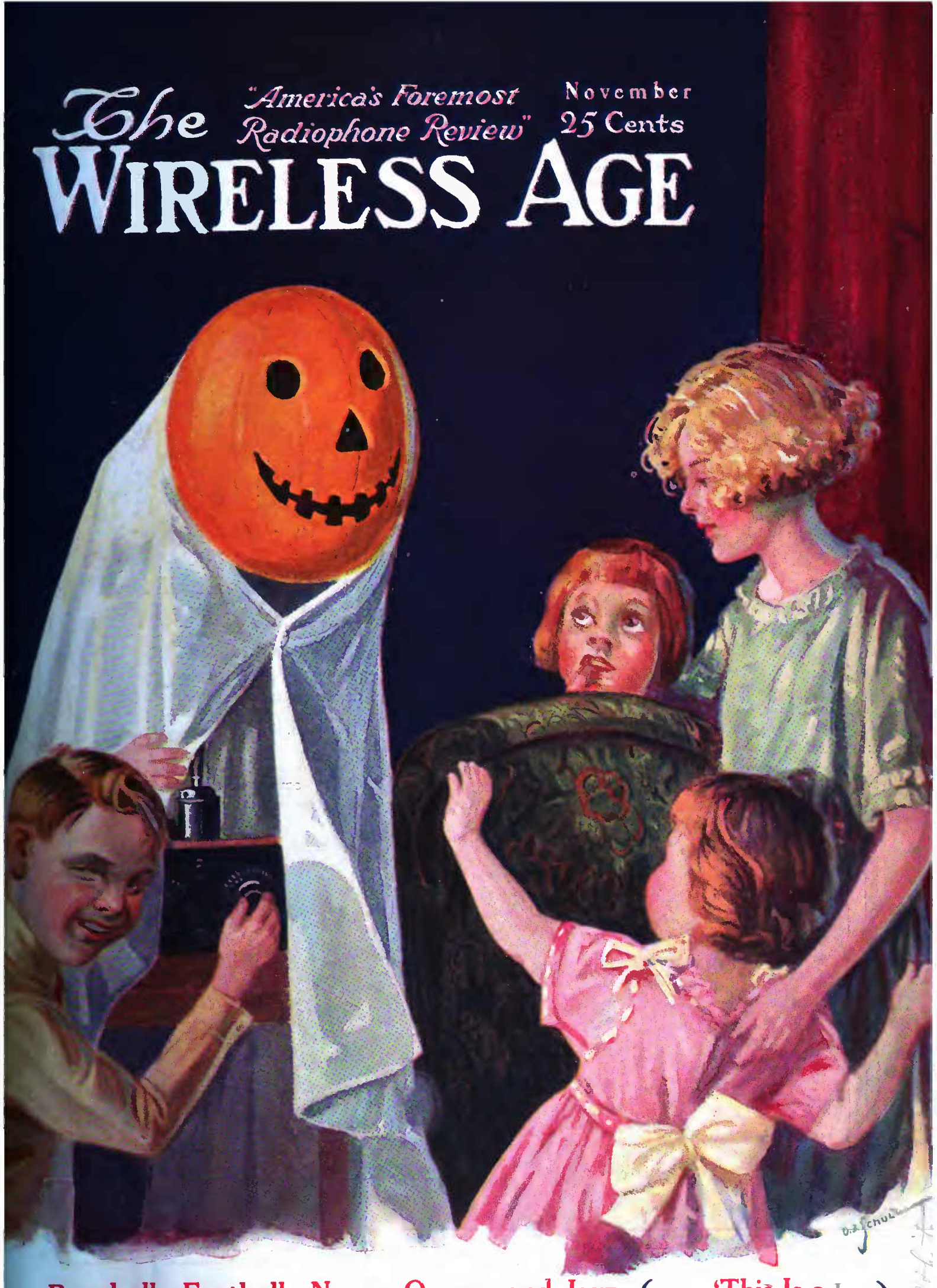
"America's Foremost Radiophone Review"

November
25 Cents

The WIRELESS AGE



Baseball—Football—News—Opera—and Jazz

WITH THE BROADCASTERS — TIMELY TECHNICAL ARTICLES IN POPULAR LANGUAGE — HEARING DISTANT BROADCASTING

"This Is a Radio Christmas"

USE JEWELL INSTRUMENTS EXCLUSIVELY

Mr. Harry H. Carman, owner and operator of C-W Station 2 EL, Freeport, Long Island, is one of the most enthusiastic users of Jewell Radio Instruments in the country. He knows the disappointment and uncertainty of guessing at what his transmitter is doing, and he also knows the pleasure of operating a Jewell-equipped station where he knows at a glance not only his antenna current, but the current in his oscillator plate circuit, total current in the plate circuit, filament voltage, plate voltage, and supply line voltage. Ask Mr. Carman why he uses Jewell Instruments.

ILLUSTRATED BELOW, IS

Station WDAP located in the Drake Hotel, Chicago. It employs four 250-watt tubes and has been heard in practically every state in the Union. The modulation is excellent and the efficiency runs very high. Jewell instruments are used exclusively on this board. The tuning up is accomplished with a minimum of labor and all factors in the outfit are always under positive control.

Have you one of our new Radio Instrument circulars?

ORDER FROM LOCAL DEALER

JEWELL ELECTRICAL INSTRUMENT CO.

1640 Walnut St., Chicago

Low in Cost
Simple to manipulate

Opened like a book

Carried like a satchel

THE radio enthusiast who lives within ten to twenty miles of a broadcasting station has exactly what he wants in Radiola I (ER 753-A)—low cost, compactness, portability, and simplicity of manipulation.

Open the walnut cabinet, and on the front panel you find the tuning control, the crystal detector and the binding posts. In the body of the cabinet are the head-telephones. Tuck away the telephones, close the front panel, and you can carry the whole set as you would a satchel.

Radiola I, at your dealer's, $25.00

RCA

This symbol of quality is your protection.

The Book that Brings Radio Into the Home

For 35 cents you can obtain from your dealer or from us a copy of the book "Radio Enters the Home." It explains the principles, the fascination of radio in plain English. It describes Radiolas and their accessories. It contains the most valuable wiring diagrams ever published.

Radio Corporation of America

WORLD WIDE WIRELESS

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

District Office
10 South La Salle St.,
Chicago, Ill.

Volume 10 *Edited by* J. ANDREW WHITE *Number* 2

November, 1922—Contents

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Edward J. Nally, Pres. J. Andrew White, Vice-Pres. L. MacConnach, Secy. George S. DeSousa, Treas.

Printed in U. S. A.

Paul F. Godley, designer of Paragon Radio Products, listening in

Godley Warns Radio Operators of Trouble This Winter

Paul F. Godley expects a chaotic situation in radio receiving this winter. Due to the delay in governmental regulation of broadcasting, operators of single circuit receivers are bound to have serious trouble. Mr. Godley says:—

"The coming season will see from ten to twenty times as many broadcasting stations as there were, last year, all concentrating on one narrow band of wavelength. With a single circuit receiver, jamming and mixed messages are bound to result. Market reports, election returns, time signals, musical selections—all will be jumbled together in hopeless discord.

"The only way to cope with a situation like this is to use a three circuit regenerative receiver.

"For example, the Paragon three circuit receiver can select between broadcasting stations of about the same signal strength with less than one per cent differential."

The Paragon receiver is easy to operate. It provides a simple solution for an extremely difficult problem.

Don't spoil your programs this winter with an obsolete receiver. You can only expect satisfactory results with an up-to-date receiver like the Paragon.

Also Manufacturers of
PARAGON

Radio Telephone Transmitters
V. T. Control Units
Rheostats
Potentiometers
V. T. Sockets
Amplifier Transformers
Detectors
Control Dials
Amplifiers
Receivers
Switches
Variometers

ADAMS-MORGAN CO., 8 Alvin Ave., Upper Montclair, N.J.

PARAGON

Reg. U. S. Pat. Off.

RADIO PRODUCTS

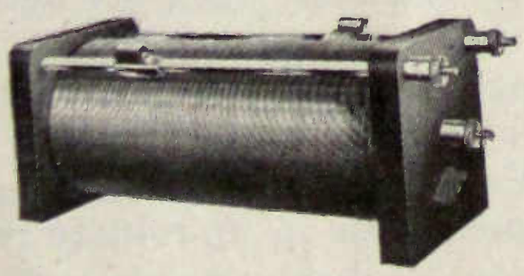
-and that's not all

OF course we are not seriously advocating that golf enthusiasts proceed to equip themselves with a radio set while playing, still they find a radio set just as refreshing as the nineteenth hole, especially after supper on the veranda. If it's too cool to sit outside there is no better fun than listening in on the news and doings of the world over one of the many types of Radisco receiving sets.

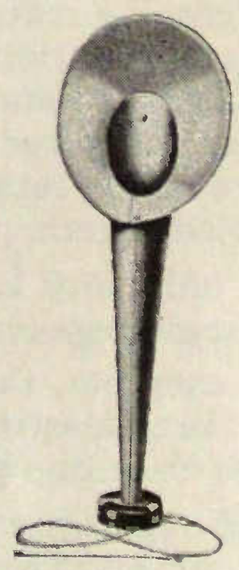
These sets may be had in a range of prices suitable to the most lean and emaciated or plump and prosperous pocketbooks. There is a set suitable for Tommy just turning seven and another for his dad who owns the only bank in town. Some Radisco receiving sets are of the simple crystal detector type and others range up to the long range high power set with two stages of amplification and loud speaker attachment so a whole roomful can hear.

In addition to complete sets the Radisco line comprises all kinds of radio parts and accessories. There is great fun in building your own set. Write us for full information and interesting radio catalog.

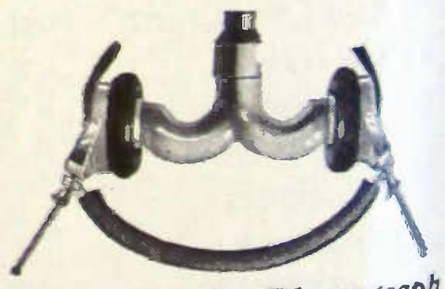
THE RADIO DISTRIBUTING CO.
Newark, New Jersey, U. S. A.



Radisco Two-slide Tuner
Price $4.00



Radisco Lily Horn and Coupler. Scientifically designed fibre horn; no distortion, only 95c. Coupler connects all makes of phones to Victor, Columbia and other phonographs—also to Lily Horn, 60c.



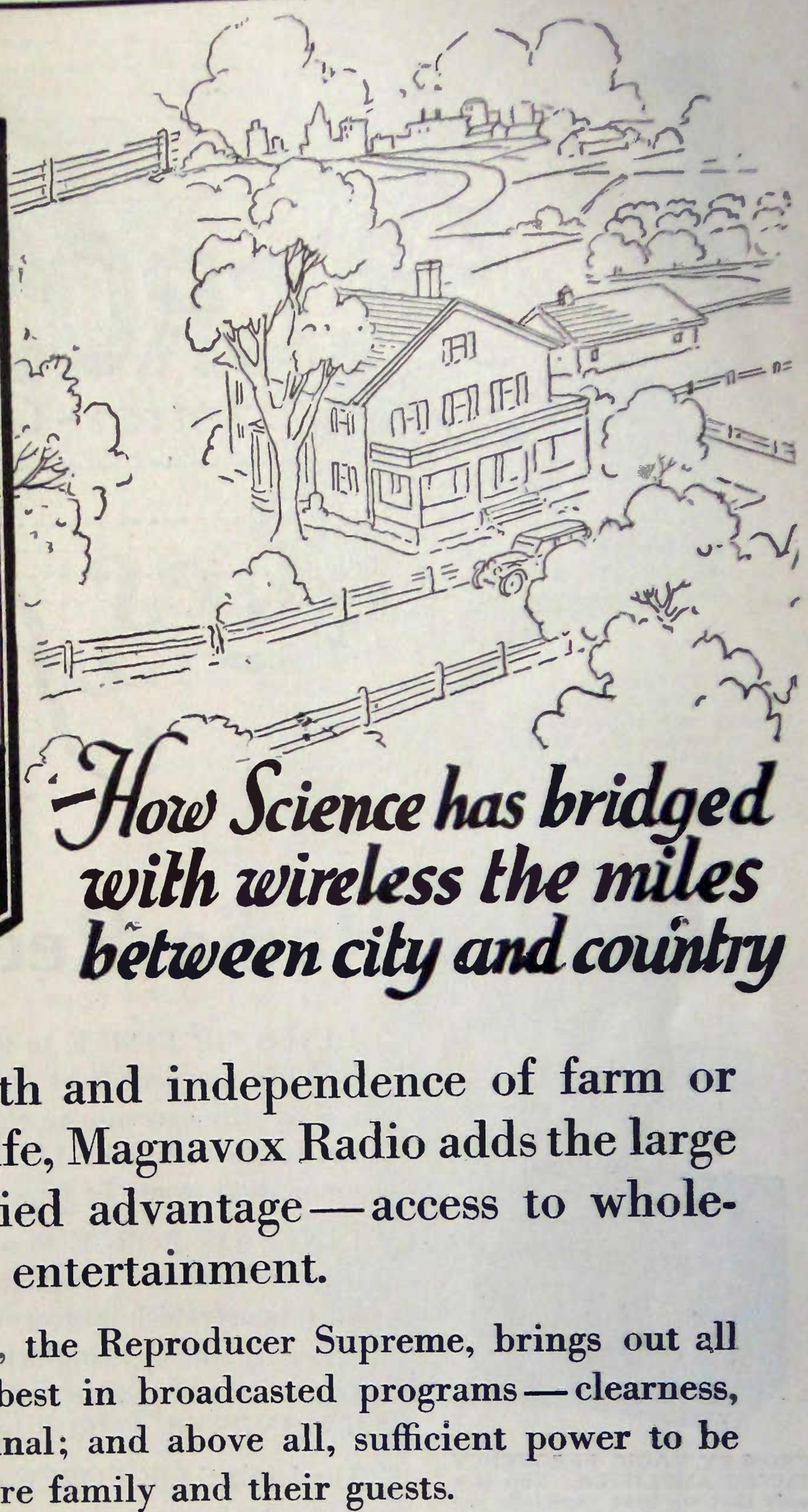
Radisco Duplex Phonograph Adapter. Price $2.50

