourne, a distance of 400 to 600 miles, using only ten watts power.

The receiving set consists of three tubes, two Marconi V24's, and a Roome tube, transformer, coupled, mounted on a small cabinet shown in the left portion of the photo. A novel feature of this set is the filament resistances, combining as they do, a switch and resistance, and are shown mounted in a horizontal position, just under the tubes, enabling each filament to be regulated or switched off. Honeycomb coils of his own manufacture, a specially constructed primary condenser, giving a very fine variation of capacity, Baldwin phones, and the usual run of tuning condensers complete this set. By means of a wavelength chart, shown mounted under a glass cover on the desk, tuning is very quickly accomplished. With this apparatus it is possible to cover all wavelengths from 300 to 25,000 meters. Nauen, Lafayette, Lyons, New Brunswick, and many other high power stations being received with fair signal strength. This station is also fitted with a heterodyne wavemeter calibrated up to 22,000 meters, which can be used either as a transmitter of damped, or undamped waves, or as a receiver, or crystal wavemeter. Used as an independent oscillator in conjunction with the Roome tube, splendid results are obtained. An experimental loop, two aerials, and a counterpoise ground complete the station.

Mr. Leverrier's station consists of three Marconi V24 tubes, composing a radio-frequency amplifier, resistance-coupled with electrostatic feed back from the second tube; the tubes, con-

denser and filament resistances, being mounted on a small cabinet, as shown in the left portion of the photo. A Telefunken condenser, honeycomb coils of his own manufacture, covering all wavelengths up to 25,000 meters, and Baldwin phones complete the long wave set. The signals of many high power stations are received with this set, including those of Nauen, New Brunswick, Pearl Harbor, and numerous others. By means of a four-pole, double-throw switch, he is enabled to change over B battery, A battery, aerial and phones to a short-wave set, shown at the right of the photo. The Armstrong double-feedback hook-up is used in this set with splendid results, the approximate receiving range being about 2,000 to 3,000 miles. With this set it is possible to receive Cavite, P. I., on long wave, very plainly, signals being heard all over the room. All local stations are received, including VIB, VLW, VLA, VIA, and many others.

The instrument shown to the extreme left of the photo is a heterodyne wave meter, built from the specifications of Mr. R. W. Goddard, January, 1920 issue of THE WIRELESS AGE with a few modifications. This instrument is calibrated up to 15,000 meters. A recent valuable addition to this station consists of a Brown loud speaker, which has given excellent results, signals being tremendously amplified. At the time of writing a cabinet is under construction, consisting of one detector tube, and five amplifying tubes, resistance-coupled, for long wave work, and it is most likely that this set will bring in all the high power stations of the world with readable signal strength.

These stations are fair examples of the scope of amateur work in Australia. As to radiophone experiments very little or none at all are being carried out by the general run of amateurs. The Amalgamated Wireless, of Sydney and Melbourne, using a ½ kilowatt set, send out concerts occasionally. Regarding hook-ups and designs, each style has its devotees, some favoring the isolated type, others the cabinet sets. I will say in conclusion that owing to some unscrupulous individuals who persistently interfere with commercial traffic we are in constant danger of losing our receiving licenses. But we hope as our numbers increase, that we will be able to exercise a system of control similar to that in vogue in America, to eradicate this evil. Therefore we live in hopes of the day when the ban will be lifted and we can experiment freely once more with transmitters.

Amateur Wireless in England

By Frederic L. Hogg

AS a regular reader of THE WIRELESS AGE, not having seen many details of what we are doing over here, it occurred to me that the amateurs of America might like to know and perhaps try some of our circuits.

The amateur wireless community, although increasing monthly, is still very small in numbers as compared with our cousins in the States: we only number 6,986, of whom 286 hold transmitting licenses. Of the recent and successful trans-Atlantic tests I will not say much, as I know they have already been fully covered.

Being so cramped for space here, we are handicapped in many ways, especially so in London, where a good aerial is very rare, and the usual earth is the waterpipe, surrounded, as we are by buildings and a maze of telegraph wires. Again we are limited to 10 watts input. So we try to get the best results under very adverse conditions.

The wavelengths for transmission, we are permitted, are 180,440 meters, and occasionally 1,000 meters. As 1,000 meters is rather close to 900, which all the Government and Air Force telephony stations use, a certain amount of jamming has been reported lately from amateurs on 900 meters. There is practically no spark transmission done, it is almost entirely confined to C.W. and radiophone.

For telephony transmission the most popular circuit is undoubtedly the choke control system, this, although tending to distort the speech very slightly, is eminently reliable and suited to the longer wavelengths which we nearly all use. The circuit is generally a modification of figure 1. The high tension supply is as a rule derived from a 600-volt D.C. generator, although some stations use rectified A.C. with considerable success, but this requires a lot of smoothing out to get rid of the hum usually noticed when A.C. is employed. The antenna current is as a rule in the neighborhood of half an ampere.

The one disadvantage to this circuit is the two extra chokes required; so grid modulation is sometimes employed, but this as a rule is not so efficient, this method also does away with the extra control valve, as in figure 2. The usual tube employed is the B type, which is very similar to the French R tube used for reception over here, but is much harder, and the grid is wound finer, other transmission tubes in use are the 0.20, and the A.T. 25, but these are intended for higher power up to 50 watts; although they all fit the standard four pin socket in use here.

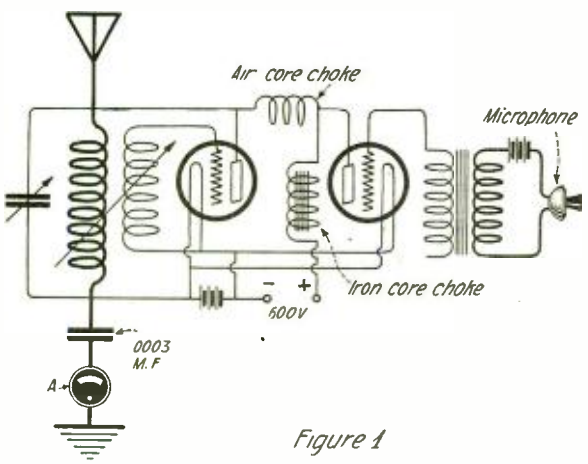


Figure 1

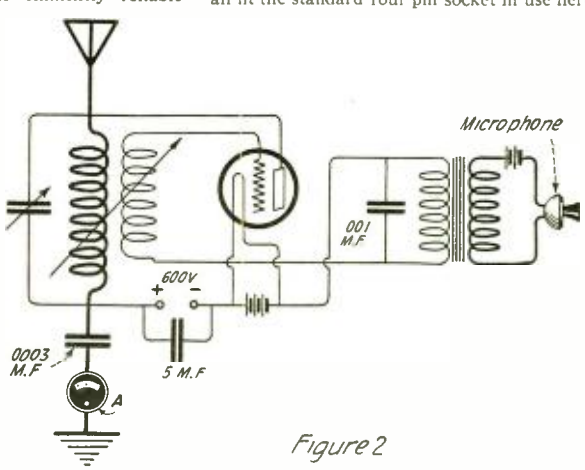


Figure 2

CW transmitting circuits that are popular in England

Radiophone concerts are very popular round London, in fact unkind people say too much so, and now we are limited to a 15 minutes' transmission, then listen in for 15 minutes before transmitting again. In fact there are very few evenings when you can't pick up the phones any time between 8 and 10 P.M. and hear several concerts going on, the usual conversation and testing.

Naturally after the war there was any amount of British, French and even German

wireless apparatus sold by the Government at knockout prices, and many an amateur station is largely composed of it. Parts of the well-known Mark 3 Tuner are to be seen everywhere; this was simply a two-circuit crystal receiver in a portable case, and contained among other things two very good tuning condensers which could be taken out, and sold for about 20 shillings. Apart from this ex-government gear, prices are on the whole much lower over here.

cuits in use, though very few stations employ the Armstrong regenerative circuit, so common in America. The single tube circuit used here by some of the smaller stations is given in figure 3. It embodies the reaction principle, and rectification is brought about by means of a leaky grid condenser. This is the standard tube receiver on which we all graduate until we want something better and go in for high frequency amplification. For low frequency amplification the

wire, tuned to the wavelength of the incoming signal by a variable condenser in shunt across the primary and electrostatic reaction is employed. The disadvantage of this amplifier is that about eight different transformers for each tube are required to cover the entire range of wavelengths from 200-25,000 meters. These transformers are usually fitted with four pins to plug into the standard valve holder we use.

The aperiodic transformers of figure 5

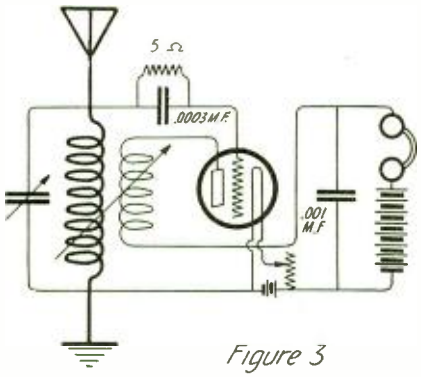


Figure 3

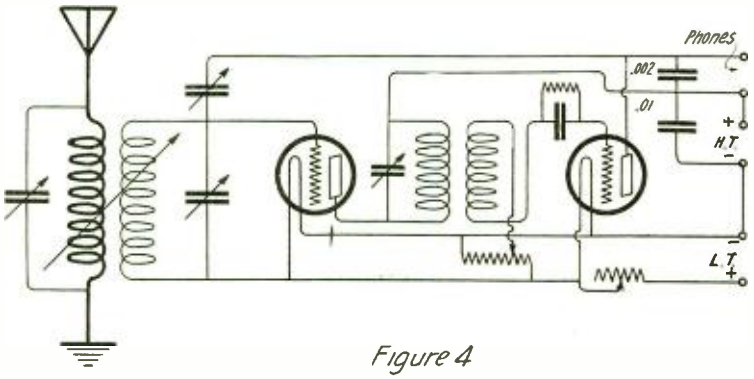


Figure 4

One and two tube English receivers, the latter using a tuned transformer

Besides amateur radiophone stations, there is plenty of telephony to listen to. All the airplane stations and airplanes on the London-Paris route are equipped with radiophones and can be heard daily. There are also other big commercial stations which use telephony, the Eiffel Tower and The Hague, which transmits the famous Dutch concert that everybody tries to "tune in." Many fail, however, as the power used is very small, only about 200-250 watts and the distance is nearly 400 miles, so it is extremely difficult to receive the station without high frequency amplification. Other stations are Berlin (POZ), and Chelmsford, the station belonging to the Marconi Co. All four give very good concerts and from the Eiffel Tower (Paris) we often hear famous singers from the Paris Opera.

usual circuit is employed. By the way, a sure cure for a noisy low frequency amplifier is a small condenser about .0007 placed across the secondary transformer after the rectifying valve. The hissing noise often met with in a low frequency amplifier is a strong oscillation just above the audibility point, and the condenser cuts it entirely out.

For high frequency amplification there are several circuits in common use. 1, tuned interchangeable transformer; 2, periodic transformer; 3, Round 16-circuit, tuned anode or auto-transformer; 4 resistance-capacity coupling.

All four circuits have their weak points, the ideal high frequency amplifier for amateur use to cover all wavelengths still remains to be found.

The tuned transformer of figure 4 is a 1-1 air core, wound with 44 S.W.G. copper

are 1-1 air core, but are wound with resistance wire 45 S.W.G. Eureka, and have a resistance of about 24,000 ohms, these transformers instead of giving an optimum on one particular wavelength, maintain a fair efficiency between 1,500-25,000 meters. This is a fair range, but separate transformers are needed for wavelengths from 200-1,500 meters. A seven-valve amplifier on this principle is used in all commercial stations for trans-Atlantic reception, on wavelengths between 8,000-17,000, but this amplifier for

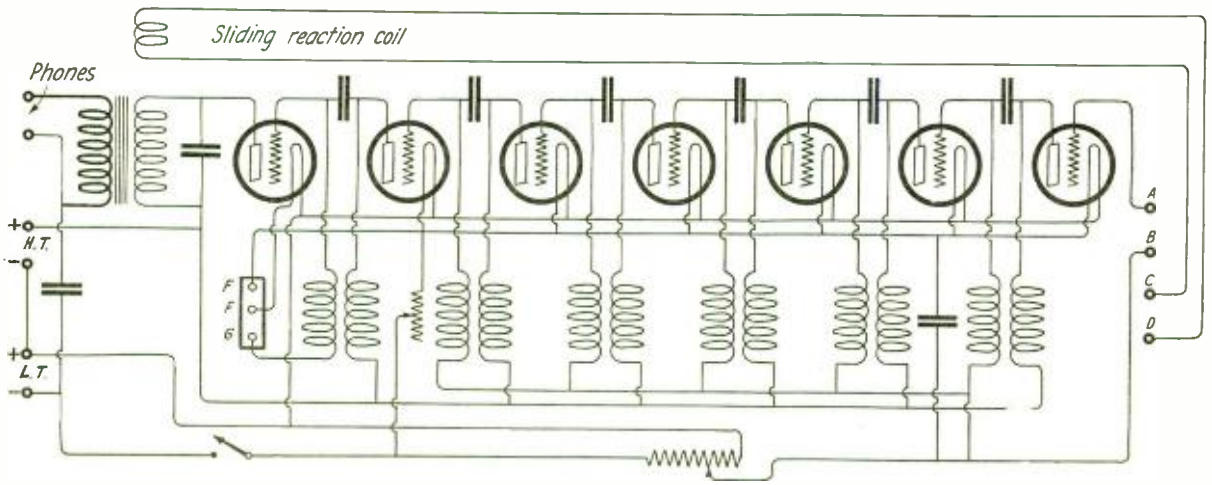


Fig. 5. Seven-tube amplifier especially suited for long-wave trans-Atlantic reception

the amateur is expensive and will not give good amplification on the shorter wavelengths.

The tuned anode circuit of figure 6, for amplification of weak and distant stations, is far and away the best, but is troublesome to tune over a large range of wavelengths, as the anode circuits have to be accurately

tuned to the wavelength of the aerial. The set will only oscillate when they are in tune. When properly tuned to a definite wavelength, however, it is capable of giving marvelous results, and is very free from jamming as it only oscillates on the wavelength to which it is tuned. I personally tuned up an eight-stage amplifier on that circuit for the first trans-Atlantic tests. Each succeeding anode circuit has to be tuned up with a wavemeter to the required wavelength, which was in that case 200 meters. Last comes resistance-capacity coupled amplifiers, as shown in figure 7.

This again employs electrostatic reaction; its chief merit lies in the fact of its cheapness, the coupling between the tubes consists of one condenser and two resistances as against the usual transformer. But it has several drawbacks; first, that it will not operate below 1,500 meters, due to the inter-electrode capacity of the tubes at that very high frequency, which at 300 meters is 1,000,000 a second. The impedance of a condenser to alternating current varies indirectly as the square of the frequency, so the high frequency impulses of the low wavelengths pass the coupling condensers very easily, and so lower the amplification. Also, its amplification seems to drop after about 15,000 meters, and at its best the amplification per tube is poor compared to high frequency transformer-coupled amplifiers. It requires about six tubes of resistance-coupled amplification to give the strength of signal that four transformer-coupled will. I believe, however, that an amplifier of this kind which overcomes all these bad points will shortly be on the market, and when it is it will certainly be the best amplifier for amateurs because of its flexibility and cheapness, as compared to other types of high frequency amplifiers.

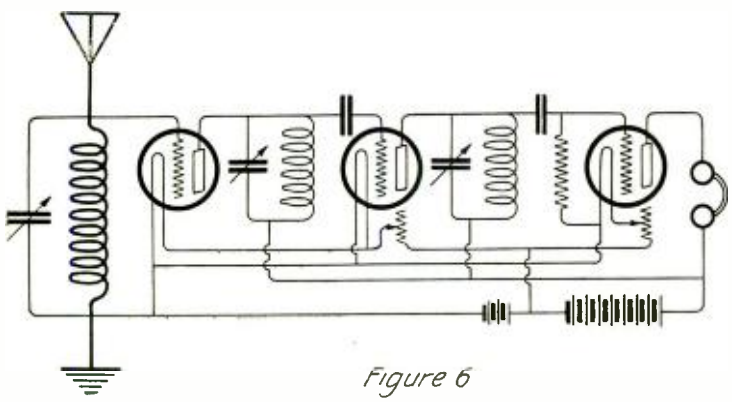


Figure 6

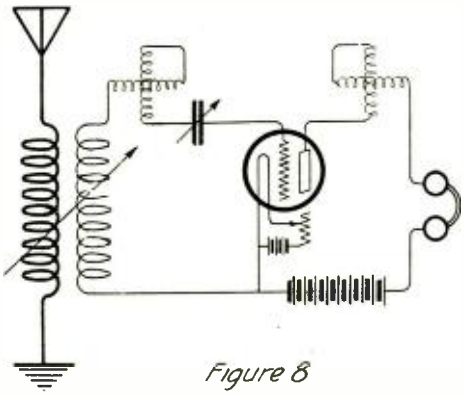


Figure 8

Tuned anode circuit and an effective single-tube short-wave receiver

One thing that strikes me very forcibly on looking through THE WIRELESS AGE, is the great use made of variometers for fine tuning, while we, as a whole, use variable condensers; I, myself, prefer the variometer. It is cheaper and more efficient. In fact, one of the finest single tube circuits I ever used contains them. It is given in figure 8 for what it is worth, and I can thoroughly recommend it.

There are all sorts of tuners in use over here, but the single layer coil for longer wavelengths is gradually being displaced, and we are following the example you set us, of using honeycomb and duolateral. One very efficient coil which, owing to the trouble of winding is not very much used, is the eight bank pile winding, this is as good as anything, for long wavelengths and also has the additional advantage of compactness, a 20,000 meter coil wound on this principle can be got on a tube three inches diameter and about four inches long, it can be tapped for the shorter wavelengths.

The advantages of an independent heterodyne are not sufficiently realized over here, the autodyne method of reaction is preferred owing, no doubt, to its greater simplicity. But the heterodyne method, besides preventing any radiation from the receiving aerial, increases signal strength considerably, especially on wavelengths over 10,000 meters. For instance, on 18,000 meters, employing an autodyne receiver, in order to get the beat note, the receiver must be mistuned nearly 1,000 meters, that is over 5 per cent mistune. With a heterodyne the signal strength would be doubled or more, as well as helping to eliminate jamming. To give an example, using a standard seven-tube amplifier and autodyne reaction, Marion (WSO) can be heard in London with the phones on the table at night time. On the same apparatus, but employing an independent heterodyne, WSO is audible thirty feet from the phones.

Talking of high power stations, I presume the American amateurs are familiar with the note of Carnarvon (MUU). An improved tube set, employing 56 tubes is being used. The antenna current is 350 amperes, and by increasing the power it is hoped to raise it to 1,000 amperes. This is the set that recently made the long distance record, being received in Australia, 12,000 miles.

A new circuit which has been employed with considerable success here lately is one giving simultaneous high and low frequency amplification, figure 9. Although looking rather involved, it gives very good results

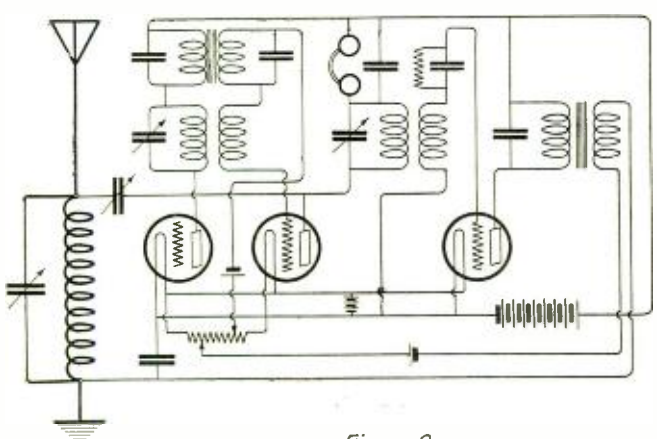


Figure 9

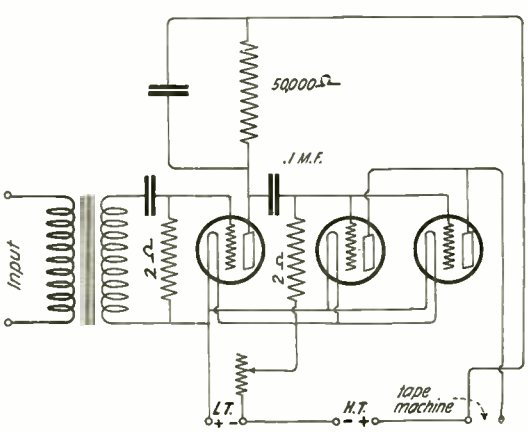


Figure 10

Heterodyning and tape recorder circuits

and of course is advantageous in decreasing the number of tubes.

A good many amateurs have attempted the recording of wireless signals with indifferent success due chiefly to the absence of a reliable relay, sufficiently sensitive and quick acting. Various circuits have been proposed from time to time to obviate this, such as the "Turner valve relay," or a circuit based on the "Wheatstone bridge" principle. But a circuit which I used with considerable success for some time, is given in figure 10. It is a "Very low-frequency amplifier," and by putting the last two tubes in parallel it will give sufficient current to actuate polarized Morse inker direct, without any intermediate relay. Of course it must be used after at least three or four previous stages of high frequency amplification, but when once adjusted is very stable and will run for hours without attention. I believe it was first proposed by Professors Abraham and Block, of the Paris University. Of course the simplest method of recording is by the Dictaphone. This is the means employed by the Marconi Co. on the London-Paris service; the signals are recorded at 120 words a minute and translated by running the Dictaphone at a slower speed afterwards.

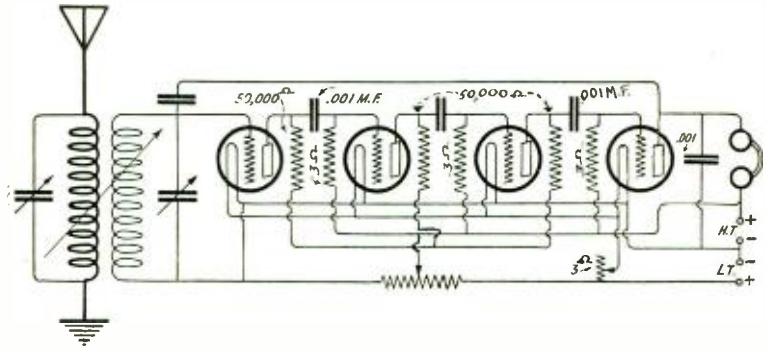


Figure 7. Resistance-capacity coupled amplifier system

Another very interesting branch which is being developed here is wireless direction finding. All the airplanes on the London-Paris route are supplied with their bearings in foggy weather. But not having done much work in this line, I am not in a position to tell you about it at this time.

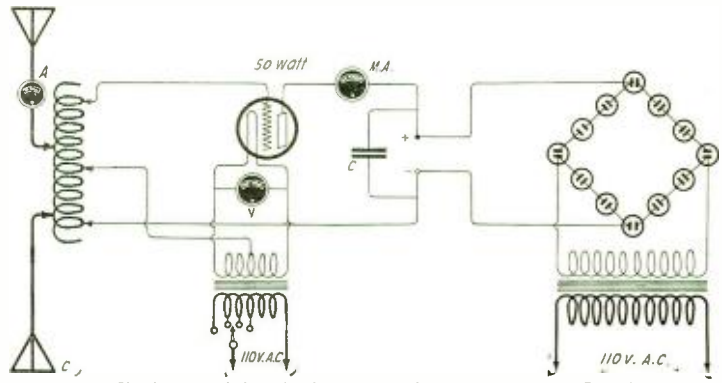
In conclusion, I hope to have the pleasure of writing more about our work over here at a later date. I shall be only too pleased to answer any inquiries if addressed to me, care of the Editor of The Wireless Age.

Exceptional DX Work on 50 Watts

By 8VY, Kalamazoo, Mich.

AN INTERESTING transmitting set, using alternating current mains for both the filament and the plate circuit of the power tube, is installed at station 8VY, operated by F. M. Louwaert and F. N. Wright of Kalamazoo, Mich. The station, which is largely composed of home-made parts has been heard in every district, on both coasts, in Alaska, and by several ships at sea, the signals being reported loud and distinct. With a 50-watt tube, the radiation is 5 amperes.

This is one of the many sets that has been going through a growing process. It started in continuous wave work with 10 watts, and was able with this small amount of power to do some interesting work, performing so well as to stimulate the imagination as to what could be done with more wattage. A



Simple transmitting circuit at 8VY using current from A. C. mains

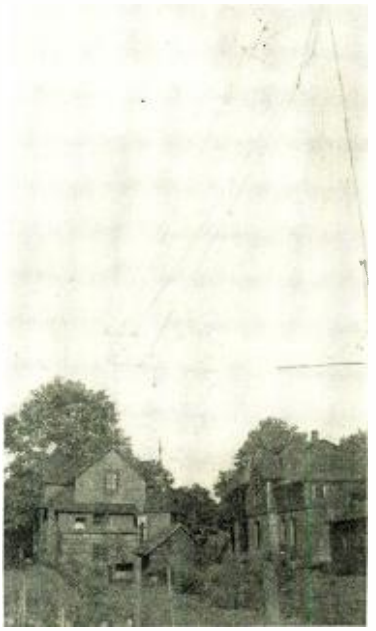
Station 8VY, at Kalamazoo, Mich.

F. M. Louwaert and F. N. Wright

conference with F. N. Wright, 8CJU, who was also seeking additional power, resulted in a pooling of resources. The two stations joined forces, which gave 8VY its first 50-watt tube.

The circuit used is very simple, as can be seen from the diagram. Kalamazoo has 110-volt alternating current, and the expense and bother of storage batteries has been obviated by making use of this current, properly rectified. The filament of the power tube is heated through a transformer made by Louwaert and Wright themselves. This has a tapped primary to vary the voltage, taking care of the changing needs of service. In order to eliminate the hum of the alternations of the current, the secondary of the transformer is tapped at its middle point and led to the tuning inductance. A voltmeter is shunted across the filament line, and in the antenna is placed a thermo-coupled ammeter, reading up to 10 amperes.

Plate potential is supplied likewise from the 110-volt A. C. mains through a transformer, a home-made one consisting of 350 turns of Number 16 cotton and enameled wire in the primary and 3,500 turns of Number 26 wire in the secondary. The current from the secondary is passed through a rectifier consisting of 20 jars of a borax solution, containing lead and aluminum plates. A mica filter condenser is connected across the leads from this rectifier, taking out the hum of the alternating current supply. A milliammeter reading up to 500 milliamperes indicates the current in the plate circuit.



Antenna at 8VY

The antenna system consists of four wires, in a box, or cage type, and a counterpoise of eight wires held horizontally by two spreaders. This system is used for both transmitting and receiving.

This station has been heard by 6XAD, 6RR, 6ZZ, 6AOW, 6ARF, 6ARE, 7LU, 7ZS, 7TQ, 7JS, 5CN; by the S. S. *Reuce* when it was 425 miles west of Fort Stevens, Ore., in the Pacific Ocean. It also has been heard in Chignik, Alaska, and has worked with 5ZA, 5ZAK, 9XAQ, 9BJI as well as a number of others with signals reported very QSA. Since last September station 8VY has received 1,595 cards, 531 stations have been worked in all, and a large number of messages handled. The station soon is to use 100 watts, and expects to increase its radiation greatly and thereby its range and strength. The receiving set used is of the standard regenerative type, making use of the Armstrong hook-up, but spider web coils are used instead of a variocoupler.

The Broadcast Reception Problem

By Ralph R. Batcher

THE announcement that a prominent Long Island Hotel has decided to install 600 radiophone receivers in their hotel, one in each room, has caused many a smile from old-time amateur experimenters who have long known both the advantages and the limitations of the art.

Since the details of the scheme were not announced we can only assume what might be done and then analyze results. Since the installation of six hundred separate antenna systems on or around the building is both physically and electrically impossible such a method will not be considered here. Because of the close inter-action between the circuits very little difference would result in trying to tune one circuit, when there are 599 others being used around it, than in trying to tune the set directly coupled to one big antenna with all the others.

"Ah," some tyro will say, "use loops, one in each room. Then put in good regenerative sets, and there you are!" I tested such a proposition by questioning several radiophone listeners as well as several electrical supply dealers who advertised to solve radio problems, and was assured that there was nothing wrong with the theory. One even thought up a neat little analogy somewhat as follows: Six hundred radio antennae would absorb no more energy than 600 steel girders in the building, so there would be enough radio energy to supply that many sets at once at least, and probably many more besides.

I mentally agreed with him that there would be plenty of radio energy in the vicinity, but wondered what per cent. of it would have originated at the broadcasting station.

This brings up the problem which I would like to call attention to which is of late overlooked so many times: A regenerative receiver will always re-radiate energy, often much more than it receives. A comparison of a typical regenerative circuit (figure 1) and a common type of transmitting circuit (figure 2) will show great similarity. The difference in general is in the amount of energy supplied to the plate circuit which is less in the case of the receiving set, and the degree of coupling between the plate and grid is somewhat less. The author used this principle several years ago to communi-

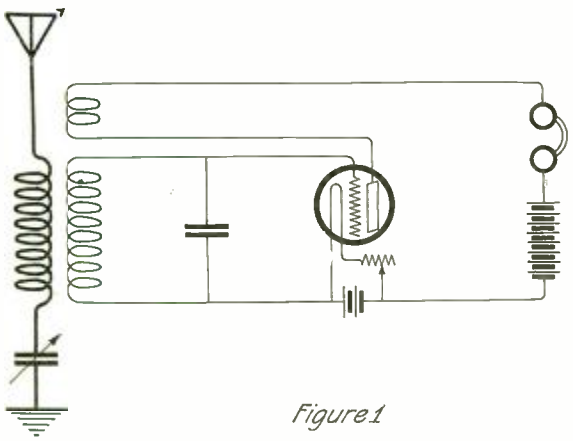


Figure 1

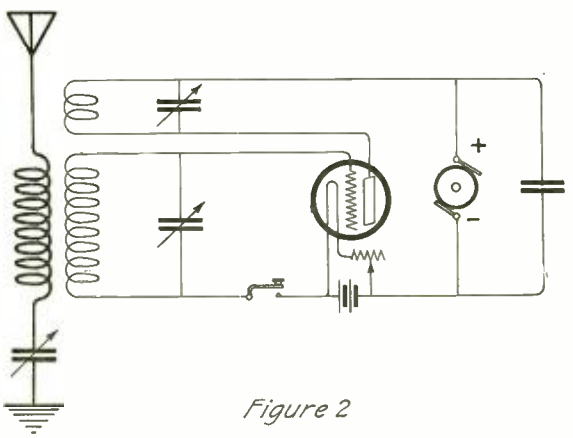


Figure 2

Circuit diagrams showing similarity between regenerative receiver and CW transmitter

cate with another experimenter several blocks away. After making certain adjustments of the tickler coil in a regenrative receiver, a message tapped out by touching the grid condenser terminal with the finger to form characters of the code could be readily picked up at the other station. Doubtless some of the distance records which are claimed with some crystal receivers are partly due to other receiving sets of a regenerative nature operating in the neighborhood, re-radiating energy.

The problem is much more difficult when using the recent Armstrong super-regenerative circuits. Here besides re-radiating energy at the incoming signal frequency there is another frequency of a super-audible order (that generated by the oscillating circuit) radiated. Thus if two experimenters are using this circuit in the same vicinity, and if each selects a slightly different frequency to use in conjunction with his circuit, an audible beat note will be heard in both sets as well as in other receiving sets within a certain range that happen to have their constants set right for such a frequency. The resulting tones when three, four or more stations try this circuit near each other can be computed, but I will leave it to persons who enjoy solving mathematical puzzles to dope this out.

Can it be that some day the number of receiving sets must be limited? or must regenerative or super-regenerative circuits be banned? In the early days of telephony it was thought that the telephone wires must be kept thirty feet apart to prevent cross-talk. Now they put hundreds of pairs of wires in a single cable, with only a comparatively thin layer of paper for insulation on each wire. This radio problem can be solved as well in short order if amateurs would do a little investigation work. Instead of sitting down and listlessly fumbling the controls during the broadcasting period, waiting to get off some real DX work, try out a few experiments along this line. By the word "amateur" I refer to the class of experimenter as found before the days of broadcasting in distinction to the present day majority of fans—broadcast listeners.

For a few pointers which may be tried first: Is the effect lessened by special arrangement of coupling coils? Will special arrangement of current limiting devices (such as the w.k. bucking crystal or valve combination) in the antenna circuit help? Will the application of one or more steps of radio frequency amplification ahead of the regenerative receiver help? What type of regeneration gives the least re-radiation? In these tests the work may be easily checked up by two amateurs living close enough together to be affected by each other's receivers. The change in the signal intensity in one station can be noticed between the intervals that the valve in the other station is regularly turned off and on according to some prearranged schedule.

Effective Radio-Frequency Amplification

By G. N. Garrison

HOW often one encounters the phrase from the pen of well-meaning but ill-informed writers that radio-frequency is far superior to audio-frequency amplification for long-distance short-wave reception "because radio-frequency steps up or amplifies a signal from a distant station a great deal more than it does the signals from near-by stations!" As a matter of actual fact it does nothing of the kind! Common sense should convince even the non-technical that the receiving set connected to an antenna has no way whatever of knowing the distance a radio wave has traveled, when once it strikes the aerial. Since the receiving set cannot distinguish between a radio wave coming from the next block and one that has traveled hundreds of miles, it is obviously an impossibility for it to amplify the one more than the other.

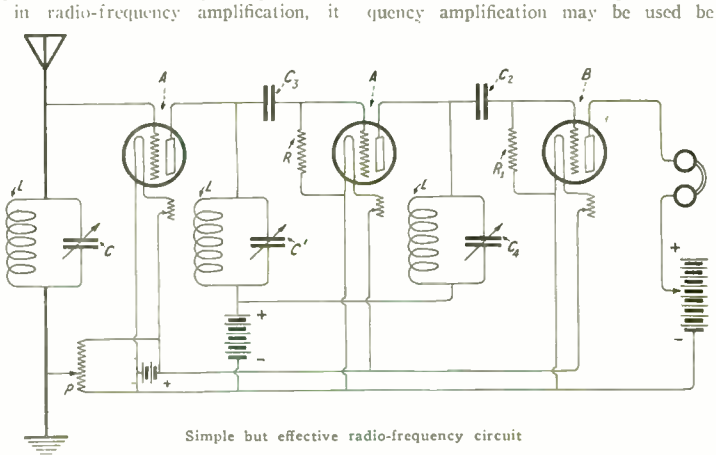
It should be pointed out that our present day vacuum tube is essentially a voltage operated device and, regardless of the type of circuit in which it is used, it will amplify only in proportion to the varying voltages applied between its grid and filament. If a relatively high voltage is applied between the grid and filament of a vacuum tube, the amount of amplification will be greater than it would be if a relatively small voltage were impressed between the grid and filament. Other conditions being equal, those signals which come from a distant station will be weaker than those from a nearby station and the varying potential which they impress between the grid and filament of our first tube—regardless of the circuit used—will be relatively small. Consequently amplification, although effected in the same proportion, will not be as great on the weak signal as it is on the strong.

Radio-frequency amplification is superior to audio-frequency amplification, not because it will "step up" weak or distant signals, but for the simple reason that it will amplify only impulses that are of radio-frequency; or, in other words, frequencies that are above audibility. Due to this fact, "A" and "B" battery noises, as well as mechanical vibration of the tubes, are almost entirely eliminated and the "squeal" which accompanies many audio-frequency amplifiers is noticeably absent. The signal, when it reaches the phones, is unaccompanied by other and foreign noises and is manifested as an easily read, exact reproduction of that transmitted by the distant station.

With the elimination of "A" and "B" battery noises as well as "squealing" of the tubes in radio-frequency amplification, it follows that by this method, considerably more stages of amplification can be used than is possible at audio-frequency, with a consequent increase in the distance covered. The writer has successfully used as high as fourteen stages of radio-frequency amplification, a detector and four stages of audio-frequency amplification and, with these nineteen tubes the small amount of foreign noises noted, were traced directly to the audio-frequency component of the circuit.

The only other claim to superiority of radio-frequency amplification lies in the fact that a circuit containing it is much more selective than one containing only a detector tube, or a detector tube with audio-frequency amplification. The sharper the set tunes, the less will be the interference from unwanted stations. This fact, accompanied by its inability to amplify other than radio-frequency impulses, accounts for the remarkable distances being covered by owners of efficient radio-frequency receiving sets.

The accompanying diagram shows a circuit which, for radio-frequency amplification, is very efficient and at the same time extremely simple. It employs tubes "A" as radio-frequency amplifiers and tube "B" as the detector. Additional steps of radio-frequency amplification may be used before, and audio-frequency amplification may be used after the detector tube with a corresponding increase in the receiving range of the set. Since the circuit makes use of impedance coupling there are three adjustments to be made for each change in wave length, namely, condensers "C," "C-1" and "C-4." The potentiometer, "P," is essential in this circuit since it tends to keep the grid of the first tube at a negative potential with respect to the filament. The other constants of this circuit are as follows:



Simple but effective radio-frequency circuit

L=honeycomb or other coils; the sizes depending upon the wavelength range to be covered. C=.001 mfd. C-1=.0005 mfd. C-2=.0005 mfd. C-3=.005 mfd. or larger. C-4=.0005 mfd. P=200 or 400 ohm potentiometer. R=50,000 ohms; exact for Radiotron tubes. R-1=2 megohms; exact for Radiotron tubes.

EXPERIMENTERS' WORLD

Views of readers on subjects and specific problems they would like to have discussed in this department will be appreciated by the Editor

Indoor Antenna With Crystal Set

By Thomas S. Towle

FIRST PRIZE, $10.00

WHEN it is impracticable to put up an outside antenna for a crystal set, the radio amateur should not be discouraged as it is possible to get satisfactory results from an antenna constructed within the house. The first type that I tried was a miniature of the ordinary outside aerial and consisted of two insulated wires strung near the ceiling of a hall twenty-five feet long by four feet wide. The ground wire ran the full length of this hall under the rug to water pipes in the kitchen. Insulated bell wire was used with no further insulation. Very good results were obtained with a simple variometer for tuning and a galena detector as shown in figure 1.

One day the ground connection at the water pipe was broken and I discovered that the signals were just as loud as before and that the only difference was a slight change in the tuning of the set. For several months this aerial-counterpoise system was used to pick up local amateur stations and the Westinghouse broadcasting station KDKA in East Pittsburgh about six miles due east.

In an effort to eliminate local interference, the outer ends of this aerial-counterpoise system were connected together to form a large loop twenty-five feet long by seven feet high and pointing east and west toward KDKA. This was tuned by a variable condenser as shown in figure 2, and very strong signals were obtained from KDKA. This arrangement had the added advantage that the directiveness of the loop eliminated much interference from local code stations. More turns were added to this loop but it was found that two turns gave the loudest signals. With this arrangement the General Electric Station, WGY, at Schenectady came in with good signal strength from a distance of about 350 miles and at an angle of about 30 degrees with the direction of the loop. This was with a crystal detector.

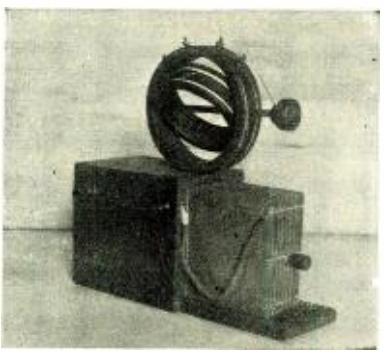


Figure 3. Home-made variometer and variable condenser

While experimenting with this loop, a variometer and variable condenser as shown in figure 3 were used. These were made by the writer ten years ago. They were connected to the loop as shown in figure 4 and good results were obtained. Although this antenna system gives good results with a crystal detector, much better results can be obtained if vacuum tubes are used and a brief description of their use will be given to show how easily the amateur can change over from the crystals to the vacuum tube detector.

The diagram in figure 5 shows how the connections between the stator and the rotor of the variometer were separated and the set made regenerative with the result that much louder signals were obtained and CW stations were picked up. With this hook-up, WGY can be heard with the head 'phone lying on the table. When using two stages of radio frequency amplification without regeneration, the Detroit station WWJ and the Indianapolis station WOH can be heard clearly. With the addition of two stages of audio frequency amplification, these stations can be heard "all over the room" with a Baldwin receiver without a horn.

A good way to extend the field covered by such coil antennae is to install two in a room on walls at right angles to one another and by means of a simple throw-over switch the operator can change from one to the other and cover most points of the compass. This is shown in figure 6.

The above shows that a loop or coil antenna of these dimensions makes it possible for one to enjoy the radio broadcasting with a crystal detector and simple tuning apparatus if he is within reasonable distance of a broadcasting station.

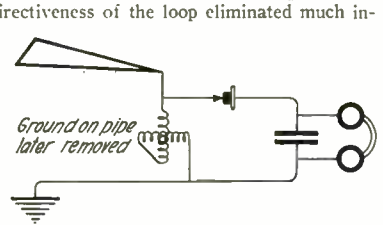


Figure 1

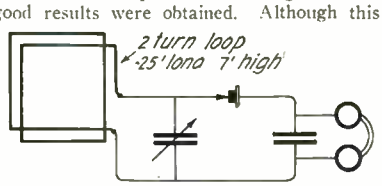


Figure 2

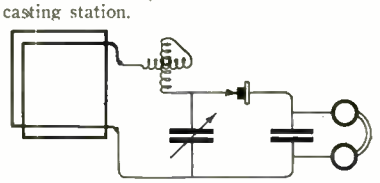


Figure 4

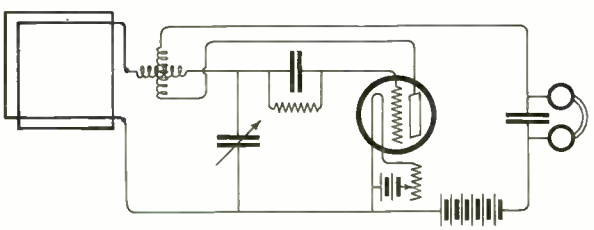


Figure 5

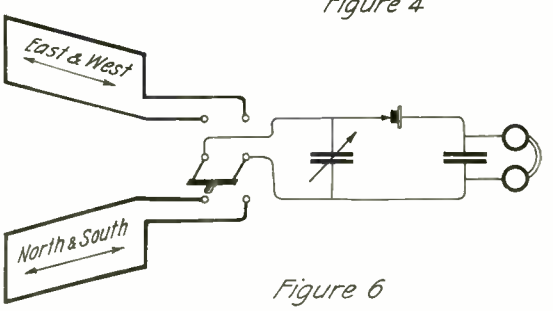


Figure 6

Figure 1. First antenna in 25-foot hallway. Figure 2. Modification into a loop. Figure 4. Addition of variometer for tuning. Figure 5. Ease of converting to a bulb set. Figure 6. Use of two fixed directional antennas

Crystal Receiver With Indoor Aerial

By Gustav Schoch

SECOND PRIZE $5.00

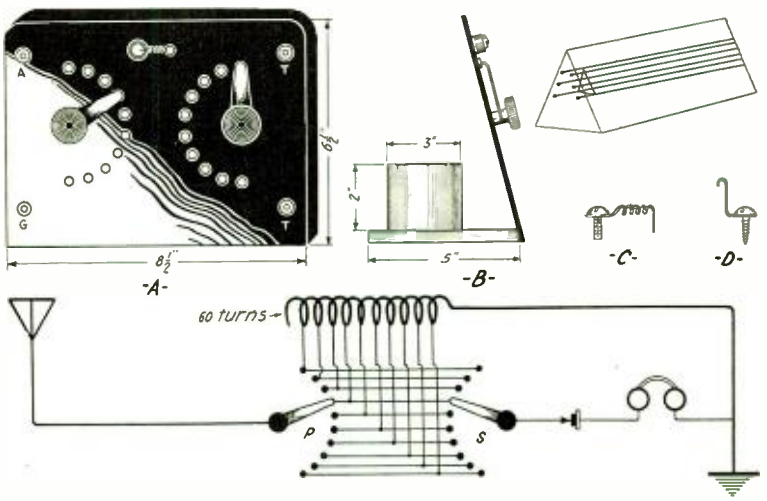
AFTER making and using many types of crystal receivers I have come to the conclusion that the following type gives best results:

This set costs very little to build and is very sensitive for a crystal set. It works on the auto-transformer principle, having but one coil for both primary and secondary. To construct the coil procure a cardboard tube 3 inches in diameter and 2 inches long. On this wind 60 turns of No. 26 to No. 30 wire. Bring out a tap every 6 turns. When the coil is finished there should be nine taps, and the ends of the coil, making eleven leads in all.