RADISCO
RADIO PRODUCTS

Type R-3
with 14 inch horn
(illustrated above)
$45.00

Type R-2
with 18 inch horn
$85.00

Model C
Power Amplifier
2 stage
AC-2-C . . $80 00
3 stage
AC-3-C . . 110.00



How Science has bridged with wireless the miles between city and country

TO the health and independence of farm or suburban life, Magnavox Radio adds the large city's most envied advantage — access to wholesome, inspiring entertainment.

Magnavox Radio, the Reproducer Supreme, brings out all that is finest and best in broadcasted programs — clearness, fidelity to the original; and above all, sufficient power to be enjoyed by the entire family and their guests.

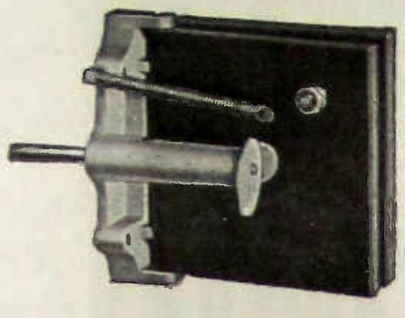
When you purchase a Magnavox Radio or Magnavox Power Amplifier you possess an instrument of the very highest quality and efficiency. Without the Magnavox, no receiving set is really complete.

The Magnavox products may be had of good dealers everywhere.

THE MAGNAVOX COMPANY Oakland, California
New York Office: 370 Seventh Avenue

MAGNAVOX RADIO
The Reproducer Supreme

MAGFON
$10.00



VARIABLE CONDENSER

MODEL "A"	$1.25
MODEL "B"	1.75
MODEL "C"	2.25

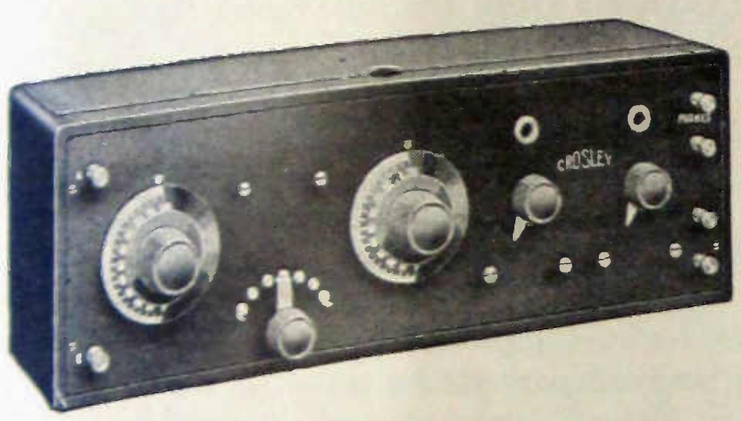
RADIO FREQUENCY AMPLIFYING TUNER
$4.00

RADIO CABINETS
$2.50 to $5.25

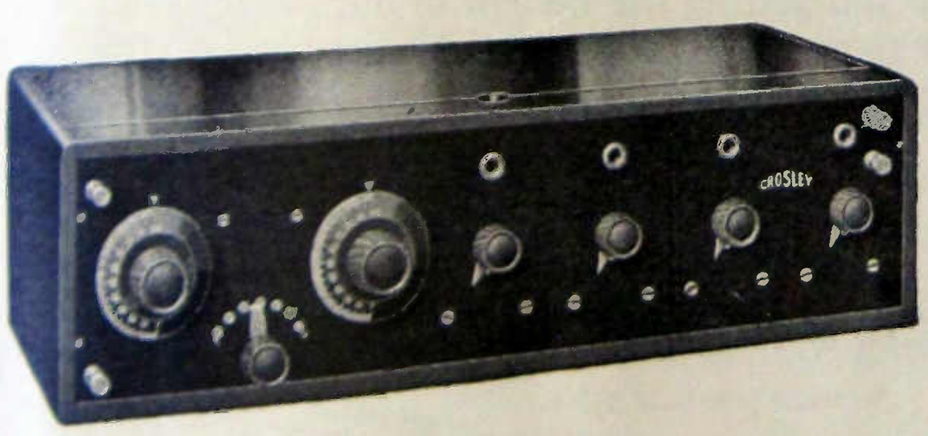
BINDING POSTS
5c. 7½c., 10c.

THE CROSLEY MANUFACTURING COMPANY makes a complete line of Radio Parts that are as good as money can buy and at about one-half the price you will pay anywhere else.

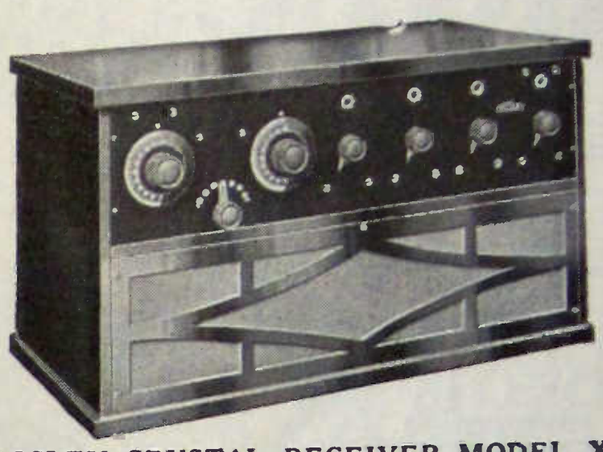
Write for Catalog



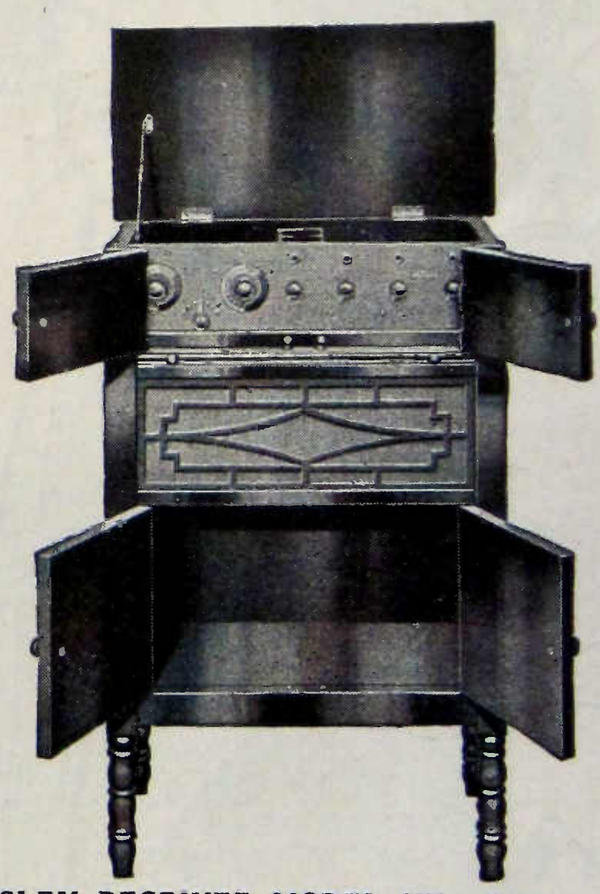
CROSLEY RECEIVER MODEL VI. This set consists of one stage of Tuned Radio Frequency Amplification and Audion Detector. It is normally for use with head phones but is especially recommended to be used with any type of loud speaker. Additional amplification is unnecessary if head phones and horn are used in receiving local stations. Price, without phones, batteries or tubes $30.00



CROSLEY RECEIVER MODEL X. Is the same as MODEL VI with two stages of Audio Frequency Amplification added. In placing this receiver on the market, we are offering you a unit whose range, volume and selectivity is remarkable. Nothing can compare with it at twice the price. Developed in the CROSLEY laboratories, this unit is absolutely the last word in long range Radio Receiving Apparatus. Used with head phones and loud speaker, it will bring in distant stations all over the house. Price without phones, batteries or tubes $55.00



CROSLEY CRYSTAL RECEIVER MODEL XV. A beautiful mahogany finished cabinet with amplifying compartment. The Receiver is the same as CROSLEY RECEIVER MODEL X shown on this page and is the acme of efficient and beautiful construction. See below for description of RECEIVER MODEL X. Price, without phones, batteries or tubes $70.00



CROSLEY RECEIVER MODEL XX. Same as the CROSLEY RECEIVER MODEL XV shown above but with compartment for batteries and a board under the amplifying chamber that slips out forming a desk for the operator. Music received on these instruments will be heard through a large room and often through the entire house. Beautiful Mahogany finished cabinet. Without phones, batteries or tubes, Price.....$100.00

Jobbers and Dealers

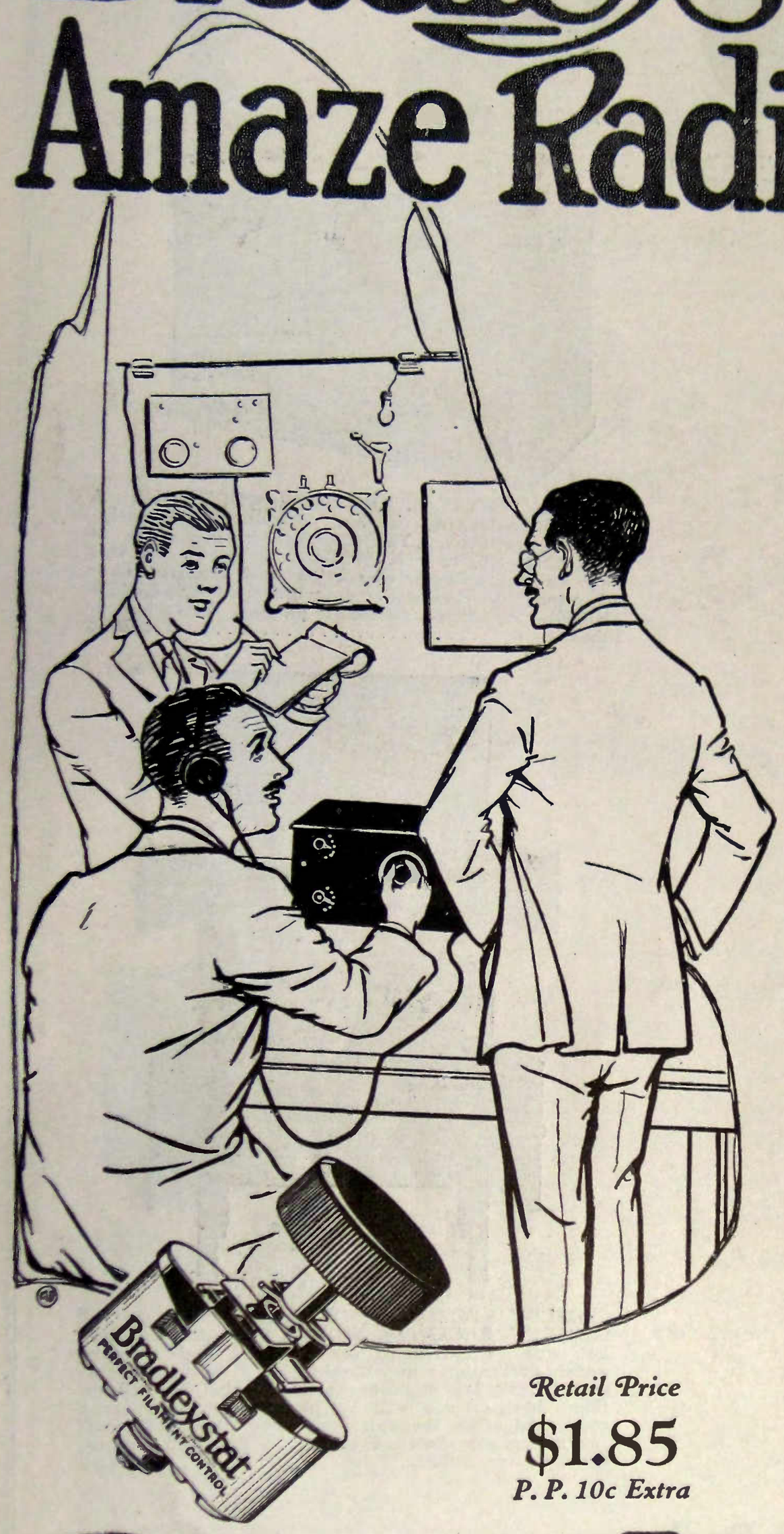
If you offer CROSLEY Apparatus to your trade, you will be working with the LINES OF FORCE instead of against them. The demand for CROSLEY instruments is increasing by leaps and bounds. Write for our attractive discount sheet.