Drill a panel as in sketch "A." For binding posts I used machine screws with battery terminals. For switch taps I used machine screws. The switches cost ten cents each at Kresge's (used to be 40 cents. Nine rahs for Kresge). The detector is merely a coiled spring bolted at one end—figure "C." Fasten the tapped coil to the base with two copper strips bent as in "D." Now connect as per diagram. The switch with the detector and phones in series with it will be the secondary.

Tap P_1 is connected with a jumper to tap S_1, then to last tap on coil. Tap P_2 is connected with a jumper to tap S_2, then to 2nd last tap on coil, etc.

My aerial is composed of eight strands of No. 14 wire, 23 feet long, connected in cage type, triangular shape, and installed in the gable of our house as shown in the sketch. All wires are shorted at one end with a rat tail lead-in on opposite end. This aerial and set have given very good results on local concerts. In cold weather it will do much better. The set is grounded to a water pipe in basement.



Simple and ingenious crystal tuner and detector with triangular cage-type antenna strung inside the gable roof of the house

Indoor Antenna With Crystal Set

By Andre L. Merle

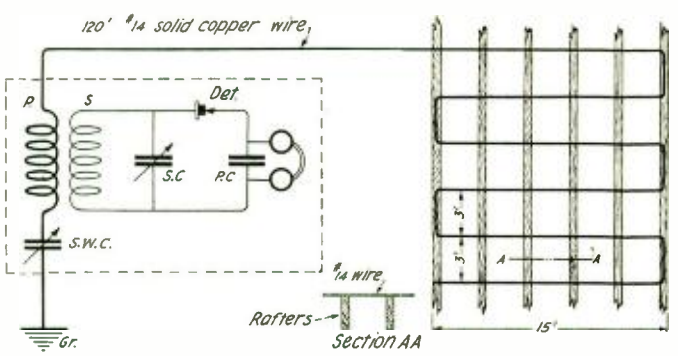
THIRD PRIZE $3.00

WITH the set which I am about to describe, using an indoor antenna fastened to the rafters in the attic, I have been able to hear the concerts from WJZ, WNO, WOR, WWZ, WEAM, 2XB, 2XJ, and a few Second District phone sets within ten miles. I have also copied most of the Second District stations which use I.C.W. and sparks and also ship stations at sea, numerous land stations, WCG, WNY, WSE, and naval stations. With additional inductance in the primary I copy NAA'S press and NAH'S weather.

The antenna is No. 14 solid copper wire about 120 feet long using a water pipe for ground.

My crystal set consists of an inductively coupled thirty-five turn honeycomb coil; a short wave condenser .001 mfd., a secondary condenser .001 mfd.; crystal detector—dust proof type—and a small fixed condenser .0005 mfd., with standard pair of 2000 ohm phones shunted around it.

The short wave condenser and secondary condenser are very critical. This set is used about thirty miles from New York City.



How the antenna was stretched over the rafters

Duplex Radio Transmitting System

(*Continued from page 68*)

waves. Upon closing the keys, the devices G and J, for example, are simultaneously operated, changing the value of the tuning inductances of the radiating circuit, and hence the frequency of the radiated wave, and also changing one of the constants of the impedance circuit, which in the case shown is the capacity. The closing of the other key has the same effect upon the radiating circuit, and the other impedance circuit. It is essential to the successful operation of this system that both the "normal" and the "signaling" waves shall be selected of such a frequency as to satisfy the condition that the impedance of each impedance circuit shall be negligible to the oscillating currents of the radiating circuit of which it is a part.

Efficient Aerial Insulation

By G. N. Garrison

PARAPHRASING an old saying, an equal truth might be stated that a radio installation, be it either for transmission or reception, is no more efficient than its weakest point.

It has been the writer's experience that nine times out of every ten, that weak point can be traced directly to the manner in which the aerial has been insulated.

When it is considered that in reception the amount of incoming energy, even from nearby powerful stations, that strikes the aerial is so small as to be almost infinitesimal the great importance of a well-insulated aerial cannot be over stated.

The aerial which contains the greatest number of insulators is not of necessity the best insulated aerial. In fact this is very seldom the case.

In reception it is essential that the little energy in the form of electro-magnetic waves that strike the aerial, alternate between aerial and ground through the primary of the receiving transformer—if one is used—and not dissipate itself to ground through the faulty or insufficient insulation of the aerial system.

How often one sees on our city housetops or other convenient places multi-wire aerials whose owners intended that they be very well insulated. In consequence we find that each individual wire of these aerials has one or more insulators at either end which is supposed to insulate these wires from their supporting cross-pieces and from the earth. In reality they do nothing of the kind; or at least not as efficiently as their builders desired for one of radio's fundamental laws has here to be contended with.

Arrangement of Insulators

An insulator of whatever kind is nothing more or less than a non-inductive resistance and it is well known that when two or more resistances are connected in series their total resistance is equal to the sum of the resistance of each separate resistance; or,

Total resistance=R and R′ and R″ and R‴ etc.

However, when we have a number of insulators or resistances connected in parallel, an entirely different rule applies, for then the total resistance is equal to the reciprocal of the sum of the reciprocals of each resistance: or,

$$\text{Total Resistance} = \frac{1}{\frac{1}{R} \text{ and } \frac{1}{R'} \text{ and } \frac{1}{R''} \text{ and } \frac{1}{R'''} \text{ etc.}}$$

Now with an aerial constructed as above mentioned we have a number of resistances all connected in parallel, and the total resistance of such an aerial system, in consequence, must be less than the resistance of any one of its insulators.

Since one of the factors entering into the efficiency of an aerial is its insulation it is self-evident that our insulators must not be in parallel. This fact is all the more pronounced should one of the insulators have a leakage slight or otherwise, which due to surface leakage it always does have during and immediately following a rain storm; for then the total insulation of our aerial would be less than the resistance of the leaky insulator.

Obviously then the most efficient aerial would be one whose insulators were all connected in series and the most efficient way to accomplish this is shown in the accompanying diagram.

Perhaps one of the strongest arguments in favor of a "series-insulated" aerial is the fact that Uncle Sam uses such a system on all his installations, and Uncle Sam has the reputation of knowing what he is doing.

A Safety Match Box Radio Receiving Set

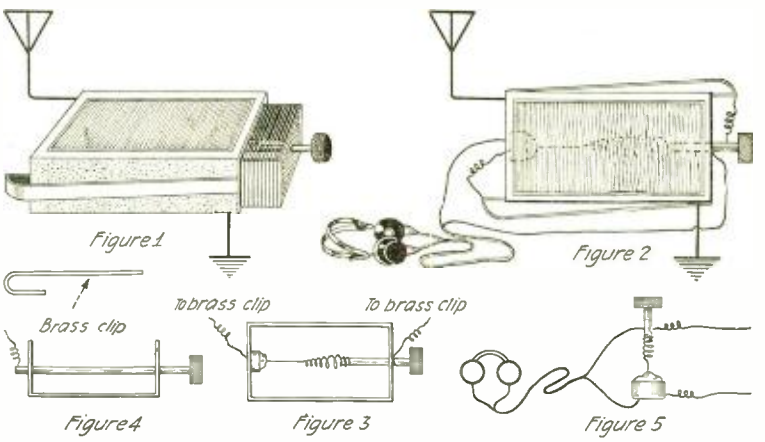
By Harold Daum

A RADIO set can be made in a safety match box which will receive from a radius of twelve miles under ideal weather conditions.

The match box is first boiled in paraffin to eliminate capacity and then wound with enough turns of No. 26 S.C.C. wire to fill the entire box. Leave plenty of wire on each end to make connections to aerial and the ground.

Each narrow side of the box is sandpapered to make a good contact with two brass clips that are fastened to the inner box in such a manner that when the box is moved the clips move and consequently the coil is tuned.

The detector is fastened to one inside end of the box as shown in figure 3. It rests on a bearing which is made as shown in figure 4. The bearing is threaded and when it is desired to make a change in the adjustment of the crystal the knob is turned. A glance at figure 5 shows how the detector knob is made. This unique construction, using a bolt, makes it possible to either slide the box and tune in, or turn the knob and adjust the crystal.



Constructional details of safety match box radio set

The antenna wire is connected to one end of the coil and the other end of the coil to the ground. One brass clip is connected to the end of the crystal cup, the other brass clip is attached to the cat whisker.

Modulation and Distortion in Radiophone Sets

By Albert F. Murray

DON'T ask "How Is My Modulation," but say instead "How Is the Quality"? The former question is asked by amateur operators of radiophones nearly as often as the historic "How is my spark" query. The answers often vary from "Poor" or "Fair" to "Fine" or "Perfect." Of course, what the transmitting operator really means is, "How is the quality"? for it is the quality and not the modulation upon which the ordinary receiving operator is able to report. Let us see what is meant by modulation and quality when applied to the radio telephone transmitter.

Modulation, in a broad sense, means the moulding of the carrier-wave by the voice frequencies. The degree of modulation can be expressed in percentage and is usually taken as the ratio of the amplitude of the audio frequency to that of the radio frequency, or, referring to figure 1, as the ratio B|A.

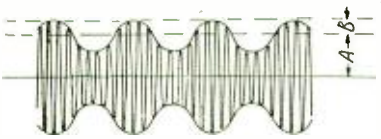


Figure 1—Per cent modulation is B A × 100

Complete, or 100 per cent. modulation would mean that A—B; this is seldom obtained in practice. 60 per cent. to 80 per cent. being considered a very good degree of modulation.

The response at the receiving station is proportional to the product of AB. (A "square-law" detector is assumed, that is, a crystal or non-oscillating vacuum tube.)

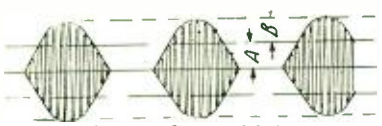


Figure 2—Over modulation

When the amplitude of the voice frequency exceeds that of the carrier-wave, over-modulation is said to occur. As a result, the antenna current remains at zero for an appreciable length of time between audio-frequency groups, as shown in figure 2.

Evidently distortion is present in the transmitted wave and it can be detected by listening in a wavemeter receiver, or, in this one case, the report from a receiving operator as to the "modulation" will be of aid, provided he is able to identify over-modulation by the resulting poor quality of speech. To check up this fault, vary the distance between microphone and speaker; if the speech quality improves with an increase in distance, it is probable the radiated wave is being over-modulated.

Under-modulation, is the reverse of over-modulation and therefore is the condition that exists when the amplitude of the signaling wave is less than the amplitude of the carrier-wave. The speech, as far as degree of modulation is concerned, will be clear and of good quality, but will diminish in volume—loudness—as the per centage of modulation decreases.

The most desirable modulation, from the viewpoint of both quality and signal strength, is obtained when the carrier-wave is modulated equally upward and downward and by a signal wave whose amplitude is such as to vary the radio-frequency from zero to twice its non-signaling value, as is shown in figure 3.

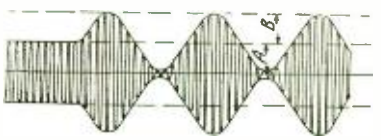


Figure 3—Equal upward and downward modulation A = B

Modulation upward is not always possible and the modulated wave may have the form of that in figure 4, where the oscillator output cannot increase to the desired value; due, for instance, to lack of filament emission. The distortion of such a wave is quite marked.

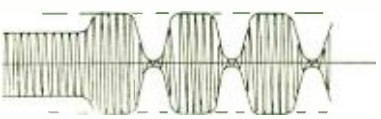


Figure 4—Incomplete modulation due to insufficient filament emission

Downward modulation can only be expected from an oscillator which is adjusted for maximum output and then grid modulated. This is also true of absorption modulating methods. It does not necessarily mean poor quality, but it does mean that, if two tubes are used in parallel and adjusted for maximum output as oscillators and their output modulated by grid or absorption methods, the received signal strength for complete modulation will be about 50 per cent. of that obtained when the two tubes are used under the same conditions as oscillator-modulator, in a plate modulating circuit. This is made evident by comparing the areas per audio cycle under the two curves in figure 5. In practice, the ratio of effectiveness is usually less than 50 per cent. because, with some tubes, the non-signaling output for grid modulation can be increased above that shown; also in the case of plate modulation, results are sometimes limited by heating of the modulator tube.

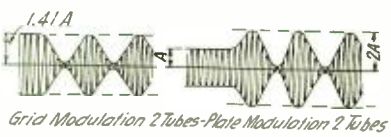


Figure 5

Quality, as applied to voice transmission, has to do with clearness of speech. Good quality means absence of distortion, and distortion can be completely eliminated only when the complicated speech wave impinging upon the microphone at the transmitter, is faithfully reproduced at the distant receiver so that; firstly, the amplitude of the received wave is proportioned to that of the original; secondly, the various voice frequencies are retarded equally. There must be a linear relation between response and excitation.

In tracing the voice frequencies from the speaker's lips to the aerial system, we come first to the microphone Dr. Goldsmith in his book on "Radio Telephony" states that the microphone is "a fairly prolific source of speech distortion, or rather speech destruction." But since, from necessity, we must use microphones, let us pick up a good one. A Western Electric Company expert advised the author that a W. E. Co., Type 323W microphone has an output of about 20 per cent. more energy than other types. However for special uses, a low resistance microphone such as W. E. Co. Type 349BW or Type 318W may give

better results, depending upon the impedance of the load into which it works. One way to eliminate microphone distortion is to talk into a telephone receiver and add a few voice amplifiers to obtain the necessary power, or a condenser transmitter might be used.

Most of the modulation transformers on the market are designed so that distortion arising from saturation of the iron core and from other effects is slight. For best results, be sure that your microphone A. C. resistance approximates your transformer primary impedance at, say 800 cycles, and that the secondary of the transformer is wound for the type of tube that it is to control. Sometimes connecting a ½ to 1 megohm resistance across the secondary will improve the quality, as it causes the device to operate more uniformly through the voice frequency range,

A brief comparison of the relative quality obtainable from absorption, grid and plate modulation methods may be of interest. Here the thing to keep in mind is that the response should be proportional to the excitation.

(a) Absorption modulation—If the antenna resistance is varied in direct proportion to the amplitude of the sound waves, good quality should result. In spite of what was said above about the microphone, fairly good articulation results from using a microphone in the ground lead or in a loop coupled to the antenna inductance.

Control curves of a Radio Corporation magnetic modulator, taken by the writer, show that this absorption device is quite critical as to mean control current and that changing the working wavelength on either side of 200 meters produces marked changes in the results. Under some conditions, the control curves are approximately straight lines, but under others they are not. These curves and measurements may be published later.

(b) Grid Modulation—A typical grid control curve is shown in figure 6.

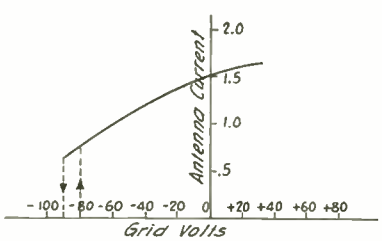


Figure 6—Grid control

The lower part of the curve, as far as it goes, is nearly a straight line, but at the upper end it bends over. It will be seen that the oscillations cease and the antenna current falls to zero when the grid is pushed sufficiently to the negative voltage. Oscillations do not commence until the control voltage is placed at some value less negative than that at which oscillations cease. Evidently considerable distortion would result if the modulating voltage operated over a greater range than that covered by the full line curve. By careful adjustment of the variables of the oscillator, it is conceded by authorities on modulation that the antenna current can be varied from zero to a maximum value along a more or less straight line, but such an adjustment will give neither high efficiency nor much output.

(c) Plate Modulation — Compare with the preceding curve that of figure 7 which is the plate control curve of an oscillator—in whose grid-circuit is a condenser and leak resistance.

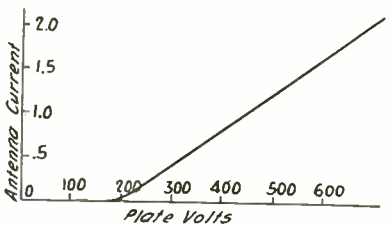


Figure 7—Plate control

For plate voltages exceeding 200, we see this curve is a straight line, and therefore if the plate voltage is not reduced below 200, good quality should result when using this method of modulation.

When amplifying tubes are used their grids should be biased by a battery so that the tubes operate over the straight portion of their characteristic curves. The input voltage should not be so great as to cause the plate current to cut-off at the bottom and reach saturation value at the top, as in figure 8.

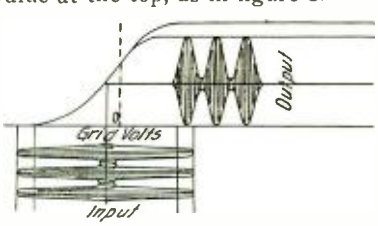


Figure 8—Amplifier distortion

It is to be noted that Mr. A. S. Blatterman, in "Comparison of Modulation Methods in Radio Telephony," finds that more modulated energy is radiated when the impressed voltage on the amplifier is such as to cause saturation, as in figure 8.

When using a low decrement antenna for radio telephony, serious distortion may result from the "fly wheel" action which tends to round off all the sharp corners of the voice wave, so necessary for good speech. Some type of antenna which has a fairly high resistance—a large part of which should be radiation resistance— is desired. This matter becomes of greater importance as the wavelength is increased, because the tone efficiency decreases, due to the overlapping of wave trains whose group frequency is high.

These are some, by no means all, of the points which should be looked into if speech of good quality is to be radiated from your antenna. I would advise the amateur to take control curves of his various controlling devices and see if they approximate straight lines. The static characteristics thus obtained do not necessarily indicate the conditions that obtain when the radio set is in operation, but they will be a guide in making adjustments that may improve the quality of speech from your radiophone. At those transmitting stations where the hum from rectified A. C. makes speech far from pleasant to the receiving operator, the intelligent use of Campbell filters, or very large capacities, will certainly decrease this nuisance.

Since this article deals primarily with the transmitter, attention will be called, only in a brief way, to conditions causing distortion in the receiving apparatus.

(a) Low decrement in either antenna or secondary circuits will cause distortion because of the previously mentioned "fly-wheel" effect. Higher voice will be suppressed because the narrow resonance curve of the receiver will not include these side-frequencies—see figure 9.

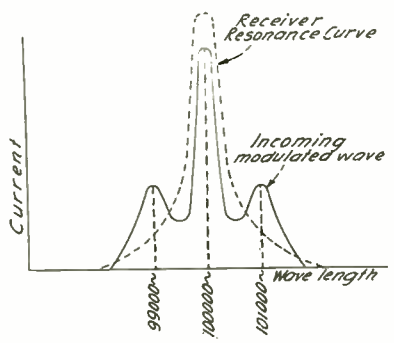


Figure 9—Distortion of modulated wave due to low receiver decrement

(b) Regeneration, of course, will reduce the decrement of say, the secondary circuit to almost zero, and every operator knows that too much

regeneration spoils the quality although it greatly increases the volume. While reception by the zero-beat, or homodyne method, will give understandable speech when the incoming signal is so faint that it cannot be heard otherwise, the writer believes with his limited experience, that this method requires too careful adjustment on short wavelengths to be widely used at the present time.

(c) Inter-tube audio transformers when, not properly designed—and there are such on the market—can render unintelligible, incoming speech which is really of good quality. The same factors mentioned in regards to the modulation transformers apply here and a high resistance shunt across the transformer secondary will help although it will greatly decrease the degree of amplification.

(d) The amplifying tubes should, of course, have their grids so biased that they operate on the straight portion of their characteristic curve.

(c) There is always some distortion present in electro-magnetic reproducers such as telephone receivers and loud speakers which might be eliminated by condenser, hot wire (or hot air) receivers. When the signal frequency coincides with the natural frequency of the diaphragm of a receiver, or loud speaker, the response is out of all proportion to that obtained with the same signal strength of a slightly different frequency; thus distortion obviously arises.

To receiving operators let me say in conclusion: Do not always blame poor quality on the transmitting station, because the trouble may exist in the receiving set.

Antenna Resistance

By Lester P. Burt

SINCE there seems to be widespread misconceptions regarding the meaning of antenna resistance and radiation resistance, perhaps it will not be out of place to call the amateurs' attention to these terms. Antenna resistance is rather an artificial term coined to give in absolute terms a measure of an elusive quantity that is of vital importance.

The entire term "antenna resistance" represents the fictitious resistance which could be inserted in a circuit of the same oscillation constant as the antenna to absorb the same amount of power as used up by the antenna. The substitution method of measuring antenna resistance is a literal translation of this definition. Since it is necessary to have a wavemeter and an accurate standard of resistance to take a curve of antenna resistance, some amateurs may feel it is beyond them. But if they are interested in efficient sending, they will find it well worth while to borrow the instruments from a radio club or high school or even to buy them. It introduces the amateur to the how and why of things instead of the blind cut-and-try methods by which most experimenters do a great deal of work and find out very little of real value and improvement to the art.

The diagram gives the general set-up of the apparatus to take an antenna resistance run on an antenna. It will be noted that a wavemeter of wide range is needed and if several coils are used to cover the range it will be necessary to make sure that there are no "jumps" in the curve due to inaccurate calibration.

In figure 1, C_3 is used for waves below the fundamental after which it is taken out as indicated by the dotted line. L_1 must be finely variable. If necessary, two or more load coils may be used in series for the last points on long waves. Resistance R must be calibrated accurately and need not go above 20 ohms for even a very poor antenna. If possible it should read to tenths of an ohm. L_2 is a temporary coil wound about the wave meter coil. or coupled to it, but not too tightly. Probably four or five turns and rather tight coupling will transfer the most energy. By varying L_1 and watching the galvanometer, the outfit can be checked to see if coupling is giving two resonance peaks — if so, loosen it. The galvanometer may be anything that will register a weak radio current. C_1 and C_3 may be any variables and the galvanometer scale is not important as the circuit is only adjusted to give the same readings and the current in milliamperes is not required. Condenser C_2 across the buzzer coils should be large, say 1 mfd. or more to prevent sparking and resultant unsteadiness in the high frequency current. R_1 is only to smooth buzzer operation and can be omitted perhaps and the contacts carefully adjusted instead.

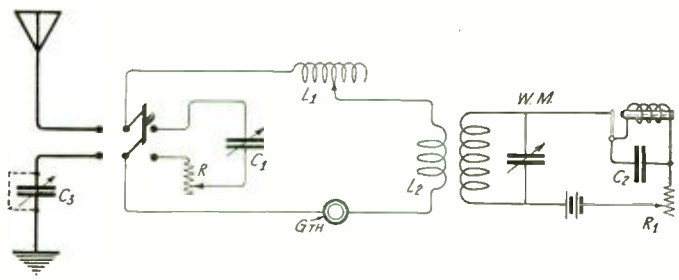


Figure 1. Diagram for testing antenna resistance

Strictly a small inductance should be in series with C_1 equal to the antenna inductance, but is so small results will hardly show the difference without it. The wave meter is set to any wave desired and buzzer started. Switch is thrown on antenna and L_1 varied until galvanometer reads a maximum — antenna then being in resonance. Switch is thrown over to "dummy" circuit and C_1 varied until the dummy circuit is in resonance. If R is all out, the galvanometer deflection will be large and it may be necessary to add resistance to keep the needle on the scale. When the dummy circuit is in tune add resistance at R until meter reading is the same as for real antenna. Switch back to real antenna again to be sure buzzer current has not changed. Value of R is the antenna resistance and is plotted against wave length.

Above the fundamental with C_3 cut out, when C_1 is adjusted, it will not have to be disturbed and only L_1 will be varied. With series condenser C_3 in, C_1 must be adjusted separately for each reading as in this case L_1 will be out of circuit and capacity of antenna circuit is varied by C_3. The point taken with C_3 and L_1 out of circuit comes just above the fundamental and is close to the point at which the antenna is used for sending, for L_1 is nearly the inductance of an oscillation transformer. The real purpose of this article is, however, more to call attention to the interpretation of these

curves than the manner of taking them, since the former seems to have been generally neglected. Three terms make up antenna resistance:

(1) Radiation resistance, representing the component of power radiated into space.

(2) Ohmic—or heating—resistance due to the conductor or conducting surfaces, and eddy currents and skin effect in same.

(3) Dielectric absorption resistance which dissipates power in the dielectric field about the antenna.

It is evident that the experimental curve of an antenna represents the sum of these losses at every wavelength. Radiation resistance, for a given antenna, is known to vary inversely as the wavelength. This is for an isolated antenna away from other absorping circuits, such as other antennae, etc. The shape of the curve can be understood without going into curve analysis for its equation is $R_{rad}=\frac{K}{\lambda^2}$ and it is clear that doubling the wavelength will reduce R_{rad} to ¼ of its former value, etc. Such a curve rises steeply at short waves and drops to extremely low values at waves several times the antenna fundamental.

Were skin effect entirely absent, the conductor heating losses would be constant at all frequencies. With stranded non-magnetic conductors, the skin effect variation over a wide range of wavelengths is very small. The curve will bend down slightly since skin effect is most noticeable at very high frequency, or short wavelengths.

Dielectric absorption is found to vary inversely as frequency or directly as wavelength. This on a curve sheet shows as a straight line through the origin. The energy used up in the dielectric probably appears as heat originating in the imperfect dielectric material. Steinmetz, however, doubts if this action is similar to magnetic hysteresis and suggests that a part of the energy may be expended in mechanical or molecular changes in the dielectric. This may explain dielectric fatigue by which an insulator finally breaks down similar to mechanical fatigue of metals under live loads. However, it is an experimental fact that the loss plots out exactly as a straight line for power condensers and is quite noticeable for glass of poor grades. This loss must not be confused with dynamic leakage through a path of high resistance in the dielectric.

Figure 2 shows the component curves and the total obtained by adding the ordinates. Given an experimental curve it is easy to find the relative values of the three components for that antenna.

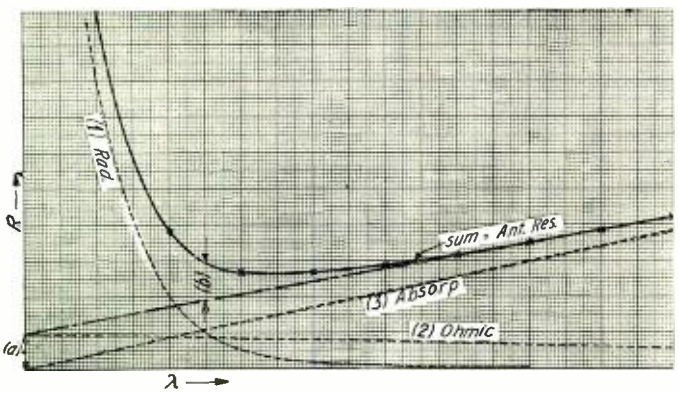


Figure 2. Component curves in measuring antenna resistance

Be sure the end of the experimental curve includes at least three points exactly on a straight line. Produce this line back to cut the vertical axis. The steepness of this line shows, in a relative way, how serious dielectric absorption is on the antenna. Ship antennae show very slight rises since there no bad dielectrics such as trees and masonry about. Most ships have so much iron and steel framework that is "grounded" that the wooden parts cannot affect the high intensity field much, for they are not in it. But antennae on the roofs of buildings and in trees, even in the winter time, show a great rise which is of course undesirable. The intercept (a), on the vertical axis represents roughly the ohmic resistance of the antenna. The difference (b) between the straight line produced and the actual curve taken is the real radiation resistance. This method assumes that the curve is continued until the radiation resistance is too small to show on the scale to which the curve is plotted.

By trying different grounds and wiring the amateur can greatly improve the true radiation by reducing the wasteful losses of his limited power. This is the part that the hot wire ammeter does not tell you anything about and by watching this you may cover more distance than the fellow who wrongly thinks he is getting several times your radiation but is really sending it into a high resistance ground. Figure 3 shows how conditions can be judged from the general shape of the curves without much measurement. (A) is high absorption and (B) is a high resistance ground or joint. Two or three cases have been noticed where the straight part of the curve produced gave a negative intercept, which of course should not be. In all cases these were either antennae on buildings with long and crooked lead-ins or were freak antennae with parts of different characteristics so the variation was more complicated than for the standard flat top construction.

Commercial companies have adopted the multiple tuned antenna on long waves. The amateur anxious to increase his range could well do the same and in view of his wavelength, the cost would not be extreme if he had space. By this the wasteful resistances of the antennae are put in parallel but radiation occurs from both so the system operates at higher efficiency because the wasted energy is reduced with the same antenna input. This will involve extreme care in tuning or results will be very poor and also some outlay for good-sized conductors. An outdoor tuning inductance for 200 meters should not be a great problem and only two antenna supports separated twice the distance used for the average 200 meter antenna are required, for leads can be dropped from the middle to the inductance. In this way the antenna efficiency can be brought up to values undreamed of a short time ago and no one can say what the distance limits are for even 1 KW.

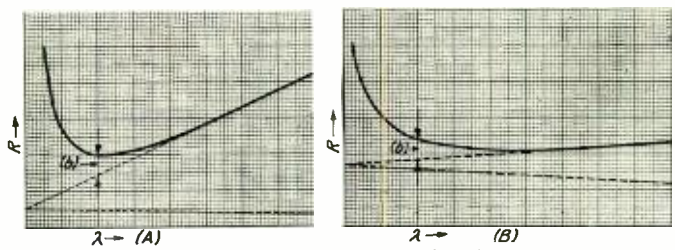


Figure 3. Antenna curves of typical shapes

A Loud-Speaker on 60-Cycle A.C.

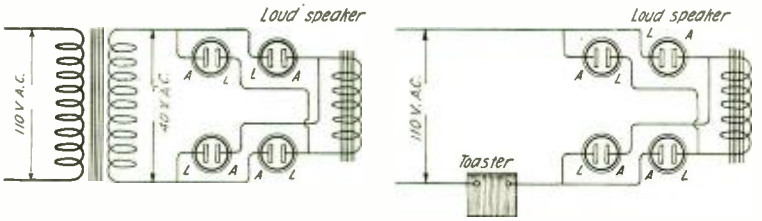
By James C. Ryder

THERE is no denying the fact that the loud-speaker is a boon to the radio enthusiast. It has converted many an unhappy radio bug whose wife has become a radio widow to a smiling, genial person who can invite the neighbors in to enjoy the concerts and lectures in a group while he sits proudly by turning a knob now and then with a knowing air. But there is also no denying the fact that the loud-speaker puts an additional load on the storage battery which runs down all too soon with a three tube set, this load eventually being transferred to the aforesaid bug, who trundles the battery to the nearest garage for another charge.

The writer has been successful in making the loud-speaker independent of the storage battery without sacrificing quality a bit and will describe the method for the benefit of other enthusiasts who are not fortunate enough to possess a battery charger. We have 110-volt A.C. power in our apartment. This of course cannot be used even through a suitable resistance on the loud-speaker on account of the 60-cycle hum which would drown out everything else. However, it is entirely possible to rectify this power by means of the lead-aluminum-borax rectifier so often described in this magazine.

The first requirement is four one-quart Mason jars. In each jar should be placed two plates, one of sheet lead and the other of sheet aluminum. They should be approximately 1½x7x1⅛ inches in size and they should be supported so that the lower ends are at least ½ inch from the bottom of the jars. A convenient way to support the plates is to make four blocks of wood 1 inch square and 4 inches long. These blocks should be well shellacked and then allowed to dry. When they are thoroughly dry a lead plate is fastened to one side with a screw and an aluminum plate to the other side. The blocks serve as spacers between the plates and being longer than the diameter of the openings of the jars will rest on the edges and hold the plates off the bottoms. A binding post should be attached to the upper end of each plate so that the proper connections may be made.

The jars should now be filled about two-thirds full of a saturated solution of Mule Team borax. Having due respect for the floors of our rooms we placed the four jars in a glass tray used in photographic work so that any spill was prevented from reaching the floor. The four cells were connected up as shown in the accompanying sketch. This method of connection takes advantage of both sides of the cycle.



Circuit diagrams of the rectifiers for 60-cycle A.C.

The family toaster was now mustered into service as a resistance. It was hooked up in series with the rectifier as shown and the whole outfit connected to a lamp socket. The field of the loud-speaker was hooked in beyond the rectifiers. The toaster proved to be of just the right resistance to bring the current down to the right amount. An electric flat iron will serve nearly as well. It would seem that a filter circuit would be necessary to smooth out the variations in the power. However, after trying out several such circuits and finding that the apparatus worked just as well without them we came to the conclusion that the field of the loud-speaker acted as a choke coil itself.

It soon became evident that a lot of energy was wasted in the toaster in the form of heat. The next step, therefore, was to build a small transformer. This transformer had a laminated core of sheet iron 1½ inches square and 7x9 inches outside dimensions. The primary consisted of 380 turns of No. 16 cotton covered magnet wire which was wound on a form and slipped over one leg of the core. The secondary consisted of 152 turns of the same size wire. This ratio gives a secondary voltage of 40 which seems to be just about right for the rectifier. Lower voltages do not seem to work well.

The rectifier and loud-speaker was hooked up to the secondary of the transformer as shown and the primary connected directly to the lighting socket. Do not be alarmed if the loud-speaker is somewhat noisy at first. It takes several hours for the plates to form properly. Patience is all that is necessary at this stage. It may be necessary to replace the aluminum plates after several months and it will be necessary to add water to the jars from time to time. Otherwise the apparatus will give no trouble whatever. The writer has used a rectifier of this type for several months now and finds it very satisfactory.

Lightning Protection

By Howard S. Pyle

IN CERTAIN sections of the country, during the period when thunder storms are common, many radio enthusiasts appear to have fears that their antenna system will attract lightning, and cause property and possibly personal damage. Such is not the case; in fact, entirely the opposite is true.

A custom which was common not so many years ago was the installation of lightning rods on homes, barns, etc., in the belief that, should lightning strike the building so protected, it would "run down" the lightning rod, directly into the ground. When it is considered that the force of lightning is so great as to shatter large trees, and even entire buildings, it will be realized that a mere metallic rod would hardly pass such monstrous currents to the ground without damage. Investigation has proved that where the protective value of lightning rods is concerned, it is not with the passing of the actual lightning bolt to ground, but acts in an entirely different way.

Lightning will be attracted to the vicinity in which the atmosphere is most heavily charged with electricity. Naturally, then, if the atmosphere surrounding a building contains considerable atmospheric electricity, it offers a better point for the lightning bolt to free its energy by a discharge to ground. Again, should one building within the charged zone be tall, and the other short, almost invariably the taller building will receive the effects of the lightning discharge. But—if we provide some means of draining the atmospheric electricity from the atmosphere, we render the surrounding atmosphere more immune to the reception of a lightning discharge, due to its greater insulating qualities, and consequent more difficult path to the ground for the lightning discharge, which will then seek an easier path. This is the way in which the lightning rod serves; it provides a leakage path to ground for the atmospheric electricity, and serves to keep the air free from such electrical activity in its immediate locality.

Lightning rods are generally constructed of iron, which has fifty times the resistance of copper. In other words, were they constructed of copper, with copper connection rod to the earth, they would be fifty times more efficient. They are generally but a few feet above the roof of the building.

Now compare the average radio antenna. To serve its purpose of radio reception satisfactorily, it must be constructed of copper or phosphor bronze, both of far greater conductivity than iron. It must also be raised ten or more feet above the building or other objects which it crosses. In other words, it should be the highest object within several hundred feet when possible. Isn't it reasonable to assume then, that it would serve a great deal more efficiently than a lightning rod in draining the atmosphere of its electrical activity? It does, as has been proven, and a well constructed antenna which is properly grounded during a thunderstorm is a far greater lightning protection to the property in its immediate neighborhood than any number of lightning rods as usually installed.

NEW APPLIANCES AND DEVICES

New Non-Magnetic Filament Rheostat

THE new filament rheostat, manufactured by the Central Radio Laboratories, 303 16th St., Milwaukee, differs from other rheostats designed for radio equipment in that no magnetic material is used in its construction.

Genuine Thermoplax, of extremely high insulating and heat resisting properties, is used for the base. The resistor is made of a special non-corroding alloy, which always presents a polished surface. Its ohmic value is calculated to give a maximum sensitiveness within the required range and its current capacity is ample for the control of any receiving tube, without heating. Each turn of the resistor is firmly anchored so that there is no possibility of noisy or scratchy operation.

The Thermoplax rheostat

The control shoe is broad and flat with its edges turned up to insure smooth, quiet, step-by-step action without stubbing. The hexagon binding posts are locked in place so that they cannot work loose when connections are made. All metal parts are nickeled.

The operating knob is Thermoplax like the base. Its sides are gracefully curved and the top polished. The nickeled pointer indicates the amount of resistance in the circuit. An open position on the high resistance end makes a filament control switch unnecessary.

The new rheostat, known as CRL No. 100, can be mounted easily on any panel, the thickness of which does not exceed ½ inch. Its overall diameter is only 2⅛ inches—an important feature because of the limited space usually available.

Merger of Insulate Manufacturers

THE situation in the insulation industry, which has been upset for some time by lawsuits for infringement of the patents covering Bakelite, recently was settled legally by a court decision upholding those patents, and still more recently a business settlement was reached merging the heretofore contesting interests. The General Bakelite Co., whose patent position has been confirmed, has formed a new corporation, the Bakelite Corporation, which combines not only the original Bakelite company, but also the Condensite Company of America and the Redmanol Chemical Products Corporation. These concerns will continue to make and market their products separately, which in many respects possess individual characteristics, though each makes use of the same basic process in manufacture. The new Bakelite Corporation is headed by Dr. L. H. Baekeland.

An Unusual Radio Exhibit

THE Radio Electric Company of Pittsburgh, pioneers in the manufacture and distribution of radio apparatus, shipped an unusual radio display to The Emporium, San Francisco's largest department store, for exhibition in the Shriner's Radio Show early in June. The general direction of this show, held in honor of the Shriner's convention, was in the hands of Mr. Charles S. Mauzy, of The Emporium. A very entertaining program was given daily, which consisted of motion pictures on the action of various radio phenomena, radiophone concerts, orchestra music, aesthetic and fancy dancing.

"Davistone" Horns

HARRY B. DAVIS, of Chicago, has recently perfected a composition known as "Davistone," which, it is stated, is free from vibration and can be used for making phonograph and radio loud speaker horns which do not cause distortion of received speech or music.

A company has been organized to market Davistone for radio loud speakers, phonograph tone chambers and for the many other uses to which it can be put. Davistone horns will be sold in attractive cabinets or mounted on metal bases. They will come equipped with or without receivers. Davistone horns will also be furnished unmounted to firms who desire to assemble their product with these horns at their factory.

Jenkins Vernier Rheostat

J. S. JENKINS, of Chicago, has brought out a Vernier rheostat the principle of which is a resistance wire wound around a solid horn fibre drum in which a screw thread has been cut. The wire lies in the bottom of the cut. Contact is made by a pointer attached to the shaft of the rheostat and, by turning to right or left, the resistance can be lessened or increased as desired, with infinitely small resistance variations.

One of the most attractive features of the rheostat is the fact that instant contact can be made by means of a switch connection which is part of the rheostat. By simply pushing the knob the circuit can be broken, and when the filament current is again required, a pull on the knob connects the circuit and the filament is heated at the same resistance as when the circuit was disconnected.

Westinghouse Type "CX" Indicating Instruments

TO satisfy a demand for high grade small size indicating instruments the Westinghouse Electric & Manufacturing Company has developed and is now producing the new Type "CX" ammeters and voltmeters.

This completes the new line of direct current instruments manufactured by the above company. The line now consists of types BX, CX, DX and SX, having overall dimensions of 2 9/16, 3½, 4⅜ and 7 7/16 inches respectively. All instruments of this X line utilize the same design construction differing only in linear dimensions.

An external zero adjuster on each instrument enables the operator to reset zero position of pointer if it is displaced due to transportation or shock. All parts are mounted

The Westinghouse Type CX Voltmeter

on a moulded sub-base, assuring sufficient insulation. The instrument is fastened to the panel by means of three machine screws furnished with the instrument. The standard finish is dull black marine.

The ammeters are self contained for currents up to 30 amperes, but can be used with external shunts for higher currents. The voltmeters are self contained up to 50 volts, but can be supplied for higher voltage with external resistance. The voltmeters have a resistance of 65 ohms per volt in series with the winding. This resistance has a zero temperature co-efficient and can be adjusted to obtain correct calibration.

Atwater-Kent Radio Products

THE Atwater Kent Manufacturing Company, of Germantown, Philadelphia, are producing variometers, variocouplers, and audio frequency transformers.

The high repute of this company has been used to good advantage in attaching to the names of the instruments their own name. The circular bases of the variometers and the variocouplers are provided for table mounting, but may easily be removed when the instruments are to be mounted on a panel. The audio frequency transformer has been developed to eliminate distortion of signals. Silent operation of the instrument has also been insured by a metal case which incloses as well as shields the transformer.

The Monthly Service Bulletin of the

NATIONAL AMATEUR WIRELESS ASSOCIATION

Guglielmo Marconi, *President* | J. Andrew White, *Acting President* | H. L. Welker, *Secretary*

Founded to promote the best interest of radio communication among wireless amateurs in America

IN a recent order the Naval Department of Canada authorized the use of the 200-meter wave length by amateur radio stations for continuous wave or radio-telephone transmission. Transmission by spark stations is to be done on wave lengths, according to the provisions of the licenses of the individual stations, some of which, particularly in proximity to commercial and government stations, are restricted to wave lengths considerably below 200 meters.

△ △

SHERMAN BROSE has moved from Mason City, Iowa, to 100 East Benton St., Clear Lake, Iowa, and his radio station, call letters, 9DJM, is now located and in operation at the latter address.

△ △

AN appeal for a radio receiving set has been issued by the National Sanatorium of the Knights of Columbus, in Johnson City, Tenn. The hospital cares for a large number of bed-ridden veterans of the World War, whose only contact with the outside world is through visitors and, in the cases of those who can see, newspapers. A radiophone would be a great blessing to these men, as it has proved in other hospitals for veterans, which have been supplied by local donors.

△ △

MAYOR CALDWELL of Seattle, Wash., proclaimed the week of June 5th to 10th as "Radio Week," when a radio show was put on by the Seattle Radio Association and Totem Radio Club, at Dreamland Pavilion, 7th and Union Streets, in this city.

The Seattle Radio Association was organized for the purpose of promoting the cause of radio in all useful channels, and its sphere of influence will be bounded by Oregon, Idaho and British Columbia. It is a non-profit making organization.