Write for Catalog

CROSLEY MANUFACTURING COMPANY

DEP'T. WA3 CINCINNATI, OHIO

Bradleystat Tests Amaze Radio Engineers



Startling Effects Revealed by Laboratory Tests

Following are extracts from the unbiased report of the Amorc Laboratories, New York and San Francisco—

"Tested Bradleystat after 32 hours of continuous burning of tube. Battery voltage dropped from 6.88 to 6.01, but current varied only 2 points, which was unimportant.

"We discovered a very important point thereby. As voltage dropped, your device automatically adjusted itself through temperature of discs and ***thereby maintained better adjustment than any other rheostat.***

"You have rendered radio a great service with your device."

(Signed) H. Spencer Lewis.

Are you getting the benefit of our twenty years of experience with graphite rheostats? Order your Bradleystat, today, for better radio.

Allen-Bradley Co.

Electric Controlling Apparatus

283 Greenfield Ave., Milwaukee, Wis.

Member of the National Radio Chamber of Commerce

Retail Price

$1.85

P. P. 10c Extra

Ask for the Checkered Box at leading radio dealers. If your dealer cannot supply you, please send us his name and we will arrange with him to demonstrate the Bradleystat.

Bradleystat

REGISTERED U. S. PAT. OFF.

PERFECT FILAMENT CONTROL

a New Willard "A" Battery for $13.60

40 ampere-hour capacity

A new Willard—at a new low price!

That's the Willard FW Radio "A" Storage Battery.

It has Willard-quality plates, selected wood separators, tested rubber jars, well-built acid-proofed container.

It has specially-designed terminals that do away with clips and insure tight, easily-made connections.

It has a special marking for the positive terminal, so that there's no chance of your hooking up the battery in reverse.

It has patented soft-rubber gaskets around the terminal posts to prevent leakage.

It has a stout roller handle that's easy on your hand.

And remember this—

All Willard Radio Batteries are Shipped Dry and Fully Charged

This means that you are always certain of a fresh battery—a battery in which there has been no deterioration—and *one you can put to work at once without charging*. All that is required is the adding of the electrolyte (a solution of pure sulphuric acid and water) which takes but a moment.

See the new Willard FW Battery at the nearest Willard Station or at your dealer's.

WILLARD STORAGE BATTERY CO.
Cleveland, Ohio

Made in Canada by the
Willard Storage Battery Co. of Canada, Limited, Toronto, Ont.

Made in Three Sizes

Capacity and prices of this new battery are as follows: 40 a. h., $13.60; 80 a. h., $17.50; 110 a. h. $22.00. Prices slightly higher west of the Mississippi and in extreme South.

Willard STORAGE BATTERY

A
Better Rheostat
for 75 cents

Half Million "Radio Fans" Bought Fada Rheostats in 1921

An unquestionable attribute to the merit of Fada rheostats is the universal approval of over half a million satisfied users.

As a parallel to this achievement, Fada announces a new rheostat—a better instrument for less money. This new Fada rheostat, using a special hard fiber resistor strip, represents the peak in rheostat design and finish.

This new fiber strip is specially treated and will not absorb moisture and corrode the wires. A notable advance in rheostat manufacture.

The new Fada rheostat, as a whole is designed for use by those experts who love to construct and who take great interest in the appearance and efficiency of their set.

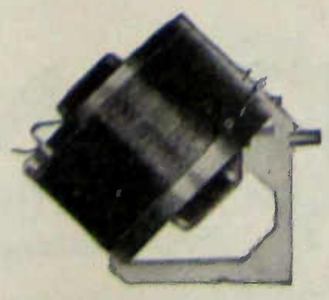
Truly, this is the rheostat you can buy with supreme confidence; one "you" can assemble in your radio set with genuine pride.

New hard grade fiber—
Will not absorb moisture
and corrode wires

Frank A. D. Andrea

1581-C JEROME AVENUE, NEW YORK CITY

$4.75

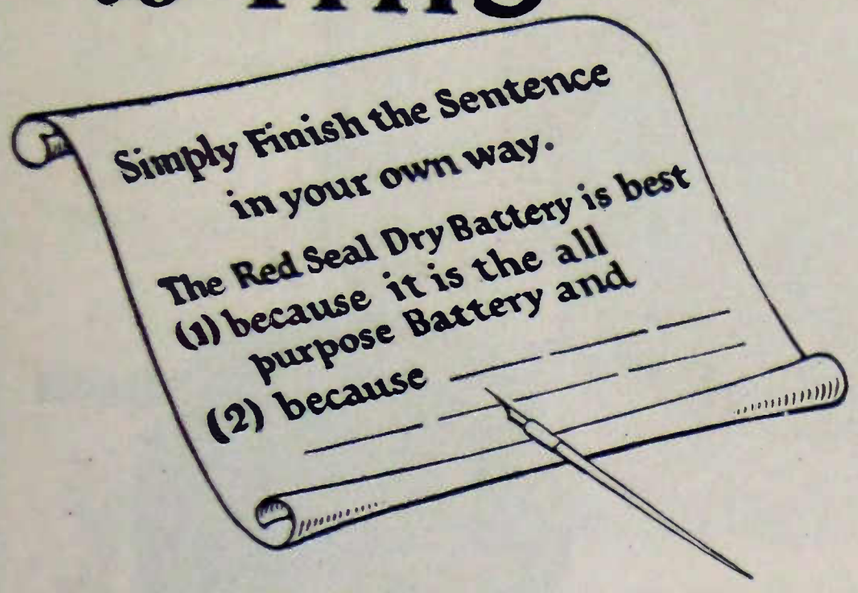


$1.00

$27.00

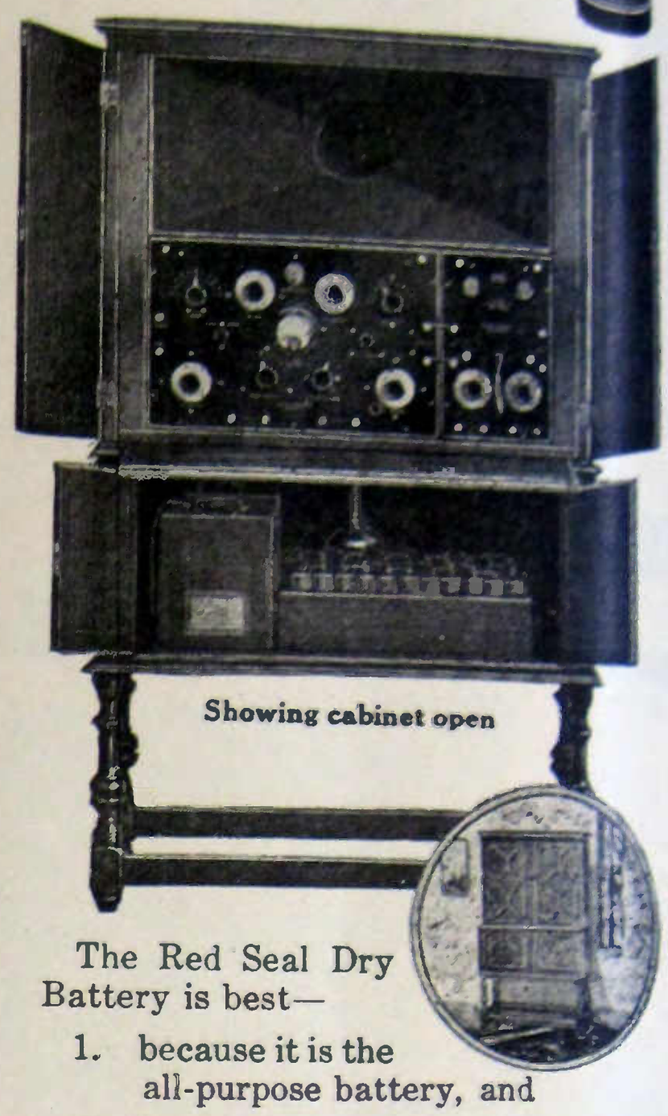
Starts Nov. 1st Red Seal Battery Contest Closes Nov. 15th

For the Best Answer to THIS-



You Win THIS $725.00 Complete Radio Set-Free

Hears broadcasted concerts 400 to 600 miles away; receives wireless telegraph from Europe, South America, from ships on the high seas, etc.



Showing cabinet open

The Prizes

It is appropriate that the Manhattan Electrical Supply Company should be the first to offer such Radio Sets as these. This company was one of the pioneers in selling radio, as well as being the manufacturer of Red Seal Dry Batteries used so successfully in connection with radio sets.

First Prize—$725.00 Complete Kennedy Radio Set

This Cabinet Type complete Radio Receiving Set is one of the finest and most up-to-date receiving sets yet produced. The cabinet is walnut and stands 58 inches high. Range from 400 to 600 miles for wireless telephone and 2,000 to 3,000 miles for wireless telegraph. Contained within the cabinet are all batteries, a Radio Homcharger De Luxe and Magnavox loud speaker with special horn. Installed free, in the home of the winner.

Second Prize—$408.50 Complete Westinghouse Radio Set

It consists of the Westinghouse R. C. Receiving Set and Western Electric Loud Speaker, "Tungar" Battery Charger, Storage Battery, "B" Batteries, Set of Manhattan 3,000 ohm Headset, 3 vacuum tubes, 2 telephone plugs and complete antenna equipment. Installed free in the home of the winner.

Third Prize—$256.50 Complete Grebe Radio Set

A complete receiving outfit made up of the well known Grebe C. R.—9 Regenerative Receiver with Two Stage Amplifier, Magnavox Loud Speaker, Storage Battery, a Radio Homcharger De Luxe "B" Batteries, set of Manhattan 2,000 ohm Headset, 3 vacuum tubes, 2 telephone plugs and complete antenna equipment. Installed free in the home of the winner.

50 Other Prizes

To each of 50 other contestants whose answers are meritorious will be given one of the famous Manhattan 2,000 ohm Radio Headsets. These headsets have great sensitiveness and high amplifying qualities.

How to Enter the Contest

Simply follow the instructions on the Contest Blanks given away by stores all over the U. S. A. Nov. 1 to Nov. 15. You will recognize these stores by the Red Seal Window Display pictured below.

The prizes will be awarded for the most appropriate answers completing *in your own way*, in not more than ten words the following sentence:

The Red Seal Dry Battery is best—

1. because it is the all-purpose battery, and
2. because .....

Important:—Only those answers written on the official Contest Blanks will be considered. Mail as many answers as you like to: Red Seal Battery Contest, Manhattan Electrical Supply Co., Inc., 17 Park Place, New York City.

The Judges

The winners will be selected by the following Judges: Mr. Llew Soule, Editor of "*Hardware Age*," New York; Mr. Howard A. Lewis, Manager of "*Electrical Merchandising*," New York, and Mr. Joseph A. Richards, President, Joseph Richards Co., Inc., Advertising Agents, New York.

Announcement of Winners

The names of the winners will be published in the *Saturday Evening Post* as soon as possible after the contest closes.

In case two or more persons submit winning answers, prizes identical in character with those offered will be given to each successful contestant.

Look for this Window Display in Dealers' Windows Nov. 1 to Nov. 15. It identifies Dealers who will give you free Contest Entry Blanks.

Important to Dealers

Duplicates of the 53 prizes are to be given to dealers having the BEST CONTEST WINDOWS. Write us at once for full information and free window display material if you haven't already done so.