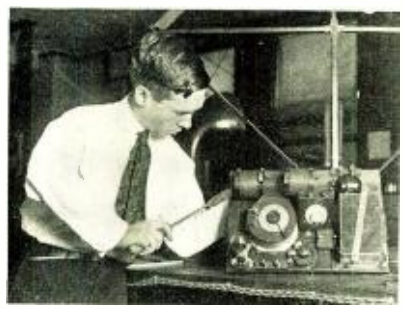
△ △

THE National Radio Club has been organized at Pittsburgh, Pa. The intentions of its organizers are to weld the nation's army of radio enthusiasts into one compact body.

The club's fundamental purposes are to promote and finance the installation of radio equipment in hospitals; keep all members informed regarding developments, improvements and news of interest regarding radio; answer, without charge, all technical questions asked by members; receive and file articles written by members for reference; lend the moral support and influence of the club to those agencies that are endeavoring to eliminate the confusion of signals; promote fraternity and good fellowship among members with the aid of a distinctive official button and card of membership.

The organization committee includes Harold B. Coe of New York City, Charles W. Payne of Philadelphia, F. R. McCray of Los Angeles, Otto J. Palm of Cincinnati, R. Gordon Craig, Ray Mansmann and Francis G. Albertson of Pittsburgh, all radio enthusiasts who are sparing no effort to promote the interests of radio transmission.

The National Radio Club has been assured the hearty co-operation of the large manufacturers, but will maintain a strictly neutral attitude in all matters of equipment, and its officers and directors will be selected from ra-



Edward T. Dickey operating a 50-meter transmitter

dio enthusiasts not engaged in making or selling radio apparatus. A nominal membership fee of two dollars will be charged applicants. Interested persons can get in touch with the club by writing to Francis G. Albertson, Secretary, 419 Fulton Bldg., Pittsburgh, Pa.

△ △

THE fame of John Grinan (pre-war 2 P M) has even penetrated to the far corners of Missouri. The Kansas City, Mo., *Star*, recently printed a partial story of his life and described his long and interesting career in radio. If they believe it in Missouri it must be so.

△ △

ALL those interested in radio, attended a meeting of the Fort Worth, Texas, Radio club meeting place 611½ Houston St.

The radio situation, particularly in regard to broadcasters, amateurs, and those with receiving sets was explained and discussed. An efficient receiving set has been installed at club headquarters and half-hour radio concerts given, with the set adjusted to eliminate all possible noises and interference.

About 40 members attended the meeting. Four new members were received, W. E. Branch and G. C. Rulison, technicians, and G. C. Arnoux, all of *The Star-Telegram* radio staff, and Bert Barber of the H. C. Meacham radio department.

B. H. Parker was added to the theory committee of the organization, appointed by President O. R. Garrett.

△ △

THE Portsmouth Radio Association, in a meeting held on June 13 adopted unanimously the by-laws reported by a committee named several weeks before.

A booster committee with S. J. Seckelman as chairman was appointed by the club.

There were several lectures delivered before the meeting, all of them having to do with radio work. Among them, was an address by W. D. Daniels, chief electrician of the U. S. S. *Langley*, who talked on the subject of electrons in connection with wireless work.

It is the intention of the club to have other lectures, all of them dealing with elementary electricity. There are a number of persons interested in wireless work, who are anxious, it was stated, to gain the benefits to be derived from lectures of this sort.

W. J. Rogers was elected assistant secretary of the association in the meeting, and was also placed in charge of the club's publicity program.

△ △

THE Cleveland Radio Association, directors have a celebrated receiving set to keep tab on amateurs who interfere with broadcasting concerts.

△ △

A REGULAR meeting of the Atlanta Radio club was held in the club rooms, on the fifth floor of The Journal building on June 10. F. S. Bernhard, radio engineer of the Western Electric Company, who is directing the installation of The Journal's new broadcasting station, gave an interesting talk on the construction and operation of the new station. He also described broadcasting stations in various parts of the country.

Radio Engineer G. A. Iler, of station WSB, told of his recent visit to Radio Central, Port Jefferson, Long Island, N. Y., the largest radio transmitting station in the world.

It was unanimously voted that the Atlanta Radio Club should co-operate with the radio clubs now being organized by the Junior Chamber of Commerce, the two clubs to preserve their separate identities, but work together for mutual benefit and advancement. Committees have been appointed to work out various details of the plan for co-operation. Harry Dobbs, president of the Atlanta Radio Club, presided at the meeting.

△ △

ABOUT seventy-five members of the Tri-County Radio Club attended the first annual outing of that organization on June 5, at Westhampton, Va., and enjoyed a novel

entertainment program that included radio concerts, tricks by two magicians, refreshments and other features. From 7:30 until 10:30 o'clock the party was a series of one stunt after another, given on the lawn at John B. Swartwout's home.

High amplification beyond the dreams of many members of the club was demonstrated, when the radio concerts passing through the air were picked up and reproduced by a loud-speaker horn so that they could be heard a quarter of a mile away. A standard short-wave regenerative set and two-step amplifier, supplemented by a new three-step power amplifier and loud-talker that is just being placed on the market was used.

Another interesting display was the universal receiver, built by Mr. Swartwout, on which almost any combination can be worked. The set includes a short-wave regenerator, honeycomb coil section for all waves, with two stages of radio frequency, two stages of audio frequency and power amplification.

The outing was so successful that steps probably will be taken at the next meeting of the club to make it a permanent annual event.

△ △

THE Eastern High School Radio club and the science classes were given an unusual treat recently by C. Francis Jenkins, local inventor, who explained how he had successfully sent moving pictures by radio at a recent test of his new invention. The lecture was delivered in the physics lecture room of the school, the genial little Scotchman being introduced by Henry Flury, the livewire instructor of physics and faculty adviser for the Radio club at the Capitol Hill institution. Mr. Jenkins talked in terms that all could understand and intense interest was displayed by the budding radio fans.

The inventor showed how the variation in light would affect the electric resistance of selenium and a corresponding variation in the current be produced. "Selenium, however, is too slow in its action and another substance more sensitive is used," declared Mr. Jenkins.

"On the receiving end of the line is an apparatus with a sensitive detector much like the radio vacuum tube which picks up the electric waves. These are passed through a polarizer and an analyzer surrounded by a magnetic field. The analyzer reconverts the electric variations into light variations and flashes a picture on the screen," was the explanation of the method of broadcasting pictures given by the inventor.

At the conclusion of the talk Mr. Jenkins answered a number of questions and said he would receive the club a few days later at his laboratory and demonstrate the apparatus. His offer was immediately accepted.

The school radio set, which consists of a two-step vacuum tube amplifier, was fitted up during the past week by the members of the club under the direction of G. Murray Clay.

△ △

JOSEPH LIMONE, of East Boston, Mass., has constructed a receiving set that is claimed to be the smallest receiver in existence that really works. It is 3 inches long, 2 inches wide and 1½ inches high and receives stations within a 50-mile radius.

△ △

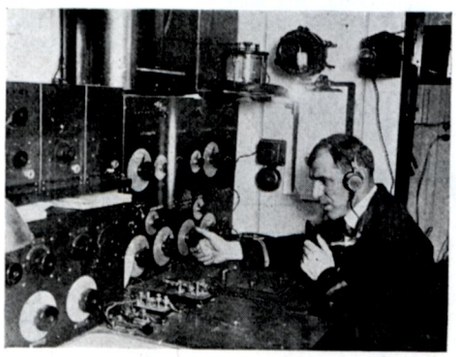
MISS ABBE P. MORRISON, of New York City, President of the Women's Radio Club of America, is spending the Summer in Europe and is endeavoring while there to co-ordinate the activities of the amateurs of several foreign countries with those of the United States. Miss Morrison will visit England, France and Holland.

△ △

CARROLL V. KING, a radio amateur of Oakland, Cal., and Miss Lorraine Howard, of Berkeley, were married recently and the music for the affair, including the wedding march was broadcasted from a nearby station and made audible to the wedding party by a loud speaker.

△ △

THOMAS J. WEST, of Wheatley Hills, L. I., 100 years of age, claims the distinction of being the oldest radio amateur in the world. While celebrating his one hundredth birthday recently, at his home, he was visited by his son, Edward B. West of Brooklyn, seventy-four years of age, and his niece, Margaret Atwater, 82 years of age.



Operator F. E. Black aboard the S.S. America talking to Washington

A MEETING was held in the Daniel Boone Tavern in Columbia, Mo., recently, by representatives of the radio organizations of the state to perfect a statewide organization. Dr. Klenk represented the St. Louis Radio Association at the meeting.

△ △

TWO boys of New York City recently let their desire for radio equipment overcome their scruples as to how of where they got it and as a result were brought up in court on charges of having stolen $2,000 worth of new radio equipment from a factory. The parents of the boys, however, returned the stolen equipment intact and the judge severely lectured the boys and let them go.

△ △

THE radio station of the College of the City of New York Radio Club is located at the top of the Bell Tower in the main building of the College, 139th st. and Amsterdam ave., New York. This room was used during the war by the U. S. Navy as a Radio Compass Station and a depot for the detection of enemy wireless stations. Through the kindness of Professors Fox, Turner and Hubert, and the Club's Faculty Advisor, Prof. A. N. Goldsmith, the historic room was turned over to the Radio Club for their exclusive use, night and day.

From the radio station a stairway leads to the roof where one will find observation seats and stone tables. The loop aerial used by the Navy was located on this roof and it is being restored under the direction of Chief Operator Carlisle as a memento of the war. A regulation 200-meter aerial stretches between the two small towers of the main building—one of which is the Bell Tower—and a 2-wire receiving aerial, about 150 feet long is stretched from the main tower.

The Club was addressed recently by Professor Alfred N. Goldsmith, head of the Research Dept. of the Radio Corporation of America and Professor of Electrical Engineering at the College. The Professor traced the development of radio telephony from its feeble beginnings in 1903 and thereabouts, following with a discussion of what will be done in the near future in regard to ship to shore telephony, saying that it would soon be possible for a man to call up from his home, another man in his cabin on a steamship.

The club has recently completed the erection of a three-wire antenna 160 feet high.

In the election of officers for next fall the following were elected: Richard Carlisle, formerly chief operator, was elected president; Lymen Barry was elected vice-president; and David Weinbloom, secretary-treasurer.

△ △

THE Southern Illinois Radio Association has decided to hold regular meetings every Tuesday night. The Association is to buy a complete practice set with which the code can be taught. It is the aim of the club to teach all the different subjects of radio. The officers of the club are: Monroe Sisney, president; Carry Davis, vice-president; T. L. Bryant, secretary-treasurer; William Felts, recording-secretary.

△ △

SEVERAL hundred delegates attended the first annual convention of the amateur operators of the Seventh Radio District in Seattle on June 10, many coming from Portland, Salem, Eugene, Vancouver, B. C. Pullman and Wenatchee, as well as from Seattle.

Uniformity in traffic rules, so that all amateur radio operators of the Northwest may make the most of their opportunities without interfering to any great extent with the work of broadcasting stations and the like was discussed.

The plans of the originators of the convention provide that resolutions are to be adopted setting forth, for the benefit of the federal government, recommendations for rules and regulations that will conserve the interests of the amateur radio telegrapher.

The assembling of the convention is in the hands of the Totem Radio Club of Seattle, which sent out invitations to 20 amateur radio clubs and associations in Washington, Oregon, Montana, Idaho and British Columbia, the last named being taken into the fold as a complimentary measure. British Columbia stations are just as much interested in having assigned hours for their radio telegraphy entering into the scheme of the whole Pacific Northwest as are those who reside in the states.

△ △

DURING the period of the membership contest of the New Haven, Conn., Radio Club 23 new members were brought into the club which brings the total membership up to about 150 active members. Fred Brill of 242 Davenport ave., brought in six new members and was awarded the prize, a UV200 tube. The club's secretary, Wilmott, was second with two members, and 12 people brought in one each.

The new three-step amplifier which Martino and Barnum have just built for the club is giving good service. According to Martino all that the club now needs is a good aerial, so that the broadcasting stations can be heard with ease.

The finances of the club took a big jump during the week, and it looks as though it would be smooth sailing hereafter.

It has been decided to keep the club going during the summer, and to lease the present meeting place (Fraternal Hall) until the Fall. The overwhelming majority in favor of this action indicates that radio will be a live issue during the hot weather. Mr. Butler promises good entertainment at their Summer meetings.

Walter A. Rida, who has been vice-president of the club tendered his resignation, due to the pressure of business. S. Martino, 1AWB, will take his place.

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THE new apparatus of the Washington, D. C., Radio Club of Central High School has arrived. A T-type cage aerial with a cage lead-in, has been constructed and the ground system changed. This aerial is similar to the one used in one of the most successful trans-Atlantic amateur stations.

Two complete transmitting sets have been installed and a third will be completed as soon as possible. The first set is a ten-watt self-rectifying continuous wave transmitter and is composed of school apparatus. The other set is a twenty-watt radiophone. The major part of this set has been constructed by the members, although several parts were purchased with money from the club fund and President Dewhirst furnished the high voltage generator for the plate supply. A tube rectifier for changing high voltage alternating current from a transformer to direct current will be made as soon as the remaining apparatus arrives.

△ △

MEMBERS of the New Orleans Radio Association opened new headquarters for the club at 620 Baronne street on June 2 in a rousing fashion. About 100 members and friends were present and thoroughly enjoyed the program. It was one of the liveliest and most successful meetings in the history of the club.

"There is nothing standing in the way of our progress," President J. A. Bowling said. "We have been delayed getting started on account of not being in permanent quarters, but now that we are established, we hope to go ahead on a scale that will improve the association.

"The New Orleans Radio Association stands for radio development. It was organized to promote local interest in the new use of the air. Most of the members are amateurs with considerable experience. Many of the members hold commercial licenses. So, taken as a whole, the membership is experienced in radio and its problems.

"We hope amateurs who are just getting into the game will take an interest in the New Orleans Radio Association, and will join. There is plenty of work to be done and with proper support from all interested we should accomplish great things.

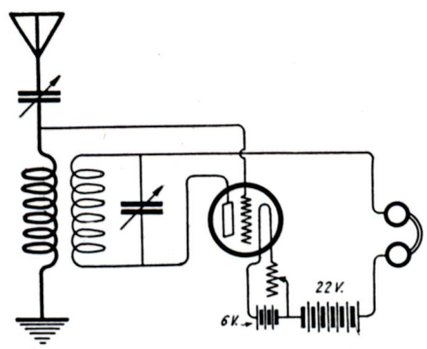
"A complete receiving set will be installed in the near future. It will be the latest thing in receiving apparatus. We expect to work out an arrangement that will give us a competent operator on duty at all times. This will allow beginners and others to visit the headquarters day and night and 'listen in' to programs being broadcasted by local stations and others.

"A cordial invitation is extended to anyone interested in radio to join the association. Meetings are held the first and third Friday every month."

△ △

A UNITED STATES Civil Service examination to fill a position as Junior Radio Engineer will be held August 9. The vacancy is at Camp Alfred Vail, N. J., the famous Signal Corps camp, and pays $1,700 a year. Applicants must be graduates of a college, or senior students, and have studied electrical engineering. The subjects of the examination will include physics, mathematics through calculus, practical questions on radio engineering, and education, training and experience.

△ △



David W. Cobb, of Hanover, N. H., has been getting the broadcasting programs every night with this simple circuit

△ △

FORTUNATO Crino, fifteen years old, and Almond Didomendo, eleven, both of No. 2403 Hoffman street, the Bronx, were arrested after they and five other boys, according to the police, burglarized the radio store of Samuel Paur, No. 2111 Southern Boulevard, the Bronx, New York City.

Patrolman Condon and Hunter of the Bathgate avenue station, noticed the group of boys carrying radio apparatus. They took to their heels when they saw the patrolman. The two prisoners told the police that the "gang" had decided to build a radio station in their headquarters in a nearby shack.

△ △

The Radio Neighborhood

By CLARENCE E. FLYNN

While we have struggled patiently
Toward the larger good,
Friendship on every land and sea,
A world-wide neighborhood,
Space set its limits everywhere,
Its hedging curtains swirled;
But now we speed o'er land, through air,
And talk around the world.

Who is our neighbor? Yesterday
It was the man whose home
Was down the road or o'er the way
Where we might often come.
Today the golden tie that binds
Men's souls in joy or care,
The word uniting hearts and minds,
Is vibrant everywhere.

Have You Met Him?

By GEORGE F. PATRICK

HAVE you met the guy who knows just why your tube won't oscillate, who ridicules the things you do to change its dormant state. He has the dope, this new white hope, but you are off the track, the stuff they print don't give a hint, of what your outfit lacks. He's found out that experts, inventors and all such, though they have the reputations, just do not amount to much, they write a lot of verdant bull, to try and hide the stuff, that he has gotten wise to, they try to make you muff. Is your radiation smaller that you think you ought to get, he knows what's wrong there too, although he's never seen your set. Just listen while he tells you, of the things that he can do, and the wonders of his outfit, all stuff that's strictly new. It's not your gap, that's wrong you know, that don't cut any ice; antenna, ground, spark frequency? No. no, don't think about them twice; its something new that he has got, right off the bat and sizzling hot, and some day he will show them all, that they have missed a lot. Do you use your batteries carefully and treat them every day? What a nut you are to waste your time, he knows an easier way. Don't argue that you think the makers ought to know their stuff; he knows they're wrong, this prodigy, and he has called their bluff. Has your set been heard a thousand miles, and do you think that's fine? Just hear him snort in great disdain, you're way behind his time. A thousand miles is practice for him most every day, and when he's out for distance, he just makes the ether sway. You hear him rave about the hams, that clutter up his way. They don't know how to telegraph; their trade is making hay. They send too slow; they do not space; he shows them up most every place. He has to put their business through; they cannot hear a thing, and if they should they could not read. It surely is a sin, to give such ones a license that reads the same as his; they're good for naught but QRM, to hamper others biz; not that the QRM hurts him. Oh no, he has that fixed; he cuts it out entirely, no matter how it's mixed. Do you want to try CW? He'll give you all the dope; don't bother reading magazines, they only make you grope; just listen while he tells you of the things that he can do, with one small bulb, a few old cells, a tuning coil or two. The radio compass stations are bunk; he's found that out, although there's something in it, and some day he'll put them right; it's surprising that the government with all the wealth at hand, can't do the things that he would do, were he in high command. And so it goes all down the line; if you stand round to hear, this wonder is the only one that's working in high gear. You gaze at him with mouth agape; you marvel at the things he states. He must be some inventor grand, who's known in every clime and land. Have you met this guy? Who knows just why, if not I'll put you wise. He's the Past Exalted Master of Amalgamated Liars, he holds the proud position of a steamship second op; he holds it, but he's slipping, and he probably will drop, for his chief in every single case that I have come across, says he's worthless and a shirker, and his brains a total loss, so when you meet him brothers, just pat him on the back, and tell him "Say no more old pal, I've got your number Jack."

STATIONS WORKED AND HEARD

Stations worked should be enclosed in brackets. All monthly lists of distant stations worked and heard which are received by the 10th of each month will be published in the next month's issue. For example, lists received by November 10th will be published in the December issue. Spark and C. W. stations should be arranged in separate groups.

1-BAS, Paul S. Hill, Jr., Saco, Maine, (May and June.)

C. W.—(1aq), (1adl), 1agi, 1ajp, (1akg), 1aun, (1awb), 1awo, (1azd), (1azw), 1bbw, (1bcf), (1bdi), (1bdv), 1bep, (1bes), 1bet, 1bgf, 1bhi, 1bht, 1bka fone, (1bkq), (1bln), 1blx, 1bnt, (1bqe), (1bvr), 1cal, 1cbp, 1ccz, 1cdo, (1cfi), (1cgs), (1chj), (1cit), 1cja, 1cla, (1cmk), 1cne, 1cnt, (1cra), 1csm, 1cve, 1cm, 1dh, (1ee), (1es), 1fw, 1hk, 1hx, 1ii, 1iv, 1on, 1pr, 1qp, 1rd, (1rh), 1sg, (1ul), 1xz, (1yb), (2afp), 2agb, 2anm, 2aws, 2axk, 2bg, 2bai, 2bbb, (2bdg), (2beh), 2bes, 2bfx, 2blp, 2bmc fone, 2bne, 2bnz, 2bqd, 2bqh, 2brb, 2brc, (2btj), (2cbg), 2cbt, 2ccd, (2ces), (2fp), 2kl, 2nz, 2wr, 3aay, (3acz), 3ais, (3ajd), 3aln, 3ask, 3bfu, 3blf, (3bnu), 3dt, 3fp, (3no), 3qn, 3qp, (3vw), 3wf, 3zo, (3zz), 4dc, 4gl, 4gx, 8an, 8adg, 8adn, 8annn, (8aqo), 8avd, (8awp), 8bo, (8bil), 8bke, 8blx, 8cbs, 8cjh, 8ckm, 8cko, (8qc), 8qk, 8se, (8tb), 8ue, 8uk, 8vy, 8zq, 9al.

Spark.—(1aa), 1aw, (1aco), 1acu, (1adc), (1akg), 1aok, (1bcf), 1bjs, 1boe, 1boq, (1bpz), (1brq), (1bto), (1bub), (1bzn), (1cl), 1caj, (1cgu), (1cib), (1crt), (1fm), 1kv, 1or, 1rv, (1rx), 1sc, 2bfs, 2bme, 2dn, 2fp, 2om, 2rm, 2tf, 2ts, 3bvc, 3gx, (3ta), 4ea, 8bah, 8zq.

1-ACU, Preston D. Baldwin, Groton Long Point, Conn. (June)

C. W.—(1es), 1hk, 1hx, (1iv), (1oz), (1pr), (1agh), 1anq, (1asf), 1ayz, 1azd, (1bkp), (1bqe), (1ccz), (1cne), (1cpz) 1cre, 1cve, (2bg), (2hj), 2hv, (2nz), (2ry), 2ts, (2vh), 2wb, 2abs), 2acd, (2ajf), 2aql, (2ayf), (2ayv), 2bdg, (2bdu), 2bem, 2bfz, 2bji, 2aog, (2blp), (2bml), (2bqh), (2bqu), (2brb), (2brc), (2btw), 2bum, (2byc), (2cbg), 2ccd, 2ccu, (2cdk), (2cei), (2ces), 2cim, 2crv, 2cwe, (3as), 3bg, 3cc, 3fr, 3fs, 3iw, 3ta, 3adx, 3bfu, 3bhl, 3blf, 3bnu, 3cbm, 4bq, 4by, 4dc, 4lp, 8an, 8kl, 8mp, (8oy), 8uc, 8uk, 8vq, 8acf, 8aim, 8amm.

C. W.—8avd, 8avl, 8avt, (8bdb), 8bpo, 8deo, 8bke, 8blx, 8brw, 8cay, 8cbj, 8 cjh, 8ckm, 8cko, 9hw, 9io, 9vv, 9bed, 9bhd, 9bsg.

Spark.—1boe, (2cy), 2fp, 2di, 2om, 2rm, (2abm), 3fp, 3bfu, 8bn, 8ew, 8jl, 8baz, 8cig, 9cp.

Can.—9al.

Prize Contest Announcement

The subject for the new prize contest of our year-round series is:

RECEIVER RADIATION PROBLEM

CLOSING DATE :: :: SEPT. 1, 1922

Contestants are requested to submit articles at the earliest practical date. Prize winning articles will appear in the November, 1922 issue.

All manuscripts should be addressed to the CONTEST EDITOR OF THE WIRELESS AGE.

THE increasing use of regeneration in broadcast receiving sets is causing considerable difficulty in reception because of the radiation of energy by many of the regenerative receiving circuits now in use, especially when several are located in close proximity. How can this be avoided? For suggestions, see Ralph R. Batcher's article on page 76 of this issue.

PRIZE CONTEST CONDITIONS—Manuscripts on the subject announced above are judged by the Editors of THE WIRELESS AGE from the viewpoint of the ingeniousness of the idea presented, its practicability and general utility, originality and clearness in description. Literary ability is not needed, but neatness in manuscript and drawing is taken into account. Finished drawings are not required, sketches will do. Contest is open to everybody. The closing date is given in the above announcement. THE WIRELESS AGE will award the following prizes: First Prize, $10.00; Second Prize, $5.00; Third Prize, $3.00, *in addition to the regular space rate paid for technical articles.*

Handy Hints

Grid leaks and grid condensers cannot be used in connection with the crystal receiver.

A crystal set cannot be made to regenerate.

The wave length has little to do with the distance received.

Low resistance (75 ohm) city telephone receivers do not respond to weak signals and cannot be used for radio reception.

Two or more receiving sets cannot be connected to the same aerial, and receive at the same time.

A crystal detector, as well as a vacuum tube detector, can be amplified to almost any degree.

Do not burn the filament of a tube too brightly just to strengthen signals; it will shorten the life of the tube.

It is often better to buy a few accessories than to build them.

Do not expect too much from a home-made set.

Do not use water from the faucet in a storage battery.

Keep a rubber mat under the storage battery so that acid will not get on the floor.

The positive pole of the storage battery generally sulphates first around the top of the case. Keep this terminal clean.

Queries Answered

Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of one reader can be answered in the same issue. To receive attention these rules must be rigidly observed.

Positively no questions answered by mail.

G. J. W., Jr, Chicago, Ill.

Q. 1. Which is the best type of variometer? a. wood; b. bakelite; c. lattice-wound or basket-ball.

A. 1. Bakelite or lattice-wound variometers are to be preferred to wood, as wood has a tendency to warp and injure the windings.

Q. 2. Does a tickler coil give greater regeneration and sharper tuning than a variometer in the plate circuit?

A. 2. A tickler coil does not give any greater regeneration than a variometer in the plate circuit.

Q. 3. Give the constructional details—size of primary tube. rotor and wire, number of taps and where placed—of a vario-coupler and tickler coil—if better than plate variometer—variable if better, that will receive up to six hundred meters.

A. 3. This set has been thoroughly covered in previous issues of THE WIRELESS AGE. Several good circuits of this type are shown, for instance. in the June issue of THE WIRELESS AGE.

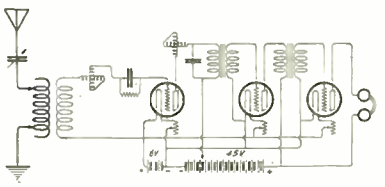
Q. 4. Give hook-up for a five-watt C.W. set. using 110 volts A. C. for voltage source.

A. 4. See figure 3, page 13, of the Radio Corporation's catalog, for complete circuit diagram of a 5-watt, full-wave rectification set.

Q. 5. Can I use a land telegraph key in set described in No. 4?

A. 5. A land line telegraph key may be used for radio signalling for sets of low power.

* * *



Charles A Clark, New York City.

A. 1. You can build a short wave regenerative receiver with the equipment you have on hand. by assembling it as shown in the above diagram. As we presume you will understand the assembly from the diagram, we have not numbered or named the various parts.

* * *

Joshua Shapiro, Brooklyn, N. Y.

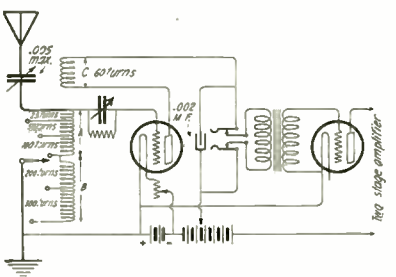
Q. 1. Could you please give me the hook-up of a transformer for a vacuum tube set using 6 volts for A, and 22 volts for B, for detector, 6 volts for A, 95 volts for first two stages of amplification, and 150 to 200 for third stage of amplification.

A. 1. We do not recommend use of alternating current for plate voltage as it is a complicated job and requires apparatus which would be infinitely more expensive than "B" batteries. Besides it is exceedingly difficult to filter and balance out all the A. C. hum, a considerable amount of it always being present. In fact it would probably be much louder than the music you desire to receive. However it is possible to use A. C. for lighting your filaments of the detector and amplifier tubes but even then the hum would be quite bad and would seriously interfere with proper broadcast reception. In the long run it is best to use a storage battery for filament and "B" battery for the plate. If you desire to use A. C. for filament lighting, consult the articles that have appeared in THE WIRELESS AGE, March 1922, pages 38 to 40.

* * *

H. G. Hubbard College View, Neb.

Q. 1. In the June 1922 number of THE WIRELESS AGE, page 71, is shown a hook-up which took second prize and was won by Paul M. Wright. It is claimed that the range of this hook-up is up to 3,000 meters, but I cannot see how this is possible from drawings.



A. 1. (Diagram.) Coils A and B are both wound on the same bakelite tube 2½ inches diameter by 5 inches long. Coil A is a single layer, containing 100 turns, with taps at 25, 50 and 100 turns. Coil B is a 2-bank winding, connected in series, containing 200 turns additional, with a tap at the midpoint. No. 10/38 litzendraht, or No. 28 S.S. copper wire may be used. Coil C which rotates inside of coil A, is used as the tickler. It contains 60 turns of No. 28, S.S.C. wire wound on a tube 1⅞ inch diameter by 1¼ inch wide. An ordinary variocoupler may be used instead of coils A and C, but it may be necessary to add more turns to the secondary in order to get sufficient tickler coupling at the longer waves.

The grid condenser should be variable in order to compass such a range of wave lengths effectively. When using a Radiotron U. V. 201 as a detector, there is quite an advantage in connecting the grid leak between the grid and the positive leg of the filament, inasmuch as you can get substantially the same signal with very much dimmer filament. However, this is really equivalent to connecting the ground side of the receiver to the positive filament instead of the negative filament. A blocking condenser of .002 mfd. should be used across the primary of the first transformer to act as a by-pass for the radio frequency.

* * *

L. A. B., Baltimore, Md.

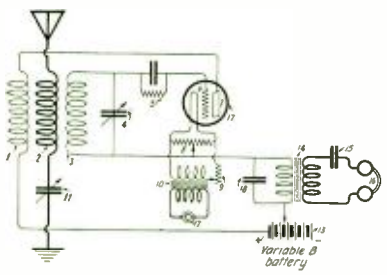
Your diagram is correct, except that condenser 18 should be connected across the primary of 14. Condenser 15 should be of at least .002 mfd. capacity—see THE WIRELESS AGE for March, 1922.

Q. 1. What type, make, price, etc., for instruments 8, 10 and 14?

A. 1. The following are the type numbers and approximate prices of the items referred to. Number 8 Radio Corporation potentiometer PR 536—$2.00. Number 10 GE bell ringing transformer Number 179541—$4.00. Number 14 General radio telephone transmitter, type 166,—$9.00.

Q. 2. Can instruments 10 and 14 be easily made? If so, how?

A. 2. Item Number 10 can be made quite readily, as shown in the following diagram.



1—Tickler coil
2—Primary coil
3—Secondary coil
} Spider-web type. Several different sizes can be plugged in.
4—23 plate variable condenser. 5—Grid leak and condenser. 6—Grid of tube. 7—Plate of tube. 8—1000 ohm potentiometer. 9—Rheostat for filament. 10—110 v. to 6 v. transformer. 11—43 plate variable condenser. 12—Socket for plug to house lighting circuit. 13—B battery—22½ volts. 14—Transformer. 15—Fixed condenser 0.0002 mfd. 16—3000 ohm phones. 17—Detector vacuum tube and socket. 18—Fixed condenser 0.0005 mfd.

Primary having 110 volts of Number 20 DCC wire. Secondary 10 turns Number 16 DCC wire. Item 14 should be purchased complete, but if desired one can be made by using a core of an amplifying transformer. Primary should contain 2500 turns Number 36 SSC wire, and the secondary 1000 turns of the same size wire.

Q. 3. What would be the approximate dimensions of a loading coil to enable this set to hear Arlington time signals? Is this coil put in series with aerial circuit?

A. 3. In order to hear Arlington, NAA, it would be necessary to load both primary and secondary circuits with coils of approximately 400 or 500 turns.

* * *

T. G. W., Jr., Chicago, Ill.

Q. 1. Is radio-frequency amplification superior to audio-frequency? Is transformer coupled amplification better than resistance coupled amplification?

A. 1. Radio-frequency amplification should be used if it is desired to receive distant stations. If it is desired to use a loud speaker in receiving nearby stations, audio-frequency amplification is better. Transformer coupling is recommended in both cases.

Q. 2. In a four-step amplifier, which of the following combinations will give the best results? (a) Four steps of radio-frequency. (b) Three steps radio and one of audio. (c) Two of each. (d) Three steps of audio and one of radio or (e) four steps of audio-frequency amplification.

A. 2. The best combination of radio and audio-frequency is two steps radio, one detector and one step of audio.

Q. 3. What is the best circuit for amplification—heterodyne, superheterodyne, etc.?

A. 3. See the July 1922 issue of THE WIRELESS AGE.

Q. 4. Kindly publish the best short-wave regenerative hook-up, using the combination given in question one or two for coupling and number three for circuit and one vario-coupler, two variometers, and variable condensers for tuning and a tickler for regeneration.

A. 4. The July issue also contains several complete diagrams of combined radio and audio-frequency. See answer to Charles A. Clark for wiring of regenerative receiver, using grid and plate variometers. Long waves can be regenerated as well as short waves by use of coils of the proper size. Tickler coils should be coupled to the secondary and short-wave variometers may be left in the circuit even on the longer waves.

Review of New Radio Books

J. O. Smith (2ZL) Writes the Book of the Year

WHAT is destined to be the foremost radio book of the year has just been written by J. O. Smith, the internationally-known amateur, who, as 2ZL, has won fame by his feats with continuous wave transmission. Those who have been privileged to see the advance proofs of the new volume, which is now ready for distribution, have discovered it to be a very comprehensive survey of modern tube receivers and transmitters, and thoroughly up to date.

The book, which is called "Modern Radio Operation," has been carefully written to interest the average man who is just beginning to take notice of radio, while the more advanced chapters, to which the early chapters lead in logical fashion, contain many details and data that the most experienced amateurs will find new, novel and exclusive. In the opening pages Mr. Smith gives a simple outline of the principles upon which radio communication is based, and includes illustrations and details of the principal broadcasting stations, with several of which he has been connected in an operating or advisory capacity. He then takes up the design and operation of vacuum tube receiving sets and transmitters. There is a particularly forceful and impressive analysis of the comparative merits of spark and continuous wave transmission, illustrated with facts drawn from Smith's long experience in working with other amateurs using all types of transmitters.

Complete details are given of the equipment at 2ZL, with which trans-Atlantic and trans-continental work has been done, and a number of other prominent amateur stations are described. The text contains many illustrations, including, of course, complete diagrams of all types of transmitting and receiving circuits. The newest circuit in receiving apparatus, the Armstrong super-regenerative system, is here presented for the first time within the covers of a book. The volume closes with many exceedingly valuable operating hints, some of which will be new to all except the comparative few who have been privileged to know Mr. Smith personally. The equivalent of that privilege now is open to all through his new book, which should be in the hands of everyone interested in radio.

Modern Radio Operation, by J. O. Smith. New York, 1922, THE WIRELESS PRESS, 326 Broadway, New York City. 144 pages, cloth bound, price $1.50.

Receiving Tube Elementals

THE vacuum tube appears to the layman as a complicated form of incandescent bulb that operates in an entirely mysterious manner; E. H. Lewis in his book, "The ABC of Vacuum Tubes in Radio Reception," endeavors to overcome this impression, setting forth clearly the principles and operation of receiving tubes, for detection and amplification. The book covers its subject in a non-technical manner, being designed for readers

having little or no previous knowledge of either electricity or radio. It should be of considerable assistance to the layman who wishes to operate intelligently the bulbs of his radio telephone receiving set.

The ABC of Vacuum Tubes in Radio Reception, by E. H. Lewis. 132 pages, cloth. New York, 1922, Norman W. Henley Pub. Co. Price $1 from the publisher or of THE WIRELESS PRESS, 326 Broadway, New York City.

Shows Commercial Apparatus

"HOW to make Commercial Type Radio Apparatus," by M. B. Sleeper, is primarily of interest to advanced amateurs and experimenters who desire specifications and detailed values to enable them to construct commercial type apparatus for their own use. The book covers, in detail, both transmitting and receiving sets of modern commercial types for practically every purpose. In addition, it has constructural details of many accessories, such as wave meters, condensers, precision measuring instruments, telephone receivers and B batteries.

How to Make Commercial Type Radio Apparatus, by M. B. Sleeper. New York, 1922, Norman W. Henley Pub. Co. 160 pages. Price 75 cents, in paper, from the publisher or of THE WIRELESS PRESS, 326 Broadway, New York City.

Describes Crystal Sets

"RADIO for the Amateur" is the descriptive title of a new book by A. H. Packer and R. R. Haugh; the name would have been even better if it had been "Radio for the Novice," for the volume of some 200 pages is exceedingly popular in type. It explains the fundamentals of wireless, condensing theory into several short and easily understandable chapters or "messages" as they are called. From theory the authors proceed to its practical use in apparatus, describing various crystal receivers and how to make them wtih instructions for operating. But two pages are devoted to bulb receiving sets, and these only describe the possibilities of the bulb in general terms. For that reason the book will have its sale practically confined to a radius of 25 miles around each broadcasting station. In those centers it should be of value to beginners.

Radio for the Amateur, by A. H. Packer and R. R. Haugh. Chicago, 1922. Goodheart-Willcox Co. 208 pages. Price $1.50 from the publishers or THE WIRELESS PRESS, 326 Broadway. New York City.

Covers Radio Telephone

CAREFUL yet popular explanations of the principles in use in radio telephoning and the instruments embodying them are to be found in the new book "Radio-Telephony for Everyone," by Laurence M. Cockaday. During the war, Cockaday was a radio instructor in the U. S. Navy, and his book reflects his experience in teaching wireless principles and operation. It is simple yet readable, and includes an outline of theory, and details of the simpler vacuum tube receiving sets. There is even a chapter on tube transmitters. This book makes an excellent study for those who have just started to listen to broadcast radio telephone programs.

Radio-Telephony for Everyone, by Laurence M. Cockaday. New York, 1922. Frederick A. Stokes Co. 212 pages. price $1.50 of the publisher or from THE WIRELESS PRESS, 326 Broadway, New York City.

Some Measurements of Telephone Sensitivity

(*Continued from page 66*)

Frequency	*S (pulsating) / S (sine)*
498	0.63
660	.55
720	.75
840	.65
1020	.70
1200	.65

(2) Sound produced by alternating current of sine wave form in one telephone receiver being adopted as a standard, measurements were made of the current of the same wave form but in a second telephone receiver to produce equal sound. The telephone receivers compared were Western Electric Co. Type P-11 phones, to which the numbers L-2-B and L-2-A were assigned. Approximately sine-wave current was supplied to each at frequencies from 450 to 1200 cycles per second. The following table gives the values of the ratio of the current through receivers L-2-A to the current through receiver L-2-B to produce equal signals.

Frequency	*IL-2-A / IL-2-B (sine wave)*
450	0.87
540	1.20
720	1.24
960	1.26
1080	0.90
1200	1.00

A Book For Beginners

BEGINNERS who have just bought a receiving set, or who have decided to build one, will be interested in "Radio Receiving for Beginners," by R. T. Snodgrass and Victor F. Camp. The book, which has just come from the press, serves admirably as an opening volume in the new radio fan's radio library, and by provoking a desire for more detailed knowledge probably will stimulate the sale of more advanced works. There are some excellent instructions for tuning regenerative sets and operating amplifiers and this is perhaps the most valuable section to the beginner.

Radio Receiving for Beginners, by R. T. Snodgrass and Victor F. Camp. New York, 1922, The Macmillan Co., 100 pages, pocket size, 5x7 inches, bound in cloth. Obtainable through the Wireless Press, 326 Broadway, New York City.

What Radio Means to the Blind

(*Continued from page 45*)

A very similar situation is to be found in the Maine Institution for the Blind, Portland, whose superintendent, W. E. Travis, says:

We are contemplating the installation of a receiving set and are keenly interested in the project, feeling that it will increase the avenues of information from which the blind may learn what is going on about them.

In the meantime, while the blind are happily listening in increasing numbers daily, some of them who are talented in various ways, principally musically, have sung or played for the radiophone. One of the first such instances was last Fall, when during the New York Electrical Show, the radio station of the National Amateur Wireless Association broadcasted nightly concerts, two blind boys, violinist and pianist, performed. Since then many others have been "put on the air," in practically every station. KHJ, in Los Angeles, last May gave an entire evening's program with the aid of blind musicians.

Lack of the necessary funds hampers nearly every asylum, home, workshop and institution for the blind. They all want radio apparatus, for they know its unsurpassed advantages. Most of them work on a narrow budget, barely sufficient, even when increased by local philanthropists, to cover the operating expenses, and the expenditure of a few hundred dollars extra for a radio set with a loud speaker is beyond them. For from $275 to $300 it should be possible to provide apparatus suitable for the average home for the blind; maintenance of course is minor, consisting of keeping the battery charged and buying a new bulb occasionally.

The blind present an extraordinary field for the radio fan's charity.

THE WIRELESS AGE, will see that money or instruments given are divided among institutions in all parts of the country.

SMALL ADS OF BIG INTEREST

A MEETING PLACE FOR BUYERS AND SELLERS

Space in this department costs only 65 cents a line. Minimum space seven lines. Payable in advance.

Amateur Radio Stations of the United States

Supplementary List brought up-to-date from August WIRELESS AGE

First District

1 JR L. F. Sise, 31 Powder House Rd....Medford Mass.
1 LB Charles H. Leave, 161 Allston St.....Allston, Mass.
1 LF Wesley A. Sowle, 58 Winthrop St., Winthrop, Mass.
1 AAO Reginald F. Chase, 29 Bradlee St., Dorchester, Mass.
1 AAR Daniel F. Collier, 589 Smithfield Rd., No. Providence, R. I.
1 AAW Kenneth Sanders, West Main St.....Georgetown Mass.
1 AAZ Guy I. Bonham, 194 Park Rd..West Hartford, Conn.
1 ABC Arthur Z. Smith, 200 Park Ave...Woonsocket, R. I.
1 ABE Charles H. Wiley, 97 Evergreen Ave., Hartford, Conn.
1 ABG Manoog. John C., 111 Chandler St., Worcester, Mass.
1 ABL P. H. Steinmetz, 52 Willard Ave., Springfield, Mass.
1 ABM Henry Kulikowski, 483 Main St.....Ansonia, Conn.
1 ABU N. T. Young, 397 Prospect Ave.....Hartford Conn.
1 ABV L. W. Colby, 62 Long Beach....Gloucester, Mass.
1 ABW Graham R. Hall, 209 Lippitt St....Providence, R. I.
1 ACB E. N. Scott, Jr., Brookside Drive, Greenwich, Conn.
1 ABD Fritz A. Almquisth, 21 Clarendon St...Quincy, Mass.
1 ACG C. T. Venstrom, 49 Highland Ave...Everett, Mass.
1 ACI Edward N. Pease, 72 South St...Plymouth, Mass.
1 ACL Dwight E. Keeney, 67 Sycamore St., Holyoke, Mass.
1 ACP George G. Starkey, 800 Water St., Fitchburg, Mass.
1 ACQ West End House, 45 Chambers St...Boston, Mass.
1 ACR Arthur Weidman, 18 Gothland St....Quincy, Mass.
1 ACT Myles W. Brennan, 77 Mechanic St., Westerly, R. I.
1 ACU Preston D. Baldwin.....Groton Long Point, Conn.
1 ACV Albert J. Dalton, 13 Terrace Ave., New London, Conn.
1 ACW LeRoy M. Webb, 20 Taylor Ave.....Bethel, Conn.
1 ACX Harry M. Dunton, 225 Sawyer St...So. Portland, Me.
1 ADB Woelgesy Julius, Box 284.....Fairfield, Conn.
1 ADD Thomas H. Baldwin, Jr., Beech Drive, Norwich, Conn.
1 ADE Thomas A. Stevens, 79 Union St., Deep River, Conn.
1 ADG H. H. Hollis, 22 Cleveland Ave., Braintree, Mass.
1 ADH Philip B. Stearns, 71 Pierce St., Greenfield, Mass.
1 ADJ Thomas H. Kearney, 14 Veres Ave., Fairfield, Conn.
1 ADK Charles T. Wilson, 35 Millet Rd., Swampscott, Mass.
1 ADM Carl Scheffy, 739 School St., West Mansfield, Mass.
1 ADN Everett D. Gibbs, 128 Prescott St., Clinton, Mass.
1 ADO Edward Shepard, 106 Main St., Southington, Conn.
1 ASL Ray C. Rayner, 10½ Cross St.....Norwalk, Conn.
1 AXA Ernest Mathers, 146 Warren Ave.....Milson, Mass.
1 BZK John F. McQueeney, 185 Summer St. Watertown, Mass.
1 CUE John B. Henry.....Lincoln, N. H.