MANHATTAN

ELECTRICAL SUPPLY CO., INC. NEW YORK

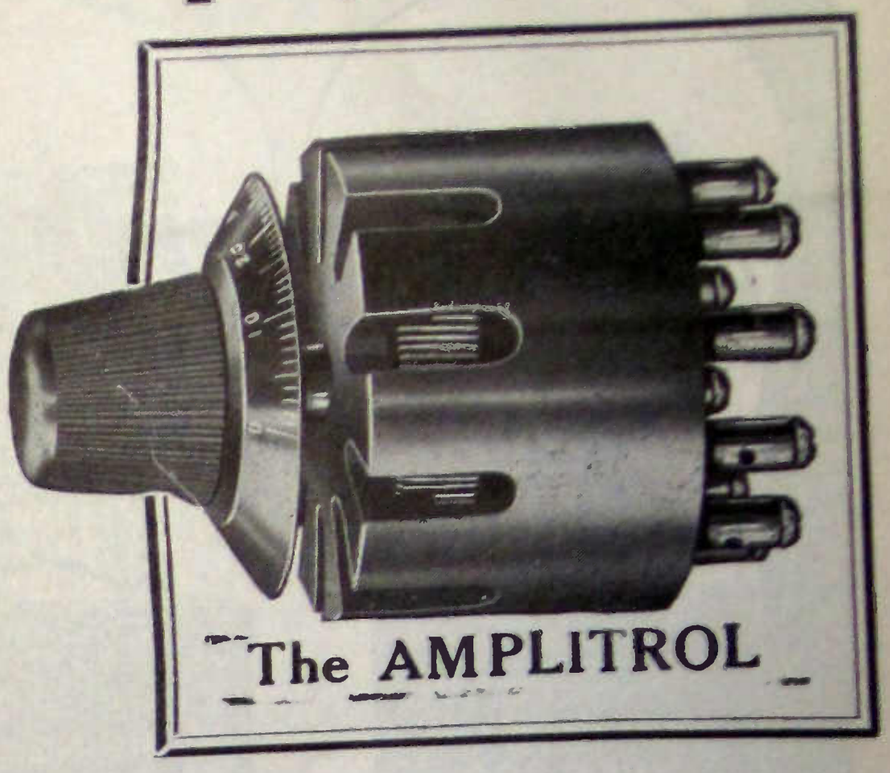
Makers of the Famous Red Seal Dry Batteries and Manhattan Head Sets

New Method of Controlling Amplifying Tubes

Complete control and adjustment of each amplifier tube merely by turning a simple knob. Does away with all jacks, plugs, rheostats and switches. A turn of the Amplitrol knob switches on the plate circuit and adjusts the filament circuit at the same time.

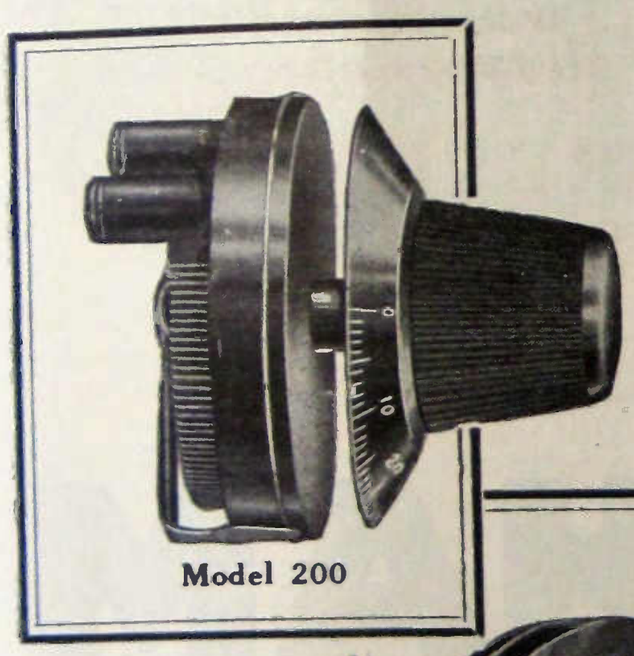
Lengthens the life of the tube from one-third to one-half as it absolutely prevents the ruinous practice of suddenly throwing a heavy current onto the delicate tube filament. With the Amplitrol, the filament current is turned on GRADUALLY.

Genuine indestructible condensite, white graduations on a black dial, phosphor bronze contacts. Strictly highest grade. Each of your expensive tubes deserves one. Complete with simple wiring instructions, retail price $4.00 from your dealer or from us direct.

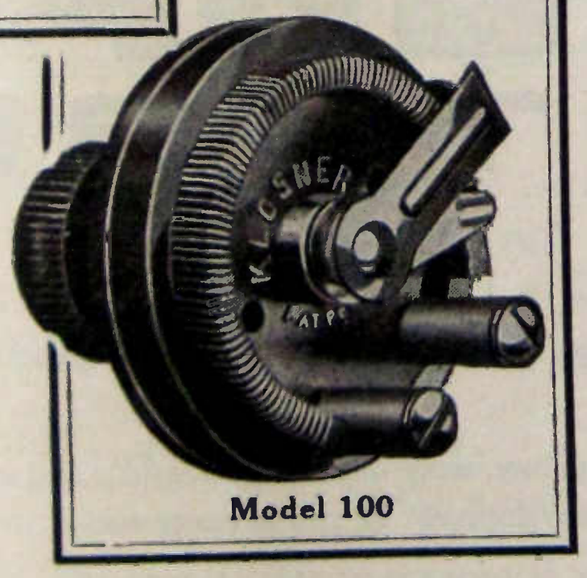


The AMPLITROL

Detector Tubes Demand a Rheostat with a VERNIER



Model 200



Model 100

It is simply impossible to get perfect reception unless you have perfect adjustment of your detector tube. No ordinary rheostat can be sensitive enough. It cannot give you the fine adjustment necessary for best results. This is why every detector tube should be controlled with a VERNIER rheostat.

The Klosner Vernier Rheostat Model 200 has a micrometer adjustment that permits getting EXACTLY on the very spot for perfect tuning.

The Klosner is the original Vernier Rheostat. No other operates both the coarse and fine adjustments with the ONE knob. No other can be so handy.

Also—the Klosner is wire-wound like all true electrical instruments—everything is where you can see it and repair it if ever necessary.

And it has a graduated DIAL to show at all times just where it is set. No guessing.

Genuine Condensite, phosphor bronze contacts, white graduations on black dial. Very high grade. Buy from your dealer. If from us, direct, $1.80.

Klosner VERNIER Rheostat, Model 100 is the original VERNIER Model. It was first and still is best except only Model 200. Thousands and thousands are in use. Same high quality as model 200, but equipped with a pointer instead of a dial. Greatly improved, but still priced at $1.50. All dealers or direct from us.

KLOSNER IMPROVED APPARATUS CO., 2024 Boston Road, New York City.

KLOSNER

At Last! The Perfect Radio Loud Speaker *for the Home*

Here is the Radio Loud Speaker you have been waiting for! Here is the Loud Speaker that gives you the world's supreme quality at an **amazingly low price.**

Price $20

Complete with 5 ft. flexible cord.

THERE is no other Loud Speaker like the DICTOGRAPH—made expressly for home use by the makers of world-famous Dictograph products—standard everywhere for the finest, most accurate and most sensitive sound-transmission and loud-speaking devices. No other organization in existence has the facilities, the skill, the experience of the Dictograph Products Corporation for producing a perfect Loud Speaker.

A beautiful instrument! Finely constructed, richly finished. Its handsome appearance harmonizes with any home. Highly burnished, French lacquered, eleven-inch spun copper bell horn attached to die cast black enamel tone arm, finished with nickel trimmings. Cabinet 6 x 5 inches base, 4 inches high, of solid, ebony-finished hardwood, mounted upon rubber knobs. Furnished complete with 5 ft. flexible cord. No extra batteries required.

DICTOGRAPH Radio LOUD SPEAKER

Years of experience in producing the marvelously sensitive "Acousticon" for the Deaf, the Detective Dictograph and the Dictograph System of Loud-Speaking Telephones have made possible this wonderful Radio Loud Speaker that reproduces every sound—singing, speaking, instrumental music—in crystal-clear, natural tones, full volume, and FREE FROM DISTORTION AND NOISE.

The Dictograph Radio Loud Speaker gives perfect results with any vacuum tube receiving set. No alterations; no extra batteries—you simply plug in and listen. The handsome appearance of this quality instrument harmonizes with any home.

And you pay even LESS for DICTOGRAPH quality than for an ordinary loud speaker. The tremendous demand of radio enthusiasts, volume production and Dictograph resources have made possible a REDUCTION from the price originally announced. Instead of $25, **the price is ONLY $20**—complete with 5 ft. flexible silk cord.

Ask for a FREE DEMONSTRATION of the Dictograph Radio Loud Speaker at any reliable radio shop. See why fans are so enthusiastic about it. Satisfy yourself that here at last is the perfect Loud Speaker for the home. Get DICTOGRAPH quality and still save money.

DEALERS

Order through your jobber or write for names of authorized distributors

The Standard of the World

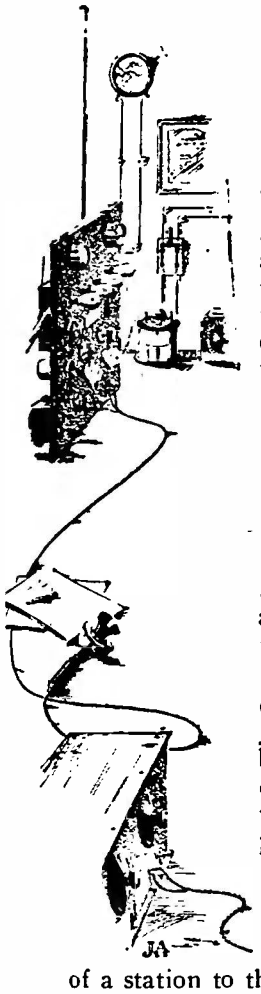
DICTOGRAPH *Radio* HEAD SET

THE Dictograph Radio Head Set has established a standard of quality impossible to secure in any other product. Its use on any receiving set, crystal detector or vacuum tube improves reception immeasurably.

Be sure you get the DICTOGRAPH Radio Head Set—the world's standard of supreme quality for super-sensitive and accurate sound-transmission. 3,000 ohms resistance. The best Head Set in the world. Regularly furnished as Standard Equipment with the leading Receiving Sets made.

DICTOGRAPH PRODUCTS CORPORATION
220 West 42d Street ***Branches in all principal cities*** **New York City**

In Our Opinion



Broadcasting Station Harmonics

DURING the past year of broadcasting the activities of transmitting amateurs have been considerably curtailed because of claimed interference, especially in the congested cities, between them and the new legion of broadcast listeners. As a matter of justice to the transmitting amateur it must be recorded that practically all curtailment of transmitting activity was voluntary; few, if any cases occurred where any action on the part of the authorities was necessary.

Many transmitting amateurs, in endeavoring to solve the difficulty readjusted their transmitters to wave lengths below 200 meters, but in spite of their good intentions, ran into new difficulties, in the form of harmonics from the broadcasting stations. These harmonics were especially heavy on wave lengths between 170 and 200 meters and made C. W. work in that band practically impossible.

Harmonics, especially from low-powered tube sets such as are used by the majority of broadcasting stations, exist only because of carelessness or negligence and can be eliminated, without a great deal of trouble or expense, by the installation of proper filter traps.

These devices will absorb energy radiated on wave lengths other than the main wave length of a station and so confine the radiated energy of a station to the wave length for which it is licensed—360 or 400 meters.

All broadcasting stations which radiate energy on wave lengths other than their licensed wave length should be compelled to install filters to confine the radiated energy where it belongs, so that other stations may work in their legally designated band of wave lengths without this unnecessary interference.

* * *

Wireless Transmission of Power

ONCE again a valuable service has been rendered to the radio industry by Dr. Charles P. Steinmetz, chief consulting engineer of the General Electric Company, in his disclosure of the practical nature of the obstacles to wireless transmission of power. His outline of the possibilities only serves to make the impossibilities more evident.

With this authoritative analysis of the situation available, there is small room left for the operations of the fake stock promoter of "universal radio power" concerns, while those sincere radio experimenters who might be tempted to waste time and money on the project will be spared their efforts for something more possible of immediate accomplishment.

Insurance Companies Adopt Constructive Attitude

AMONG the insurance fraternity there is visible a constructive attitude toward radio. One circular letter, sent to thousands of holders of fire insurance policies, begins as follows: "Private installation of radio equipment should not be made without expert electrical advice." This is what the radio industry has been saying for some time, and installation work has become an important part of the service performed by capable, thoroughgoing dealers. Results depend in great measure upon proper installation; one little slip-up by a careless novice and the receiving instruments function poorly if at all. Fortunately, installation that is correct from a radio engineer's viewpoint also is approved by the insurance companies. The two fit like hand and glove. There is no hardship involved in making installations that will fill both radio needs and fire insurance regulations; when you have satisfied one you have fulfilled the other.

* * *

Radio in the Cable Emergency

THE ease and rapidity with which existing trans-oceanic radio circuits were rearranged to meet unprecedented conditions during the recent cable interruption, clearly demonstrated radio's practicability. But of greatest importance was its emphasis upon the superiority due to the flexibility possible with radio circuits in trans-oceanic communication as compared with fixed point-to-point wire circuits.

In communication emergency between the New World and the Old radio shouldered the big additional load and delivered the goods.

* * *

Completing Farm Broadcasting

BROADCASTING of farm market reports has aroused so much enthusiasm among farmers as to justify the declaration that already the prophecy has come true that radio would end the isolation of the farm. Now the most isolated farmer is as close to the city as he is to his radio receiver—say within three feet. Just one thing remains to be done, and that is standardization of broadcasting practice and consequent uniformity of printed forms for copying reports. At present each station goes its own sweet way, as anyone knows who listens to two or more broadcasters. For the listener, it is important to get the information down correctly and quickly on paper; unless that is done, there is not much use listening.

Some broadcasters print and supply forms to those in their territory, the Missouri State Marketing Bureau being one of the leaders in this respect, but this is a burden of expense that should be borne by listeners. At present, commercial printers cannot place blank forms on the market because there would have to be literally hundreds of different ones, with only a comparatively small market for each. Officials at Washington have taken note of the situation, and are working on standardization. When it is achieved a great step forward will have been taken in broadcasting's already invaluable service to the farmer.

—THE EDITOR.

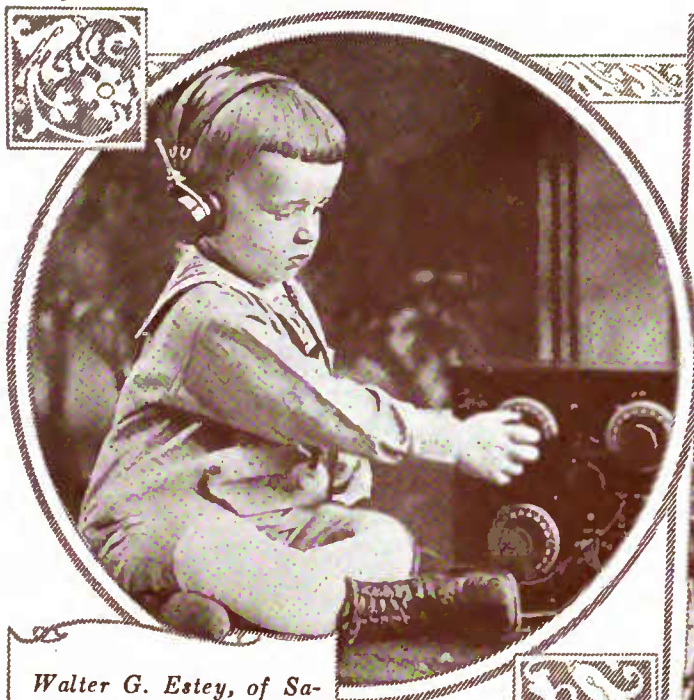
IT is said all people have a craving to write for the movies. And so when people meet Anita Loos, famous scenario writer, they ply her with questions. On page 35 she tells how radio can help these strugglers through a service department

MARY MILBURN as "Molly Darling" scores with a serious-minded radio number, while Frank Tinney and Georgia O'Ramey (inset) in "Daffy Dill" mix transmitting and receiving for a laugh—see page 33

SOLVING crime mysteries is the life-work of William J. Flynn, former head of the Department of Justice. He believes the radio telephone can, and will, play an important rôle in crime solution work of the future. *His interview is on page 36*

MARIE RAPPOLD'S voice transmitted beautifully when she sang Aida on that memorable night at WJZ, described in an article starting on page 27. Her comments on radio broadcasting include a frank discussion of operatic audiences in America

Explaining the Phrase "Radio in Its Infancy"



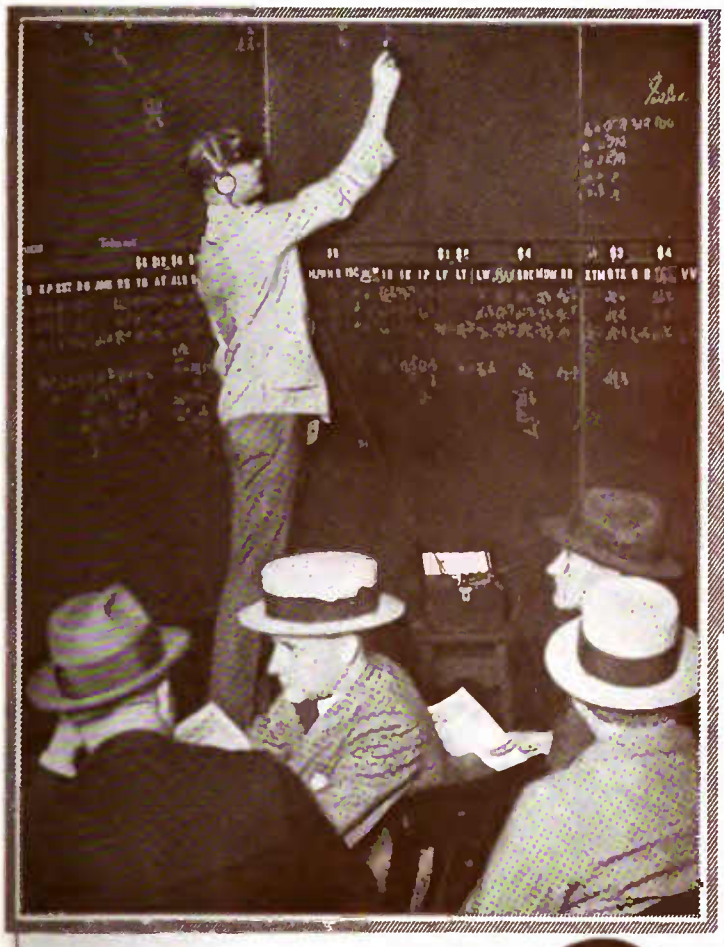
Walter G. Estey, of Salem, Mass., tunes in for his nightly bedtime story

The best part of the afternoon tea for children in London is the radio concert sent by a local newspaper

Again in London we see that the modern baby does not demand mother's lullaby any longer. This family group shows why. English children are as fond of bedtime stories as American kiddies

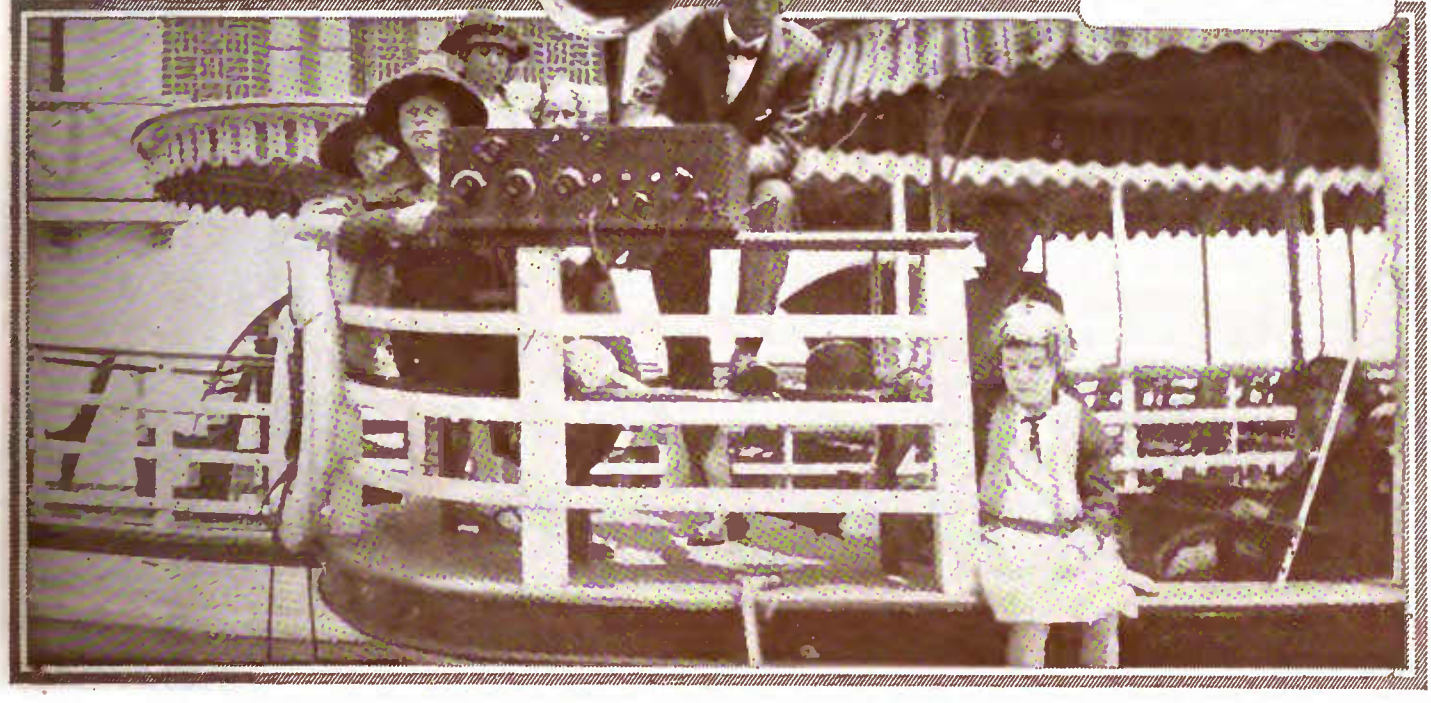
John Hardy, Jr., and Teddy, who amuse millions in the famous Mack Sennett Comedies produced in Los Angeles, demand absolute quiet during the concert period

Radio—Business Bound and on Pleasure Bent



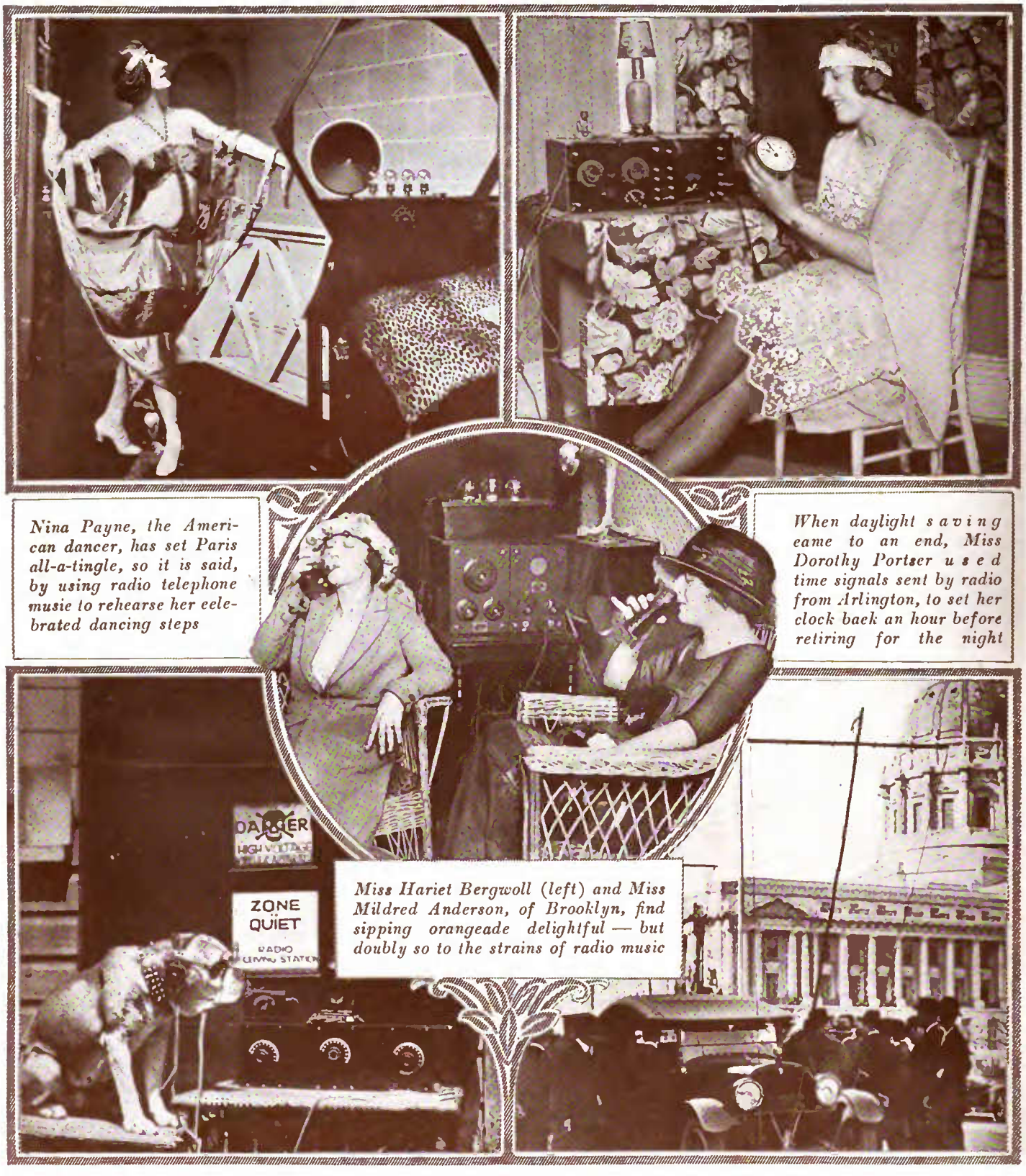
A Wall Street brokerage firm finds getting market quotations over the radio telephone is quicker than the regular way