CHANGE OF ADDRESSES

1 RP Hollis E. Polk, 88 Maple St.....Waltham, Mass.
1 ALV John Howe, Bradlee Rd.....Milton, Mass.
1 APK W. O. Gordon, 4 Harbor View Ave., Winthrop, Mass.
1 APL Edwin M. Cleverly, 89 Appleton St.....Boston, Mass.
1 APX Henry Tardiff, Jr., 13½ Washington St., Claremont, N. H.
1 AST A. G. Cutler, 100 Marlboro St.....Wollaston, Mass.
1 AXE Roger Strout, 6 Potter St.....Brunswick, Me.
1 AYZ Anton A. Leonard, 4 Maher Ave., Greenwich, Conn.
1 BAA C. T. Downes, 43 Harvard Ave., W. Medford, Mass.
1 BAN K. V. R. Lansingh, 99 Beaumont St., Ashmont, Mass.
1 BHQ J. M. E. Powell, 44 Hammer St., Burnside, Conn.
1 BHR Arthur W. Lee, 28 Autumn St.....Gardiner, Me.
1 BSI Carroll S. Fisher, 15 Walnut St...Somerville, Mass.
1 BTW Roland Lizotte, 196 Merrimack St.....Lowell, Mass.
1 CMP W. E. Jackson, 205 Summer St....Bridgewater, Mass.
1 BTW Roland Lizotte, 196 Merrimack St...Powell, Mass.
1 CQW Russell E. Thomas, 82 Mill St.....Newport, R. I.

Second District

2 CMR Richard Silberstein, 315 Central Park West, N. Y. C.
2 CMS Ralph C. Powell, Hampton Hall..Cranford, N. J.
2 CMU Charles Draper Hayden, Brown St., Sea Cliff, N. Y.
2 CMV W. W. Leathe, 20 Larchmont Ave., Larchmont, N. Y.
2 CMW David Leiter, 1338 41st St.....Brooklyn, N. Y.
2 CMX S. G. Meyer, 240 Washington Ave...Rutherford, N. J.
2 CMY Sydney V. Salthouse, 304 Ivy St., Arlington, N. J.
2 CMZ William Dewey, 55 North St...Mount Vernon, N. Y.

2 CNA Alfred Sturr, 422 Washington Ave.Belleville, N. J.
2 CNB John Kaul, 448 West 163rd St., New York City
2 CNC R. William Bell, Main St.....Tom River, N. J.
2 CND Fred W. Gordon, 49 East 61st St...New York City
2 CNF Arthur Willard Howell, 336 Trinity Place West, Mount Vernon, N. Y.
2 CNG Thomas C. Bracken, 120 Judge St., Elmhurst, N. Y.
2 CNH Charles Breen, 9511 118th St...Richmond Hill, N. Y.
2 CNI Albert A. Johnson, 23 O'Neil St., Kingston, N. Y.
2 CNJ Newark Sunday Call, A. E. Sonn, Opr., 204 Market St., Newark, N. J.
2 CNK B. W. Kirschner, 255 W. 108th St., N. Y. City
2 CNL Jeffrie Crowell, 188 Charlton St.....Newark, N. J.
2 CNM John J. Young, Jr., 1136 Jackson Ave...N. Y. City
2 CNN Louis Herlinger, 31 Ridgefield Ave., Bogota, N. J.
2 CNO Guyon R. Herbert, 1307 Franklin Ave....N. Y. City
2 CNP Stephen A. Vanderveer, Beach St.....Newburgh, N. Y.
2 CNQ William R. Vogts, 304 Amsterdam Ave...N. Y. City
2 CNR C. J. Minners, Jr., Grand Ave...Palisades Park, N. J.
2 CNS Frederick M. Holbrook, 303 S. Lexington Ave., White Plains, N. Y.
2 CNT Addison G. Clark, Island Road.....Mahwah, N. J.
2 CNU Harry A. Fuller, 384 Halsey St.....Brooklyn, N. Y.
2 CNV E. L. Stoddard, 69 Hudson Ave., Green Island, N. Y.
2 CNW Ellsworth D. Cook, 43 Ballston Ave., Scotia, N. Y.
2 CNX William H. Smith, R.F.D. No. 28, Magee St., Southampton, N. Y.
2 CNY W. Y. Van Alstyne, 550 Myrtle Ave., Albany, N. Y.
2 CNZ Dwight Hulings, 175 Prospect Place, Rutherford, N. J.

2 COA Richard H. Knopf, 3340 Decatur Ave.....N. Y. City
2 COB William L. Wheeler, Jr., 348 W. 22nd St., N. Y. City
2 COC Richard M. Somers, 125 William St., Orange, N. J.
2 COD Oscar Fischer, 1287 Washington Av., N. Y. City
2 COE Louis Martin, 3651 3rd Ave.....N. Y. City
2 COF Louis August Nees, 203 27th St...Guttenberg, N. J.
2 COG Jack A. Sieber, 738 E. 21st St...Brooklyn, N. Y.
2 COH Frank J. Murray, 69 Bay 20th St...Brooklyn, N. Y.
2 COI Robert K. Straus, Northview Ave., Mt. Kisco, N. Y.
2 COJ Edward P. Cunningham, Jr., Premium Point Park, New Rochelle, N. Y.
2 COK J. Hulick Conover, 350 Central Ave., E. Orange, N. J.
2 COL Albert Cavileer, 2119 Caton Ave., Brooklyn, N. Y.
2 COM Paul Delgado, 1869 Third Ave.....New York City
2 CON Public Service Electric Co., Marion Station, J. A. Inwright, Opr., Duffield Ave., Jersey City, N. J.
2 COO O. Rene Pfaltz, 5 Soundview Ave., Larchmont, N. J.
2 COP Fred L. Brown, 210 Edwards Ave., Long Branch, N. J.
2 COQ Raymond C. Beyers, 11019 Jamaica Ave., Richmond Hill, N. Y.
2 COR W. G. Alcombrack, 625 W. 142d St., N. Y. City
2 COS Harold Danson, 31 W. 114th St.....N. Y. City

Third District

3 BWA Myers, W. A., 2506 N. 18th St.....Phila., Pa.
3 BWB Oppenheimer, W. L., 103 Towanda Ave....Phila., Pa.
3 BWC Rowe, Edgar C., State Road.....Enola, Pa.
3 BWD Schwabe, Harry, 915 Mt. Vernon St.....Phila., Pa.
3 BWE Simpson, T., 286 Ashmeade St., E...Germantown, Pa.
3 BWF Nachtigale, William J., 2238 Lee St.,.....Phila., Pa.
3 BWG Schuler, Franklin G. 2725 N. 25th St...Phila., Pa.
3 BWH Carberry, Jos. F., 2825 Kensington Ave., Phila., Pa.
3 BWI McGee, John B., 607 E. Allegheny Ave., Phila., Pa.
3 BWJ Weible, Norman, 120 Frazer Ave., Collingswood, N. J.
3 BWK Morris, Joseph A., 1239 N. 6th St.....Phila.. Pa.
3 BWL Seaton, Stuart L., Washington Grove, Md., Washington Grove, Md.
3 BWM Todd Lewis P., 829 Stokes St...Collingswood, N. J.
3 BWN Robb, Harry C., Jr., 816 Whittier St., N. W., Washington, D. C.
3 BWO Hagerman, George G., 1075 Lalor St., Trenton, N. J.
3 BWP Chamberlin, Alan C., 313 Broad St...Bethlehem, Pa.
3 BWQ Danley, Joseph, Main Street.....Groveville, N. J.
3 BWR Keelins, James T., 118 E. Third St..New Castle, Del.
3 BWS Flory, Malcolm Y., 763 North 39th St....Phila., Pa.
3 BWT Darne, Eppa W., 132 Tennessee Ave., N. E., Washington, D. C.
3 BWU Erickson, Viola, 1911 North Park Ave., Phila., Pa.
3 BWV Delzeit, Bertram, Jr., London Ave.....Berlin, N. J.
3 BWW Guise, Walter C., 504 Wallace St.....York, Pa.
3 BWX Kiracofe, C., 62 W. Main St...Mechanicsburg, Pa.
3 BWY Price, Lowell M.,.....Pocahontas, Va.
3 BWZ Love, Charles H., 1241 Bushkill St....Easton, Pa.

3 CAA Boy Scouts of America, Troop 8, Center Ave. and Oley St., Reading, Pa.
3 CAB Briggs, C. A., 1521 Oak St.....Washington, D. C.
3 CAC Sandruck, F. Jr., 1127 W. North Ave., Baltimore, Md.
3 CAD Woodruff, Albert, 6042 Norwood St.....Phila., Pa.
3 CAE Frick, Ralph, 2443 W. Elkhart St.....Phila., Pa.
3 CAF Turner, Francis, 2952 N. 26th St.....Phila., Pa.
3 CAG Martin, Harry, 2406 Alleghany Ave.....Phila., Pa.
3 CAH Funk, W. Maurice, 7906 Germantown Ave..Phila., Pa.
3 CAI Fellman, William, 1208 N. Broad St.....Phila., Pa.
3 CAJ Turner, Edward F.....South Langhorne, Pa.
3 CAK Letherbury, John B., 710 Wingohocking St., Phila., Pa.
3 CAL VanFleet, Stephen C., 2006 Columbia Rd., Washington, D. C.
3 CAM Coffin, Donald L., 3053 Frankfort St.....Phila., Pa.
3 CAN Farrell, David H., North East Cor. Rustelton Ave. and Cottman St., Frankford, Pa.
3 CAO Harvey, L. T., 125 Anacostia Rd., Washington, D. C.
3 CAP Bates, J. G., Jr., 234 South St., Morristown, N. J.
3 CAQ Conculin, Lloyd M., 3526 New Hampshire St., Washington, D. C.
3 CAR Kaltenstein, Wm. S., 1109 Olive St.....Phila., Pa.
3 CAS Schench, J. E., Jr., 1332 Fairmount Ave., Phila., Pa.
3 CAT White, William S., 6611 10th St.....Phila., Pa.
3 CAU Peterson, George, Jr., 35 W. Montgomery Ave., Ardmore, Pa.
3 CAV Perlouise, Anthony, 2221 Haskner St.....Phila., Pa.
3 CAW Slocum, W. W., 244 Montgomery Ave., Ardmore, Pa.
3 CAX Overton, Harry L., 3231 Carlisle St.....Phila., Pa.
3 CAY Kessler, F. T., Jr., 1012 Duncannon Ave., Phila., Pa.
3 CAZ Finkler, Archie, 2155 Sixth St.....Phila., Pa.

3 CBA Parker, James, 33 Holland Ave.....Ardmore, Pa.
3 CBB Green, Charles A., 2660 N. 16th St.....Phila., Pa.
3 CBC Sagel, Edward R. 5743 Osage Ave.....Phila., Pa.
3 CBD Belile, Robert J., 2819 Kensington St...Phila., Pa.
3 CBE Bernert, Joseph, 205 Oakland Ave.....Audubon, N. J.
3 CBF Arthur, L. J., 3428 Evergreen Terrace, Balto., Md.
3 CBG Biben, Benjamin F., 5621 Pine St.....Phila.. Pa.
3 CBH Smith, Sidney E., Jr., 5011 Chester Ave..Phila., Pa.
3 CHI Hesser, J. M., 904 "B" St., S. W., Wash. D. C.
3 CHJ Baker, Harry W., 135 Baltimore St., Gettysburg, Pa.
3 CBK Sheldon, H. L., 619 W. Spruce Ave., Anglesea N. J.
3 CBL Stocker, Clarence J., 330 Second St....Reading, Pa.
3 CBM Schell, David, 12 W. Main St.....Myerstown, Pa.
3 CBN Jones, Clarence N., Jr., Talbot St...St Michaels, Md.
3 CBO Seibel, Harold E., 503 Southard St...Trenton, N. J.
3 CBP Schwanger, Robert M.....Elizabethtown, Pa.
3 CBQ Harwood, Morris, 3001 Broad St.....Richmond, Pa.
3 CBR Shockley, Kenneth R., Chestnut St..St. Michaels, Md.
3 CBS Bugbee, James B., 565 Rutherford St...Trenton, N. J.
3 CBT Cowan, H. Boyd, Norwood St.....Atglen, Pa.
3 CBU Hendrix, Donald K., Green St...Shiremanstown, Pa.
3 CBV Hamburger, Louis P. & F. H., 1207 Eutaw Place, Balto., Md.
3 CBW Werner, G. W., 432-34 Northampton St., Easton, Pa.
3 CBX Sutter, F. W., 317 Rutherford St.....Trenton, N. J.
3 CBY Williams, John H., 329 McKnight St...Reading, Pa.
3 CBZ Ritchie, Joe G., 101 Main St...Charlottesville, Va.

3 CCA Finnegan, W. B., 5144 N. Sydenham St., Phila., Pa.
3 CCB Blitch, James D., Box 250, University Campus, Lexington, Va.
3 CCC Oldham, Samuel, 6008 Tulip St.....Phila.., Pa.
3 CCD Matteson, Joseph R., 2036 Ritner St.....Phila., Pa.
3 CCE Cooper, James P., Market St.....Camp Hill, Pa.
3 CCF Umholtz, Ammon M., 809 Wilbur St...Easton, Pa.
3 CCG Goss, Frank A., Jr., R. F. D. No. 1, Washington Valley, N. J.
3 CCH Bast, Stanton L., 222 N. Second St.....Reading Pa.
3 CCI Fuss, F. D., 5402 Fifth St.....Olney, Phila., Pa.
3 CCJ McClary, J. P., 18 Maple Ave...Flemington, N. J.
3 CCK McCaleb, Thomas S., 717 Redgate St...Norfolk, Va.
3 CCL Daniels, George A., 748 South 53rd St...Phila., Pa.
3 CCM Moore Terris, 400 Washington Ave..Haddonfield, N. J.
3 CCN Newman, Emanuel, 1416 South 27th St...Phila., Pa.
3 CCO Haddon, Nelson, 824 Brooklyn St.....Phila., Pa.
3 CCP Mears, W. A., Jr., 836 North 24th St., Phila., Pa.
3 CCQ O'Neill, Joseph J., 1624 French St.....Phila., Pa.

Fourth District

4 MA Calvert, Richard C. M., 151 High St., Oxford, N. C.
4 MB Little, Frank Q., 53 Broad St.....Commerce, Ga.
4 MC Wheeless, Verne A., 103 Idlewild Park, Orlando, Fla.
4 MD Rainey, James W.....Statham, Ga.
4 ME Marchman, James W., 620 Highland Ave., Atlanta, Ga.
4 MF Donahue, Elmer A., 109 Bloodworth St., Raleigh N. C.
4 MG Thompson, Robt. S., 315 Neeley St., West Point, Ga.
4 MH Medford, Benj. S., 57 Gillman St.....Oxford, N. C.
4 MI Isenhoar, Paisley G., Fairview Cottage, Ashville,N. C.
4 MJ Calloway, Fuller E.....LaGrange, Ga
4 MK Clark, Weston, 19 Moore St.....Sanford, N. C.
4 ML Ringling, Henry E., 419 Orange St.....Eustis, Fla.
4 MM Griswold, Loren W., 184 Waller St., Jacksonville, Fla.
4 MN Settle, Victor J., 492 Athens St.....Winder, Ga.
4 MO Allston, Wm. F., 14 Government St...Asheville, N. C.
4 MP Meador, W. A., U. S. Govt. Reservation, Oteen, N. C.
4 MQ Goodson, B. C., 1626 N. W. 7th Ave.....Miami, Fla.
4 MR Walton, W. C., Jr., 1215 West Ave., Cartersville, Fla.

4 MS Collins, E. J., 922 N. 8th Ave.....Pensacola, Fla.
4 MT Middleton, Stephen R., 142 Washington St., St. Augustine, Fla.
4 MU Freyer, Frederick R., 2425 Bull St....Savannah, Ga.
4 MV Newman, Walter F., 718 Marshal St., Winston-Salem, N. C.
4 MW Dunn, Wm. L., Jr., Hillside St.....Asheville, N. C.
4 MX Weeks, P. L., Jr., 653 Sycamore St.....Decatur, Ga.
4 MY Dodd, Richard E., 4 East 13th St.....Atlanta, Ga.
4 MZ Liles, Marden, 1808 Oscola St.....Tampa, Fla.

RE-ASSIGNED CALL LETTERS

4 EX Sanders, B., 401 Road St., Elizabeth City, N. C.
4 EK Kinney, DuPont G., 305 Cherokee Ave.....Macon, Ga.
4 EP Bacon, Geo. W., R. F. D. No. 4.....Raleigh, N. C.
4 ER Nichols, Geo. H., 184 Cascade Ave., Atlanta, Ga.
4 GG Byrum, R. L., 131 Poplar St., Winston-Salem, N. C.
4 KF Tison, Wm. W., Jr., 1 Forsyth St.....Atlanta, Ga.

Fifth District

5 AAQ B. A. Bowman, 1017 Fondulac St....Muskogee, Okla.
5 AAR Lundy L. Ziegler, 2007 Huff St., Wichita, Falls, Tex.
5 AAS Samuel P. Dooley, 711 White St.....Norman, Okla.
5 AAT A. S. Webre, 743 Government St., Baton Rouge, La.
5 AAU H. C. Sundstrom, 1716 Lubbock St., Housotn, Tex.
5 AAV Chas. H. Thielman, R. F. D. No. 2, Powderly, Tex.
5 AAW J. M. Brooks, 508 E. Washington...McAlester, Okla.
5 AAX James Dominic.....Krebs, Okla.
5 AAY Charles M. Dillion.....Covington, La.
5 AAZ Harle R. Peters, Box 185....Mountain Home, Ark.

5 ABA W C. Norris, 257 Maximillian St., Baton Rouge, La.
5 ABB Reginald C. Sweet, 807 Lahoma St..Norman, Okla.
5 ABC Military Gulfcoast Academy R. F. D. No. 2, Gulfport, Miss.
5 ABD G. J. Peuke, Jr., 4052 Baudin St., New Orleans, La.
5 ABE Edwin Helmke, 2111 Everett St.....Houston, Tex.
5 ABF William B. Glass, 101 Albany St., San Antonio, Tex.
5 ABG Clyde Phillips, 305 E. Hunt St...McKinney, Tex.
5 ABH E. H. Christy, 5347 Colisum St..New Orleans, Tex.
5 ABI H. E. Velte, R. F. D., No. 6, Box 14, Little Rock, Ark.
5 ABJ Francis C. Bowen, 1911 W. 12th St., Lubbock, Tex.
5 ABK J. G. J. Perkins, Jr., 1528 Vinton Ave., Memphis, Tenn.
5 ABL Norman B. Drake, 210 W. 8th St.....Tulsa, Okla.
5 ABM Claude E. Fox, 806 N. 5th Ave...Knoxville, Tenn.
5 ABN G. A. Reynolds, 522 So. Margin St., Franklin, Tenn.
5 ABD Wayman, Davenport, Texas St.....Plainview, Tex.
5 ABP Richard H. Gilley, 1205 Fawn St., Caldwell, Tex.
5 ABQ Cecil H. Stroup, Box 636.....Krebs, Okla.
5 ABR Wm. V. Harber, 484 Ave. A, N. W., Childress, Tex.
5 ABS R. E. Deckman, 1145 Russell Pl., San Antonio, Tex.
5 ABT G. T. Vickers, 104 Lewis St.....Montgomery, Ala.
5 ABU Oliver K. Doop.....Pond Creek, Okla.
5 ABV William H. Stonerock.....Roswell, N. M.
5 ABW L. B. Cornelius, Painter House, Stephenville, Tex.

5 ABX Paul H. Roberts, 3112 Baker Ave.....Bryan, Tex.
5 ABY Robert T. Bradford.....Lenoke, Ark.
5 ABZ Robert W. Carr, Jr., 3110 West Ave., Austin, Tex.

5 AGA Nickelauss, 235 S. 25th St.....Paris, Tex.
5 AGB Gulf Radio Service, G. S. Rowe, Mgr., 763 Palmette St., Mobile, Ala.
5 ACC Elwyn K. Atkinson, Box 308.....Childress, Tex.
5 ACD Tom Wheadon, 1829 Milan St.....New Orleans, La.
5 ACE John A. Wilkes, 909 N. 2nd St...Nashville, Tenn.
5 ACF Austin W. Pollard, 225 Marshall Ave., Houston, Tex.
5 ACG P. Y. Eyer, 108 First & Gilsen St., El Paso, Tex.
5 ACH Max Henry Jacobs, 404 James St...Houston, Tex.
5 ACI J. F. Walsh, 613 ... Florence St., El Paso, Tex.
5 ACJ Wade Hilliars, Ave. F & 14th St...Childress, Tex.
5 ACK Sydney G. Kent, 916 McGhee St...Knoxville, Tenn.
5 ACL Not issued.
5 ACM Arthur Hill, 118 E. 13th St.....Anniston, Ala.
5 ACN Sam Note.....Bryan, Tex.
5 ACO Robert Frank, Kilmarnock St.....Mobile, Ala.
5 ACP R. L. Kuester, 401 Gargan St.....Houston, Tex.
5 ACQ Dale Hales, 3826 Anderson St.....Greenville, Tex.
5 ACR F. W. Scharpwinkel, 2402 Ave. I, Galveston, Tex.
5 ACS Walter D. McCormick, 2222 Burdette St., New Orleans, La.
5 ACT W. D. Bowen, Jr., 633 W. Hopkins St., San Marcos, Tex.
5 ACU Geo. T. Perry, 233 Claudia St...San Antonio, Tex.
5 ACV A. M. Reager, 1817 Huntsville Ave., Birmingham, Ala.
5 ACW John Fink Jewelry Co., J. D. Fink, 809 N. Sixth St., Fort Smith, Ark.
5 ACX Wm. H. Pierce, 1227 S. Hull St...Montgomery, Ala.