The radio carriage call is said to be giving satisfaction at the Westchester Biltmore Club, Rye, N. Y. It's the latest touch to an exclusive club



For the entertainment of his patrons, the owner of a launch which carries pleasure seekers about on Lake Merritt, Oakland, Cal., has installed a radio receiving outfit. The excursionists dance while music is coming over and, during the odd moments, listen eagerly to news items, and other broadcast features from nearby stations

No Matter Where You Go—You Will Find Radio



Nina Payne, the American dancer, has set Paris all-a-tingle, so it is said, by using radio telephone music to rehearse her celebrated dancing steps

When daylight saving came to an end, Miss Dorothy Portser used time signals sent by radio from Arlington, to set her clock back an hour before retiring for the night

Miss Hariet Bergwoll (left) and Miss Mildred Anderson, of Brooklyn, find sipping orangeade delightful — but doubly so to the strains of radio music

Now this dawg is of the English bull species. His owner is Edgar C. Ganse, of Kennett Square, Pa. Ganse says the dawg takes a keen interest in radio and one look at the pup's expression and specs should convince you of it

The radio auto is here! First test in San Francisco of a new type of receiving set, with folding antenna 'n' everything. It is claimed signals were heard while the auto was going thirty miles an hour, thus breaking two records

When Entertainers Are Entertained by Radio

Ann Pennington of "Scandals" fame, says she likes radio next to dancing—and that is like saying 105 per cent.

Doug Fairbanks finds his radio transmitting set handy in ordering extras about for the "mob" scenes in his pictures

Charles Ray of motion picture fame calls this primitive set his Ray-dio, which we suggest he have copyrighted as a contribution to science

Henry Van Dyke on Radio

Dr. Henry Van Dyke, of Princeton University, and one of the most noted of contemporary American writers, wrote the following exclusively for readers of THE WIRELESS AGE.

BY HENRY VAN DYKE

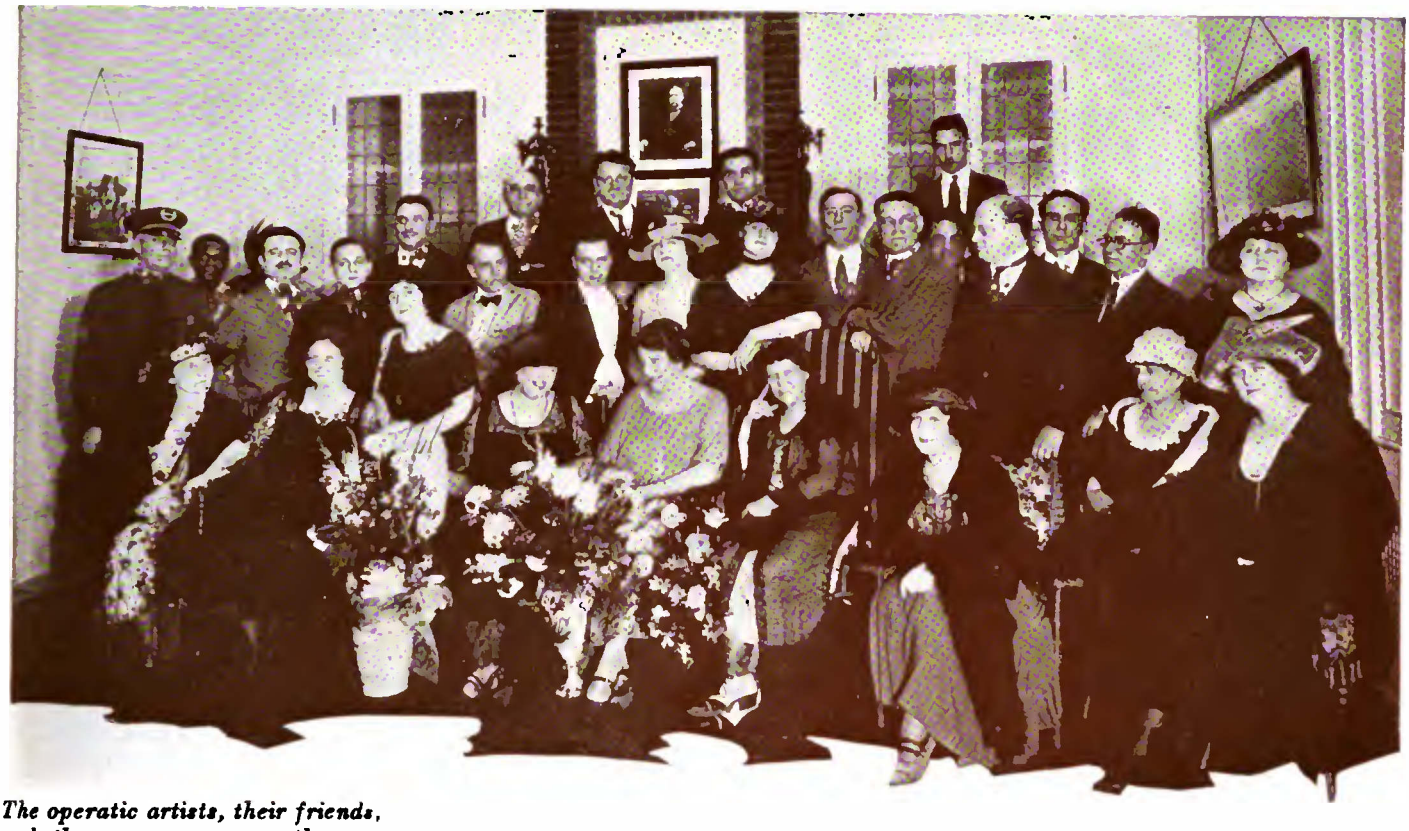
Henry Van Dyke

THE radio telephone is beyond all question one of the most marvelous inventions of the present age. It seems to open a new view into the mysterious possibilities by which we human beings are surrounded in this wonderful world which the Eternal Being has created and is governing in accordance with His wise and beneficent laws. The more we know of these laws the better it is for us, not only because our intelligence is thereby increased, but also because our powers are thus enlarged. In this aspect of the case there should be no doubt that the invention of the radio telephone is a gain for education.

The practical utility of the radio telephone in schools and colleges will depend entirely upon the way in which it is used. If it is employed merely as a kind of scientific toy it will distract the attention of the pupils from serious work without giving them any compensating advantage in the way of real mental training.

It does a boy or girl no particular good merely to tinker with "transmitters and receivers" without any intelligent purpose in view.

The meaning of the message that comes by wireless is much more important than the surprising fact that it arrives without a wire. In education nothing can take the place of mental concentration, hard work, patience, and clear thinking. In the development of these habits of mind the direct personal contact of the pupil with a wise, enthusiastic, "live" teacher is so important as to be almost indispensable.



The operatic artists, their friends, and the announcers, as they assembled in the studio at WJZ on the night Aida was broadcast

Aïda on the Air

By Maurice Henle

ON the evening of September 13—a lucky thirteenth for radio—that large part of the invisible audience that was in tune with WJZ heard the opera "Aïda," and secured a new insight into the vast promise of the future of wireless telephony.

I could pound out superlatives on my typewriter from now until Gabriel blows his trumpet, and still fall short of a just appreciation of that night, and its meaning to the radio world. What would be the use? You—the reader, the listener—could do the same, for you, too, heard; you, too, appreciated; you, too, were thrilled.

Far better, then, to place before the readers, and the listeners, a panorama of the events of that evening, a glimpse behind the scenes. You heard—now read, and see.

But before you journey with me to the Newark studio from which Aida was sent into your homes, please fix one thought firmly in your collective mind. In the short hour during which you listened, you heard radio history in the making. Coming events cast their shadows before, and in this instance the shadow is a beam of light that will serve as a guide for those who direct the still youthful footsteps of radio broadcasting.

Because of an unexpected hitch in arrangements the opera did not get under way until shortly before eleven o'clock, though scheduled for two hours earlier. Marie Rappold, the prima-donna soprano; Stella De Mette, the mezzo-soprano; and Charles D. Isaacson, director of music for the New York "Evening Mail," who was responsible for securing the operatic artists, had reached the studio on time, but the others had been delayed. Without them the opera could not be given. A small group waited in the studio as the minutes flew by. Soon the big touring car with the other singers drew up before the door—and a few minutes later Mr. Isaacson was asking for absolute quiet.

The usual announcement of the station was made, Mr. Isaacson was introduced and "Aïda" was on!

The small group of those fortunate enough to be within the studio—some twenty-five persons, as the photograph reproduced with this article will show—leaned forward expectantly.

"We are in Egypt," Mr. Isaacson spoke into the microphone, "the old land of ancient splendor, in the days of the Pharaohs, when Egypt was ruler of the known world.

"The days of temples, pyramids,

WHAT—WHEN—WHERE AND WHO

What — Broadcasting of the opera "Aïda" by principals of the San Carlo Opera Company. Evening arranged by Charles D. Isaacson.

When—The night of September 13, 1922.

Where — Radio Corporation — Westinghouse Broadcasting Station WJZ, at Newark, N. J.

Who—

Marie Rappold, soprano as "Aïda," the slave.
Stella De Mette, mezzo soprano, "Amneris," the Egyptian Princess.
Antonio Boscacci, tenor as "Rhadames," the Egyptian Captain.
Joseph Royer, baritone, as "Amonasro," King of Ethiopia.
Pietro de Biasi, basso, as "Ramfis," the high priest.
Natali Cervi, basso, as the King of Egypt.
Carlo Peroni.....Conductor
Fortune Gallo .....Impresario
Giacomo Spadoni ....Accompanist

cruelties, of religions of strange rites; the unusual costumes of those colorful, sensuous hot lands, are before us. There are the old hatreds of different nations, the martial marvels of wars, the joy of conquests and victories, the tragedies of defeat—slaves, courtiers, dancers, priests, soldiers—and in the midst of it all, within the confines of temples and palaces, a conflict of strangely opposing loves.

"Rhadames, captain of the Egyptian guard, endowed with a fierce love—with him the story follows its course. Amneris, the daughter of the King of Egypt, a majestic, jealous, powerful woman of unyielding passions, has loved this brave, stalwart captain of the guards for many moons. In her train of slaves is one Aïda, a beautiful captive of Ethiopia, a dusky maid of fine impulses, held in a strange land, subject to the whims of the Princess.

"But Aïda herself is no lowly woman—she is the daughter of the King of Ethiopia, and a Princess in her own country. Secretly a love has been growing between Rhadames, captain of the guards . . ."

On and on went the speaker, and I understood his emphatic words to me earlier in the evening that he would carry back the radio audience that night to old Egypt.

And back they went to the days when that African nation dominated the world, when its customs were the only ones that counted, when Egyptian color and romance and adventure were world-famous.

And first one of the stars sang and then another and another, each climbing to greater heights until Marie Rappold . . .

Notes as liquid as the waters of the Nile, rich in tone, a perfect voice that brought an involuntary burst of applause from even the professionals in the studio, which must have found its echo again and again for miles beyond the city limits, into the homes of rich, the poor, the camper, the lumber jack—

After each selection sung, Mr. Isaacson took up the thread of the story, leading gracefully up to another burst of song and another and another, —solos and duets, and ensemble numbers, until the very end of the opera.

"Aïda" went over. Cares were forgotten and worries fled from thousands of homes. Only the operator's voice giving the usual "good-night" banished the spell and brought back the reality of the 20th century.

It was an evening that will live long in the memories of those who are following the development of radio broadcasting.

The two hours' delay that preceded the opera gave me the opportunity of getting an expression from Madame Rappold on broadcasting in general and in particular, the effect of operatic broadcasting on the future of opera.

We left the studio and went to the office of the superintendent. There, amid the unromantic surroundings of bills payable and bills receivable, the great singer, the one who was about to create radio history, made the prophecy that in the years to follow radio will become one of the most vital influences in the cultural life of the country.