5 ADG Interstate Electric Co. (D. R. Simmons), 424 Carroll St., New Orleans, La.
5 ADH D. R. Simmons, 336 Baronne St...New Orleans, La.
5 ADI San Benito Radio Club (B. G. Eubank, Sec.), San Benito, Tex.
5 ADJ Raymond Holt.....Charleston, Ark.
5 ADK Malcolm Purnell, 2731 Ursuline Ave., New Orleans, La.
5 ADL G. M. McCarrell, Jr., 601 Asia St., Baton Rouge, La.
5 ADM J. D. Tucker, Jr., 1105 Glen Iris Ave., Birmingham, Ala.
5 ADN Donner O'Bracken.....Fletcher, Tex.
5 ADO Arden R. Boellner, 508 No. Mo. Ave., Roswell, N. M.
5 ADP Roby Lee Cathey, Box 152.....Lubbock, Tex.
5 ADQ W. E. Tomlin, 5212 Classen Blvd., Okla. City, Okla.
5 ADR L. Bradberry, 1122 Weich St.....Little Rock, Ark.
5 ADS W. E. Hood, Arlington, Pl., W. E. Birmingham, Ala.
5 ADT J. T. Lassetter, Wedowie St.....Roanoke, Ala.
5 ADU Jeff Davis Griffin, 220 Apache St., Norman, Okla.
5 ADV Jack Reavley.....Alba, Tex.
5 ADW E. S. Van Sickle, 2304 Ringe St...Little Rock, Ark.

RENEWALS

5 CU L. B. Sartain, Jr., 208½ Cedar St., South Pittsburgh, Tenn.
5 CX New Mexico College of Ag. & Mech. Arts, State College, N. M.
5 DU W. E. Gray, Jr., 1112 W. 3rd St., Little Rock, Ark.
5 DV Briscoe N. Jones, 924 E. Main St., Okmulgee, Okla.
5 EF M. C. Peor, 437 W. Grand Ave., McAlester, Okla.
5 EQ C. T. Brown, 1824 Bellvue Ave., Birmingham, Ala.
5 AT John Oldaker, 416 S. High St., Albuquerque, N. M.
5 BR B. R. Jones, 28th & Arline St., Muskegee Okla.
5 BV C. M., Woodman, 600 Rockwood St.....Dallas, Tex.
5 DP- J. H. Uhalt, 1219 N. Rampart St., New Orleans, La.
5 ET L. Davis, 406 Hathaway Ave.....Houston, Tex.
5 FA Ralph E. Smith.....College Station, Tex.
5 FE Roy Lee Miller, W. 13th Ave.....Corsicana, Tex.
5 FK John Brydson, Box 314.....Austin, Tex.
5 FN W. Peacock, 1401 Boulevard.....Houston, Tex.
5 FV K. H. DeWitt, Jr., 1612 15th St., Ave. S, Nashville, Tenn.
5 FX A. A. Murdoch, Jr., 328 Upsen Ave., El Paso, Tex.
5 FY New Mexico College Agri. & Mech. Arts, State College, N. M.
5 FZ New Mexico College Agri. & Mech. Arts, State College, N. M.
5 GR Leslie E. Richards, Box 368.....Beeville, Tex.

CHANGE OF ADDRESS.

5 JB Roy Dishereen, 112 W. Mineral St., Hot Spring, Ark.
5 QU John G. Owen, 3901 Elm St.....Dallas, Tex
5 GC Everett Shepherd, 1734 N. 8th St., Abiline, Tex.
5 RS F. R. Matejka, 1201 Alligator St., Calwell, Tex.
5 GK C. Andres, Jr., 2525 Myrtle St., New Orleans, La.
5 JD W. Kinselving, 1605 Cedar St., Little Rock, Ark.
5 MJ Robert Glass, 2605 Clarence St.....Dallas, Tex.
5 OB Lee Andrew Lewis, 1013, Neiner St., Houston, Tex.
5 SG Ray. U. McKinney, 1342 N. Elwood St., Tulsa, Okla.

RE-ISSUED CALLS

5 BW T. Bernerio, 277 Wisconsin St.....Memphis, Tenn.
5 CB Charles R. Galloway, 1516 Arch St., Little Rock, Ark.
5 DO Walker L. Wellford, Jr., 205 Belvedere St., Memphis, Tenn.
5 DS Dannah Boyette, 111 North 7th St....Lawton, Okla.
5 HK Le Roy Moffett, 223 E. 4th St., Oklahoma City, Okla.
5 HL William D. Van Dyke, 542 McCallie St., Chattanooga, Tenn.
5 LU Wm. B. Taylor, Box 28....Signal Mountain, Tenn.
5 NZ Alfred L. Cowels, 1101 Vance St.....Memphis, Tenn.
5 CH Wm. J. Uhalt, 1101 Pershing St...New Orleans, La.
5 FQ R. E. Kelley.....Haskell, Okla.
5 NV M. M. Brooks, 316 N. Rio Grande St., El Paso, Tex.
5 FH E. L. Deutschman, 912 National Ave., E. Las Vegas, N. M.
5 GQ E. C. Barthelomew, 902 West Av.....Austin, Tex.

Ninth District

9 CEV Milo M. Littleton, South Wing, Capitol Bldg., Madison, Wisc.
9 CEW G. A. Schlinkert, 1519 N. Crawford Ave., Chicago, Ill.
9 CEX Illinois Fixture & Electrical Supply Co., 56 Lake St., Chicago, Ill.
9 CEY Richard C. Bird.....Parker, S. Dak.
9 CEZ Elef W. Burglef, 7307 Geenwood Ave....Chicago, Ill.
9 CFA Elroy H. Black, 11515 Wallace St.....Chicago, Ill.
9 CFB Hilton C. Ingle .....Thoyer, Mo.
9 CFC Samuel S. Stoller, 2445 Chicago, Ave...Chicago, Ill.
9 CFD Oral D. Florence.....Thompson, Iowa.
9 CFE William R. Cottrell.....Prairie City, Iowa
9 CFF R. W. Blucke, 221 Caldwell St...Jacksonville, Ill.
9 CFG Cletus Driskel, 441 Sherman Ave....Wichita, Kans.
9 CFH Wm. R. Welton, 209 N. 11th St.....Mattoon, Ill.
9 CFI Vertice D. Wilson, 128 N. Cedar St...Ottawa, Kans.
9 CFJ Harry O. Berg.....St. James, Minn.
9 CFK Clarence L. Arundale, 1203 S. Main St..Lewistown Ill.
9 CFL J. C. McGregor, 304 E. Washington St., Pontiac, Ill.
9 CFM F. Adam Electric Co., 902-4 Pine St., St. Louis, Mo.
9 CFN Leonard B. Wilke, 376½ First Ave..Milwaukee, Wisc.
9 CFO Donald Anderson 1320 W. 44th St...Des Moines, Iowa
9 CFP Malcolm W. McRae, 634 Grace St.....Chicago, Ill.
9 CFQ Joseph J. Cerry, 5612 W. 24th St.....Cicero, Ill.
9 CFR Howard Frank.....Plano, Ill.
9 CFS Fred S. Palm, 5815 Roosevelt Rd., W.....Cicero, Ill.
9 CFT John F. Schneider, Summer St.....Schofield, Wisc.
9 CFU Joe Schindler, 2318 E. St.....Granite City, Ill.
9 CFV Earl C. Chandler, 341 S. 11th St....Havelock, Nebr.
9 CFW Patrick J. Dougherty.....Collegeville, Minn.
9 CFX Ralph L. Nolan, 426 N. Byers Ave.....Joplin, Mo.
9 CFY Clarence O. Ford, 523 S. Hancock St., Colorado Springs, Colo.
9 CFZ Clayton Fyfe, 454 Newberry Blvd., Milwaukee, Wisc.

9 CGA Merle F. Buck, 677 Lawn Ridge..Huron, S. Dak.
9 CGB R. J. LeDuc, 729 Montana Ave...S. Milwaukee Wisc.
9 CGC Samuel R. Durand, 384 Lake Drive, Milwaukee, Wisc.
9 CGD Wm. E. Wierdsma, 587 21st St....Milwaukee, Wisc.
9 OCE R. P. Mathison, 1403 Wisconsin St. Gladstone, Mich.
9 CGF Warren P. Adams, 307 Central Ave., Faribault, Minn.
9 CGG James H. Paist, 2298 Commonwealth Ave., St. Paul, Minn.
9 CGH Leroy Monosmeth, 1017 Van Wie St., Rockford, Ill.
9 CGI Joseph F. Hladky.....Dougherty, Iowa
9 CGJ Edwin T. Bruce, 1300 S. 3rd St., Louisville, Ky.
9 CGK James W. Korman, 3518 Itaska St...St. Louis, Mo.
9 CGL Wm. S. Waldrip, R. F. D. No. 1.....Attica, Ind.
9 CGM Wm. E. Britton, 211 N. Jackson St., West Frankfort, Ill.
9 OGN J. A. Steinlage, 2550 N. Grand Ave., St. Louis, Mo.
9 CGO Gilbert S. Jackson, Box 5.....Galatia, Ill.
9 CGP R. A. Bagley, 917 E. Henderson Ave., Decatur, Ill.
9 CGQ E. W. Kersten, 700 Baker Ave., Menominee Mich.
9 CGR W. E. Riddle, 917 Blaine St.....Peoria Ill.
9 CGS R. E. Veverka, 3071 S. 32d St.....Omaha, Nebr.
9 CGT G. T. Eastland, 2110 Clark St.....Chicago, Ill.
9 CGU Walter H. Bornholdt, 412 Windom St...Peoria, Ill.
9 CGV Ralph O. Ankeny, 294 W. Bluff St., Marseilles, Ill.
9 CGW Lorin K. Hill.....Fairfield, Nebr.
9 CGX D. F. Simonton, 216 W. Beardsley St., Elkhart, Ind.
9 CGY C. M. Moulder, 1712 W. 14th St...Davenport, Iowa
9 CGZ Sanford Griffen, 2700 E. 13th St.....Denver, Colo.

9 GHA Arthur G. Coulson.....Beaver Crossing, Nebr.
9 CHB R. H. Weyant, 615 E. Morgan St.....Dixon, Ill.
9 CHC Clarke H. Johnson, 820 N. Main St...Spencer, Iowa
9 CHD Donald R. Laird, Lincoln St., Box 71, Malvern, Iowa
9 CHE W. O. Forrest, R. F. D. Arlington Township Poynette, Wisc.
9 CHF Robt. C. Lewis, 625 Church St.....Princeton, Ill.
9 CHG Fred. C. Krick.....North Liberty, Ind.
9 CHH E. E. Zimmerman, 121 McKay St..Frontenac, Kans.
9 CHI Gordon Armstrong.....Britt, Iowa
9 CHJ Herbert Schnur, Jr., Eastmoreland Pl.....Joplin, Mo.
9 CHK P. T. Stephens, 112 S. Hickory St., Platteville, Wis.
9 CHL Clarence E. Berg, 751 39th St.....Milwaukee, Wis.
9 CHM F. B. Smiley, 514 S. Jackson St.....Belleville, Ill.
9 CHN Oscar A. Rosel.....St. Ansgar, Iowa
9 CHO John A. Davies, 517 Ottumwa St.....Ottumwa, Iowa
9 CHP R. L. Goodman, Jr., 407 Church St., Champaign, Ill.
9 CHQ Theo. Kennedy, 1221 W. Johnson St., Madison, Wisc.
9 CHR Kenneth D. Turner.....Kirkland, Ill.
9 CHS Roy Emison, 411 S. Main St., El Dorado Springs, Mo.
9 CHT M. W. Spencer, 32 Layman Ave., Indianapolis, Ind.
9 CHU Bruce R. Church, 228 Second Ave. E., Cresco Iowa
9 CHV Harry E. Niece, 108 W. Main St.....Elmwood, Ill.
9 CHW Everett M. Strous, 243 Crosat St.....LaSalle, Ill.
9 CHX R. T. Wheeler, 1826 Ludlow Ave., Indianapolis, Ind.
9 CHY Richard DuPuy, 1663 St. Claire St. St. Paul, Minn.
9 CHZ H. E. Giltner, 3 Strand Apts.....Ft. Dodge Iowa

9 CIA Winfield R. Smith, 2239 Bellefontaine St., Indianapolis, Ind.
9 CIB Roy M. Hukle, Route No. 4, Box 23..Lexington, Ky.
9 CIC Clifton M. Fisbach, 124 Poplar St.....Seymour, Ind.
9 CID Kirk T. Pruess, R. R. No. 11, Park Ave. and Lynn St., Springfield, Mo.
9 CIE M. F. Kettmeier, 2214 D St.....Granite City Ill.
9 CIF Archie O. Peterson, 706 N. 3rd St...Ft. Dodge, Iowa
9 CIG Irvine G. Sennett, 2804 W. 3d St...Duluth, Minn.
9 CIH Frederick M. Edwards.....Maitland, Mo.
9 CII C. F. Quentin, 824 Minnesota Ave., S. Milwaukee, Wis.
9 CIJ Dan Lake.....Lake City, Kans.
9 CIK Ivar Nelson, 1010 Michigan Ave., Menominee, Mich.
9 CIL Earl B. Dahl.....Britt, Iowa
9 CIM Frank H. McIntosh, 4160 Chicago St...Omaha, Nebr.
9 CIN Milo W. Utterback, 3126 Kleckner Court, Lincoln, Nebr.
9 CIO Julian A. Dieter, 118 N. Main St...Naperville, Ill.
9 CIP Frederick and Davis Weyerhaeuser, 480 Grand Ave., St. Paul, Minn.
9 CIQ John Archie Mathis.....Tamaroa, Ill.
9 CIR Central Radio Club, 1922 Orchard St...Chicago, Ill.
9 CIS Murtin D. Hoover, 216 W. Third St., Bicknell, Ind.
9 CIT Harry S. Carr, 421 W. Luverne St., Luverne, Minn.
9 CIU Frederick C. Shidel.....Amherst, Wisc.
9 CIV R. G. Brew, 4502 Beloit Rd., W. Milwaukee, Wisc.
9 CIW Ralph E. Carr, 417 E. College Ave., Waukesha Wisc.
9 CIX Robert W. Carel, 4630 Zuni St.....Denver, Colo.
9 CIY Paul E. Teale, 1746 S. 27th St.....Omaha, Nebr.
9 CIZ K. A. Smith, 210 Railroad St.....Percy Ill.

9 CJA Maurice B. Wells, 2145 Hazel Ave...Indianapolis, Ind.
9 CJB Alvin Ebert, 920 20th Ave.....Milwaukee, Wisc.
9 CJC J. C. Mosby, Jr., 425 Fairlawn Ave., Webster Groves, Mo.
9 CJD Dewar B. Victor, 1102 Park Ave.....Omaha, Nebr.
9 CJE Charles A. Pine, R. F. D. No. 5..Coffeyville, Kans.

CALLS REISSUED

9 CE Thomas H. Lokken, 162 Bluff St...Ishpeming, Mich.
9 CL Kesselman O'Driscoll Co., 517-19 Grand Ave., Milwaukee, Wisc.
9 CV Frank E. Nellis, Edgewater Beach Hotel, Chicago, Ill.

9 DI Herbert J. Ellie, 526 E. 63d St.....Chicago, Ill.
9 DU George S. Turner, 124 Pearl St. S.Independence, Mo.
9 LS L. R. Schmidt, 1522 Bellepiaine Ave.....Chicago, Ill.
9 QT J. Earl Goodwin, 429 Garfield Ave., Indianapolis Ind.
9 RQ Radio Equipment & Mfg. Co., 113 E. Second St., Davenport, Iowa
9 RX C. O. Stimpson, 416 Dearborn St.....Chicago, Ill.
9 BJF Northern Illinois Telephone Co., 213 Washintgon St., Mendota, Ill.
9 CBN Frederick H. Beach, 10 W. Sycamore St., Vincennes, Ind.
9 DIN Camp Roosevelt.....Rolling Prairie, Ind.
9 DVO Bertram A. Gooch, 1903 W. 23d St..Des Moines, Iowa

CHANGES OF ADDRESS

9 ADA Kester Marhols, 3051 Wilson Ave.....Chicago, Ill.
9 AFU William J. Morey, 5412 Ferdinand St...Chicago, Ill.
9 ADY C. H. Atchisson, 3510 Wabash Ave.....St. Louis, Mo.
9 BHF Verdon Stones, 571 Harper St...Webster Groves, Mo.
9 BJM W. H. Taussig, 549 E. Argonne Drive, Kirkwood, Mo.
9 BNA H. H. Dozois, 138 S. Harvey St., Oak Park, Ill.
9 CBQ Malcolm W. McRae, 105 S. Babcock St...Urbana, Ill.
9 CFP Malcolm W. McRae, 634 Grace St.....Chicago, Ill.
9 DKB L. H. Weeks, 1116 5th St., S. E. Minneapolis, Minn.
9 DTP John W. Ritchey, 351 Broadway.....Augusta, Kans.
9 DVM John Henry Grady, Westgate Hotel Kingshighway & Delmar, St. Louis, Mo.
9 EN Clifton M. Utley, 6027 Woodlawn Ave., Chicago, Ill.
9 FZ Randall C. Ballard, 203 E. White St., Champaign, Ill.
9 QO Guy May, 1103 Massachusetts St....Lawrence, Kans.
9 LS Verne A. H. Swanson, 1317 Jenifer St., Madison, Wisc.
9 AAX Bloomington-Normal Council, Boy Scouts of America, Bloomington, Ill.

LIMITED COMMERICIAL STATIONS

KDZQ William D. Pyle, 429 S. Sherman St...Denver Colo.
KDZU Western Radio Corporation, 737 Lincoln St., Denver, Colo.
KOA Young Men's Christian Association, (W. H. Smith), Lincoln and 16th Aves, Denver, Colo.
WAAF Chicago Daily Drovers Journal, 844 Exchange Ave., Chicago, Ill.
WEAK Julius B. Abercrombie, 819 N. 23d St..St. Joseph, Mo.
WEAU Davidson Brothers Company, 4th and Pierce Sts., Sioux City, Iowa
WEAV Sheridan Electric Service Co. (T. C. Shipley), Rushville, Nebr.
WEAZ Donald Redmond, 1120 Bertch Ave.....Waterloo, Iowa
WFAC Superior Radio Company, 2326 John Ave., Superior, Wisc.
WFAD The Watson Weldon Motor Supply Co., 123 S. 7th St., Salina, Kans.
WFAK Domestic Electric Company, 7908 Eulalie St. Brentwood, Mo.
WFAM Times-Publishing Company, 18 N. Sixth Ave., St. Cloud, Minn.
WFAN Hutchinson Electric Service Co., 115 Main St., Hutchinson, Minn.
WFAP Brown's Business College, Jefferson and Liberty Sts., Peoria, Ill.
WFAQ Missouri Wesleyan College and the Cameron Radio Company, Cameron, Mo.
WFAS United Radio Corporation, 1106 E. Columbia St., Ft. Wayne, Ind.
WFAT The Daily Argus Leader, 109-111 N. Main Ave., Sioux Falls, S. Dak.
WFAV University of Nebraska.....Lincoln, Nebr.
WFAY Daniels Radio Supply Co., 209 N. Sixth St., Independence, Kans.
WGAJ Gass, W. H., 413 7th Ave.....Shenandoah, Iowa
WGAS Ray-Di Company Organization, Inc., 1215 Leland Ave., Chicago, Ill.
WGAT American Legion, Department of Nebraska, Lincoln, Nebr.
WGAY Northwestern Radio Co., Inc., 250 State St., Madison, Wisc.
WGAZ South Bend Tribune, Colfax and Lafayette Sts., South Bend, Ind.
WHAA State University of Iowa.....Iowa City, Iowa
WJC Indian Pipe Line Corporation.....Owensboro, Ky.
WRM University of Illinois.....Urbana, Ill.

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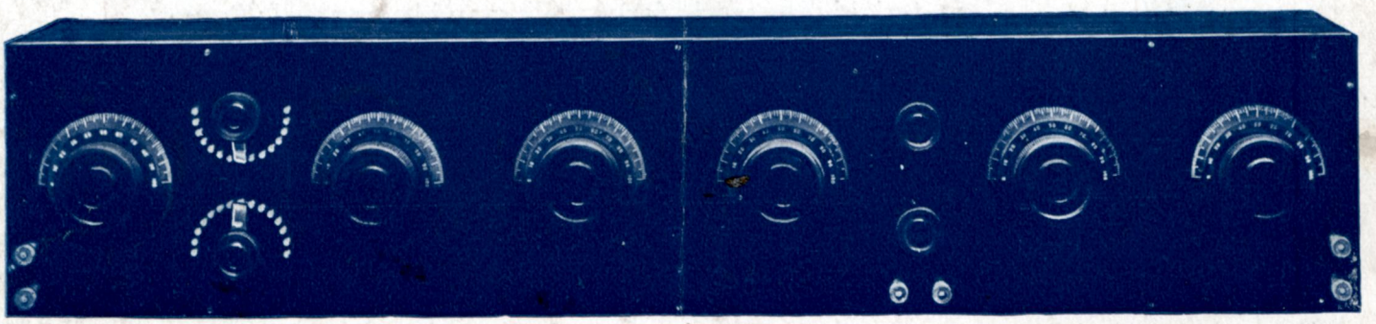

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