But she added, and without bias, that radio never will, never can, take the place of the theatre, the movies, or displace the opera.

"Eyes were made to see with," she said, "and until the whole world goes blind, people will continue to be just as deeply interested in seeing as in hearing."

Madame Rappold was prima-donna soprano of the Metropolitan Opera Company of New York, and for several seasons past she has been a guest artist of the San Carlo Opera Company. During the many years that she has thrilled American audiences, she has visited hundreds of cities and towns, and like other stars of long experience, she knows opera audiences thoroughly.

And here is what she says:

"Seventy-five per cent of 'American' opera audiences are probably foreigners or foreign born!"

During the opera season at the Metropolitan, she pointed out, one may get a concrete idea of what this means. The gallery lines, composed of those who would rather hear opera music than eat, stretch for hundreds of feet. At times you will find them completely encircling the opera house, which occupies an entire block. And in the line whom do you find? Foreigners or foreign-born men and women, in the majority.

I understood her point, for I have seen, many times, this snake-like line of die-hard opera fans, have seen them stand for hours, sometimes all night, for the privilege of buying tickets for their musical heaven.

Charles D. Isaacson, who arranged for the wonderful night. The small photo in the first column on this page is of Stella de Mette and Carlo Peroni. That in the second column, Natali Cervi, basso, who interpreted the part of the King of Egypt

"And this condition," went on the singer, "is not by any means confined to New York with its great foreign-born population. It exists in the other large cities.

"I will say, and gladly, that more and more Simon-pure native-born Americans are becoming opera goers. They are learning to like opera, they are cultivating a taste for it. But even so, let me tell you this: Even when the usual ratio of 75 to 25 in favor of the foreign-born is turned about, and the audience, as happens on occasions, contains a majority of American-born men and women, I can say that the shouts and applause from the 25 per cent of foreigners every time will drown out that of their new brothers and sisters.

"And what does that mean? To me it is significant. Why do we find this condition? It is because Americans haven't been educated, as a mass, to opera. For some reason or other they have, to use slang, 'laid off it.'

"Radio will change that. The people will hear operatic selections by wireless telephone. In that way the great mass of Americans who are not familiar with opera will learn to like it. For radio goes into the home, and I have no doubt but that of the 60,000 or so families waiting to hear us tonight, fully 75 per cent of those who are not regular opera patrons will become so.

Fortune Gallo (above) is the impresario of the San Carlo Grand Opera Co. On the extreme right is the photo of the tenor, Antonio Boscacci, while the one in the center column shows Boscacci on the left and Pietro di Biasi, basso

"It means radio's opportunity to improve the musical culture of our country. It means more to opera than the average person realizes."

Later in the evening, when it was her turn to step up to the microphone to sing, she showed that she has a keen sense of humor. She said "hello" to someone out there among the thousands of listeners, said it in a way to send a chuckle about the studio.

I do not know whom she addressed, but I wondered if it could be one of those in the little up-state town she had told me about, where she has a summer home. They were listening in up there, those intimate friends, and it was not difficult to picture the far-off group, smiling proudly and perhaps a bit flattered.

No chronicle of that wonderful night could be complete without introducing the man responsible for it—Charles D. Isaacson.

New Yorkers know him more intimately than do those in other parts of the country, and for the benefit of the latter—and some of the former—let me introduce him as the one responsible for some two thousand free concerts being given to the New York public in the past seven years.

It was due to this unusual man's boundless energy that upwards of 3,000,000 persons have, in that period, heard the best music free of charge.

Mr. Isaacson seven years ago started in to materialize a vision he always had cherished. He told me about it as we waited for the cast of the opera to arrive.

"I felt that the best is none too good for the people, that there is no human being incapable of loving and desiring the finest in life, that the greatest art belongs to all the public and can be understood by them without spending years of technical study," he told me.

"I want to break down the old tradition that only the elite, the sacred circle, can appreciate great musical performances."

So he set in motion his Musical Movement, which was to grow from an original body of thirty persons to many "centers" with 85,000 members. He has had many of the greatest artists appear before the public, and he estimates conservatively that had it been necessary to pay these stars, the public would have had to spend more than $5,000,000 to hear them.

This, then, is the man responsible for the broadcasting of the opera "Aïda" from WJZ by members of the San Carlo Opera Company.

When broadcasting made its bow, the new science had no more interested observer than he. He realized, as he told me, that it offered possibilities far greater—from the viewpoint of reaching the people and putting his idea across—than concerts ever could. He recalled the performance he gave in the Hippodrome to some 7,000 persons—a packed house—and spoke of the audiences in the parks, numbering at times 12,000 or more. However wonderful the size of these gatherings was, they were puny in comparison with the hundreds of thousands he would be able to reach simultaneously by the radio telephone.

And the result was that he directed his energy to giving concerts by radio. In the early stage of his work he devoted hours to the planning of programs. He estimates he has figured in about two hundred broadcast concerts, and Eastern fans, as well as Western ones having sufficiently sensitive equipment, will readily testify that the evenings of entertainment contributed by Mr. Isaacson were among the best that radio has ever offered.

It is hardly surprising that he should have been responsible for the broadcasting of "Aïda."

"My idea," he said, "has been, right along, to broadcast a series of the operas. Thus far the radio public has heard 'Traviata,' 'Martha,' 'Cavalleria Rusticana,' 'Pagliacci,' 'Barber of Seville,' and now, tonight, 'Aïda.'

"More are to come, including 'Carmen,' 'Il Trovatore,' 'Tales of Hoffmann,' and others.

"This thing to me amounts to a passion. I want to get my idea across, I know I'm giving the people what they want. I am certain that they crave better music. This kind of music awakens the soul of a people. It produces better and more satisfied citizens, and we must go on and on with the work until our goal is reached.

"Radio, the new tremendous power, will do its share. And just how it will figure in the future you will hear tonight—and so will about a hundred thousand others."

Just about that time the missing singers arrived and Mr. Isaacson was lost in his work.

He crossed a narrow corridor and entered the studio.

And then do you know what he did? He shed his coat and gritted his teeth and rubbed his hands together briskly.

"Silencio," he cried, smiling, yet deadly in earnest, "we are about to make radio history. Let's put it across with a bang!"

And over with a bang it went. It whizzed through metropolitan New York. It soared over the lazy country roads of rural communities through New Jersey, Delaware, Pennsylvania and Connecticut. It sang its way even to the Mississippi River and further, through the cooling Ohio valleys.

It seemed to cry: "I Am Radio—alive—eager to go on and on! I Am Radio! What you are hearing now is beautiful, it is marvelous—but I am a Giant, the Radio Giant, and there is no stopping me! Follow my progress to be educated, entertained and happy!"

That's what the impulses seemed to say as they leaped through space and were interpreted by hundreds of thousands of receiving sets that night.

At least, that's the message hundreds of letters from listeners, which have kept the postman busy ever since, say they seemed to bring.

And after all, what is this lesson taught by such a triumph as putting Aïda on the Air? Doesn't it point out emphatically the simple joy of home life—the happiness of sitting about the fireside in the family group? The foundation of our country is the family, and if radio has intensified the interest in it this is possibly its most valuable service to American life.

"YOU, the common people make the language out of your own mouths, and makers of dictionaries can only follow your speech. That is why the term Radio Broadcasting already has won a place in the dictionary."

Frank H. Vizetelly

Lexicographer, Tells George W. Gether How Radio Affects the Language

Frank H. Vizetelly

WHAT influence will the radio telephone have upon the English language? Will this astounding means of communicating the voice to hundreds of thousands mold the language in new ways?

To secure an answer to those questions, queries that have arisen in the minds of many who have listened to the broadcast programs, I sought Dr. Frank H. Vizetelly, lexicographer and authority upon modern English, Managing Editor of Funk and Wagnalls' New Standard Dictionary.

"Dr. Vizetelly," I said, "do you see any signs that as yet radio broadcasting has had any influence upon the language?"

"Yes," he replied, "decidedly. Only two weeks ago we included a definition of the term itself, 'Radio Broadcasting,' in the new edition of the Standard Dictionary. It is a new phrase that has come into common use, and as such is now a part of the every-day vocabulary, a part of the living language. As similar additions are made to our common tongue, you will find that the lexicographers will recognize them."

"Do you not expect those additions to be numerous," I asked, "as the radio telephone brings the voices of high authorities to the multitude—won't the radio broadcasting services unify the language, making it the same in all parts of the country, eliminating territorial and sectional words?"

To this Dr. Vizetelly responded with a definition of his work as a lexicographer. "You must understand," he explained, "that a lexicographer has no opinions. He can only reflect what is the fact. You, the common people, make the language out of your own mouths, and I can only follow you. What will develop in the future may interest me as an individual, but in my official position I am but passive, I only say what you have said first and said often enough for all to understand you.

"You can see that I can have no opinions. It is not the duty of lexicographers to have opinions; they are seekers of facts, interpreters not of the future, but of the present.

"We, the lexicographers, do not make the language; it is you, the people, who make it. You lead, and we follow. You speak, and we listen. What you say we write in our dictionaries. You are our employers, we your employees, and we obey you as you make the language.

"Yes, I have listened to the radio broadcasting programs with a great deal of interest. Personally, I think that the radio telephone is the greatest development of the age, and I have no doubt that sometime—I dare not hazard an opinion when—the radio telephone will reach over all the world and make all languages equally accessible to everyone.

"The more universal the radio telephone becomes, the greater its influence will be. Inasmuch as the language, any language, owes its vitality and growth to the popular interests that absorb the attention of the people, the radio telephone cannot help but have a marked influence upon the current vocabulary. The first such effect, as I have said, is to be seen in the inclusion of the term 'Radio Broadcasting' in the new dictionary."

As time goes on, other contributions will be made to the dictionaries in the form of other words and phrases created by the new radio art and science of broadcasting. It is little less than remarkable that within the short space of less than two years the radio telephone has brought even one new word to the makers of dictionaries, for, as can be seen from my conversation with Dr. Vizetelly, they are traditionally conservative.

Use by the people governs their conservatism, and a word must have come into the general language as spoken everywhere and, moreover, reached a permanent place, before it is put in a dictionary. Such words as trade names and trade marks, having a narrow meaning, restricted to a single product, are kept out. No one finds "Packard" in the dictionary, for instance, nor "Radiotron."

However, so great is the control of popular use over the lexicographers, that when the public appropriates a trade name as signifying a whole class, into the dictionaries it goes. There are several examples of this in the 1913 edition of the Standard Dictionary. "Celluloid," for instance, is a trade mark, and was originally an artificial word coined to represent the product of one company. The public, however, began to apply the word to all articles of similar composition, and presto! into the dictionary it went.

The same thing occurred with "Kodak," which is a word that the public applies to hand cameras in general and is so listed in the Standard Dictionary, despite the insistence of the famous Rochester company that "if it isn't an Eastman it isn't a Kodak." The word was coined in 1890.

Dictionaries are authorities, and are guarded carefully against slang and those temporary expressions that come into great popular favor on the wave of a fad, only to sink into oblivion when the craze that created them dies away. Not until the editors are absolutely certain that a new word has become a permanent part of the language is it allowed a place in the pages of a dictionary.

Other industries that have contributed new words to the English tongue often have had to wait many years before they have had the honor of recognition from the lexicographers.

The fact that broadcasting already has won that distinction is a tribute both to the perspicacity of the dictionary publishers, and to the position of permanence into which radio broadcasting leaped in such a short time.

"Seeing" a World's Series by Radio

Vivid Accounts of Play-by-Play Progress of Recent New York Giant-Yankee Games Heard by Radio Audience

By Glenn Scott

The Polo Grounds, New York. Packed in these spacious double-deck stands were about 40,000 baseball fans for each of the World's Series games. But they were a handful compared with the radio "audience"

"BUSH is now receiving a bouquet of flowers."

A short pause—and then:

"He says there are no raspberries in it!"

And an immense audience of possibly half a million men, women and children in a score of states laughed. The by-play during the ceremonies before the first baseball game of the 1922 World's series was gaily reported by radio. People settled themselves comfortably in their chairs at home, or edged closer to the loud speakers in the shops. The first game was about to commence.

Get the picture in your mind. A mere 40,000 were at the Polo Grounds, New York, to see the New York Giants and New York Yankees fight for the world's supreme baseball title. Packed stands. Players on the field. A group about the home plate. Then the presentation of the flowers.

And in the press box back of the plate, was a famous sport writer, Grantland Rice, with the microphone in his hands. He describes what his experienced eyes see, and his unseen audience of eager radio-baseball fans chuckle.

A million smiles and chuckles within five seconds of the actual transferring of the flowers. A multitude of persons made supremely happy and greatly excited.

They heard the national anthem played, were told that the players were taking their positions and were tossing the ball back and forth. And then—

The receiving sets reproduced a 40,000-throat power roar. The World's Series was on!

Play by play, ball by ball, strike by strike the report came from Grantland Rice. We listeners could tell from the volume of cheering whether it was an out or a hit—at least we tried to guess even before Rice spoke, which was almost immediately. We knew that when the cheering rose sharply and then fell abruptly by the wayside that the hit was a high one—and was caught.

And wonder upon wonders, we could even hear the boys going about the stands crying their hot-dogs and cold drinks!

We radio listeners lived the series as did they who actually were in the stands. And we did it in the comfort of our homes, or in our offices, leaning back in a chair, with our feet on the boss's desk!

Rice's own voice was heard off and on during the series. When he desired to rest his throat, he dictated to one of the regular announcers from WJZ, through which station the description was put on the air. Sometimes the vast radio audience could hear Rice prompting the announcer.

Even this versatile chap became excited at times, for frequently he sent the invisible audience into roars of laughter with his unintentional humor.

And this is Grantland Rice, famous sports writer, who described the games

During the first game, Meusel of the Giants worked his way to third base, and a hit brought him in. It was a tense moment; then:

"Meusel scares," said the excited operator. . . . "Beg pardon, *scores*."

That was funny, and true, too. True because by giving way to the excitement the announcer showed the state of the game as no number of the proper words could. His error spoke for the fans at the Polo Grounds, and for the radio listeners. They, too, were excited, for they were hearing not only radio, but baseball history in the making.

In many thousands of homes printed or hand-made score cards recorded the progress of each game. Publication of the "Radio Player Board" by THE WIRELESS AGE assisted many listeners to follow the games as each play was described. Many homes and even a few offices were found to have cut out the chart, and no doubt thousands were in use. In the office of THE WIRELESS AGE itself the chart was used by the editors, who gathered around an Aeriola Grand. As each man came to bat the square bearing his name was moved to the home plate. Strikes, balls and outs were recorded by using the appropriately lettered circles, and the box score kept.

The Player Board visualized the field before the group. From the instrument came the roars of the crowd and the voice of Grantland Rice. Twice during the series that most exciting situation in baseball existed: three men on bases, three balls and two strikes, two out. The next ball might bring in from one to four runs, or retire the side. All eyes were glued to the player board as the yells of the fans resounded via radio through the office. The roar rattled the windows, then became hollow with hoots of disappointment, as Grantland Rice's

voice came shouting through the turmoil: "Bush drops a high one in center field." The player board lived up magnificently to its promise of visualizing the Series.

The general public in the street likewise shared in the results as picked up by THE WIRELESS AGE, a score board being maintained in one of the big second floor windows at 326 Broadway, under the Editorial Offices. This proved to be exceptionally fortunate as a location, being several blocks from City Hall Park, around which several newspaper boards were operated. Men who had reluctantly left one of the boards further down town often found that by the time they had gone a few blocks north the score had changed. Those going in the other direction discovered this score board as the first indication that they were approaching the newspaper district. For a long distance north on Broadway and for several blocks south this was the only board visible and was eagerly inspected by passengers on passing street cars, by motorists and by pedestrians.

In fact, radio-conducted boards proved to be popular in all parts of the city, even in sections in which one would not expect to find them. The last game of the Series was played on Sunday, and most of the radio dealers opened their doors that afternoon for nothing else than the baseball results. A tour in the downtown section disclosed packed shops and crowded sidewalks. Normally, New York's business district south of 42nd street is dead on Sunday. Few people walk the streets, and only the main routes to the ferries and bridges see any traffic. However, the word had been passed in all the shops: "We'll be open on Sunday for the Series." And open they were until the game started, by which time no one could get in any of them unless some one opened the way by getting out. Downtown New York never saw anything like it before: street crowds on a Sunday. Most of the listeners had come considerable distances to reach their favorite radio shop and get the results of the national sport.

Of course, dealers in all parts of the city featured the Series, using window cards and also mailing circulars to customers and prospects. Every radio shop contained a crowd, usually as many as could get inside, while an overflow meeting was held on the sidewalk within the limits of audibility and the patience of the traffic police.

Radio has entered the home—and perhaps it is one of its lesser handicaps that it is such a home-body. When an automobile is sold it runs around the streets and roads advertising the fact, but when a radio set is sold it goes home and stays there. It makes no public display of itself, but settles down quietly to its job of taking a leading part among the educational and entertaining resources of the house in which it happens to be. It takes the broadcasting of a big event like the World's Series to draw public attention forcefully to this greatest of all means of disseminating information.

How efficient it is, how swift and sure, compared with older methods! For years the public has been accustomed to the really remarkable speed shown by the newspapers in operating their mechanical and electrical boards, which show every play much as thousands of the radio audience did for themselves with the printed Player Board. However, the radio dealers with their simple equipment of an antenna, ground, receiving set and loud speaker were able to beat the newspapers, beat them consistently by about half a minute.

This was shown rather strikingly around City Hall Park in New York City. This is a big open square, and during the series two newspapers operated two large player boards for the crowds that thronged it. On streets leading off City Hall Park are several of the leading radio dealers. The crowds before the loud speakers got the news first; the Giants would score a run, a yell would rise from the radio neighborhood, and half a minute later a roar would come from the masses in front of the boards. At one corner it was possible to see a newspaper's board, and also a box score kept by radio, the latter always ahead in showing the end of each half of each inning. This did not spoil the attraction of the big boards operated by the newspapers, for none of the dealers could afford such large and expensive displays, nor was there space for more people than gathered around the receiving sets. So the newspapers drew a few big crowds, and radio told the story first to everybody who cared to listen anywhere.

That hundreds of thousands consid-

(*Continued on page* 46)

By Grantland Rice

In the New York Tribune

WE have been asked to tell just how it feels to talk to a million people, scattered over two hundred thousand square miles, in a single address.

After the first pleasant shock, when we discovered that no one could answer us back or cut in with a winning argument, the rest of it was something of a thrill, in this respect, at least:

After the first inaugural statement it was as simple as talking to one man, a dumb man who isn't deaf; as simple as asking for a cigarette or ordering a peck of potatoes from the grocer over the phone.

The most intricate contrivance in the world, to one as unversed in mechanics or electricity as we are, had suddenly become the simplest thing in a highly complex age. If we had ever been addicted to public speaking we might have missed the ringing applause from our audience. Still, there were moments when we almost felt, by overworking the imagination, that we could take the cheers for Frisch and Nehf and Bush as personal tributes at the conclusion of some ringing outburst of eloquence, such as "Kelly strikes out."

Our imagination, possibly, should also have encompassed the great crowds and the distant spaces waiting for the story of each play. There was an early flash of this, but after a single inning it was just as if we had been doing this same thing for twenty years, showing again how quickly human nature adjusts itself to the ways of science and the sudden shocks of modern existence, where the impossible takes place every fifteen or twenty minutes through the day.

The results of the games were heard clearly, even in Wall Street, where this picture was taken, and where tired brokers halted in the street for a bit of relaxation

"I COULD not help noticing how quickly the audiences were swept into enthusiasm by the radio number"

Mary Milburn Lauds

Radio in the Theater

By Edwin Hall

Mary Milburn makes an appropriate Molly Darling

THE use of radio scenes in theatrical productions really commenced with the current season. Producers, sure of the popularity of radio and knowing that it has become a permanent part of American life, preferred to await the opening of the new Fall plays. They wanted to save their most modern ammunition for the newest shows. "Don't shoot until you see the whites of their teeth," is a managerial motto—and now that the public is grinning with delight over the wireless telephone, the managers have begun to fire. Radio has gone on the stage.

This, of course, is a big tribute, this complete recognition by entertainers of the entertainment value of radio to themselves. It adds human interest to the play, and it does its bit in building prestige for the radio telephone, as well. It is mutually beneficial.

Recently I spoke with a young woman who already has achieved splendid success on the stage, but who, I am positive, is destined to occupy one of the highest of thrones in the musical comedy world. Her name is Mary Milburn, and she is as sweet and unaffected as her name. Mary plays the titular rôle in the new success, "Molly Darling," that opened on Broadway during September, and attained instant popularity.

In "Molly Darling" there is one of the new radio numbers, and Miss Milburn agreed with me that the stage and radio already are great friends and will become better and better acquainted as the season progresses.

"I could not help but notice," she said, "how quickly the audiences were swept into enthusiasm by the radio number in the show."

It comes in the final scene of the comedy. The girl and the boy have had a misunderstanding. Each is in love with the other, but as will happen with young folks throughout the world, a discordant note is struck on the strings of life, and into each heart there creeps some sadness. He is a lawyer, struggling for his first case. It happens to be one in which he is retained for the unpleasant task of turning Molly and her father out of their house because he can't meet a note that is due. This, of course, is before the young lawyer learns of Molly's identity, and after he does, he drops the prosecution of the case and fights to help her. She, in the meantime, is heartbroken on learning of his purpose to evict her from her home. Finally, we see a broadcasting studio and a huge microphone. Molly sings into it, and somewhere, supposedly, the boy is listening. Then he sings, and under the spell of his voice, Molly confesses her love, which she thinks is lost forever. But it isn't, as you will learn, if you see the play.

The scene in the broadcasting studio is dramatic. It is not exactly like a real radio telephone studio, it is true, for you see a whirring motor generator, and sparks flying. This, of course, is added for the "effect," to put a punch into the scene. But it does show the new note that has come to the theater.

"And," said Miss Milburn, "we players get just as much fun out of it as the audience. It is something new in the theater. I believe it has come to stay.

"As far as the actual broadcasting of a play is concerned, the future will show practical results, as has the recent past. One Molly Darling company has broadcast. It took place in Chicago in the summer, and we had hoped to broadcast our performance here in New York, but arrangements could not be made. We may still do so."

But "Molly Darling" is not the only

(*Continued on next page*)

Vincent Lopez (seated at piano) and his Pennsylvania Orchestra that introduced the "radio number" into Keith vaudeville and acored a remarkable success at the Palace Theater, New York

Distant Broadcasting Stations Heard

Broadcasting fans daily surprise themselves and others by reaching out across hundreds of miles by a turn of the wrist. Often the most simple bulb equipment will produce astonishing results, as reported below. What have YOU done?

With Loop and Single Bulb

WILLIAM D. BELL, Columbus, O., reports hearing broadcast programs over the following unusual distances with a four-foot loop antenna and a single UV 200 detector bulb.

WHB	Kansas City	625 miles
WSB	Atlanta, Ga.	440 miles
WDAF	Kansas City	625 miles
WJZ	Newark, N. J.	475 miles

Hears East and West

E. E. MYERS, in Plano, Ill., which is 60 miles west of station KYW in Chicago, not only has been hearing that station on his Aeriola Senior, but many distant stations as well. He has heard WJZ, Newark, N. J., about 900 miles away, air line; Atlanta, Ga., about 800 miles, and a number of stations in the Middle West as far out to and including Denver, Colo., 1,000 miles away.

KDKA Heard in Tennessee

E. H. HULL, Sparta, Tenn., heard KDKA on September 11, much to his delight, both at the accomplishment of his Aeriola Senior and the music itself. This is a distance of about 500 miles, and Mr. Hull now is looking for an amplifier, with which he knows he can reach out even further.

Michigan to San Francisco

PERCY DEAL, of Greenville, Mich., late in September, heard San Francisco, Cal., about 2,000 miles away. The concert came over clearly, and was heard by four persons, each using headphones attached to a R.C. receiver. Mr. Deal's installation is conventional, and includes a two-wire antenna, 80 feet long, at a height of 40 feet.

Eureka!

LYNNE HULL, Eureka, Kans., is inclined to shout "Eureka!" which is to say "I've got it!" when he listens in with his Clapp-Eastham receiver. Without amplification he hears KDKA, Pittsburgh, Pa., 1,035 miles away; KLP, Los Altos, Cal., 1,500 miles; WGY, Schenectady, N. Y., 1,350 miles; WDAL, Jacksonville, Fla., 1,125 miles; WGI, Medford Hillside, Mass., 1,500 miles; WAAR, Huntington, W. Va., 900 miles, and many others.

Some Remarkable Records

ALBERT BANNISTER, Hudson Falls, N. Y., reports receiving the following broadcast stations on a single tube.

WBAY	New York City	190	Miles
WEAF	New York City	190	"
WDAM	New York City	190	"
WJZ	Newark, N. J.	190	"
WBZ	Springfield, Mass.	105	"
KDKA	Pittsburgh, Pa.	375	"
3XW	Parkersburg, W. Va.	325	"
WBAB	Syracuse, N. Y.	125	"
WGI	Medford Hillside, Mass.	140	"
WFAU	Boston, Mass.	130	"
WGY	Schenectady, N. Y.	40	"
WHAZ	Troy, N. Y.	30	"
WOR	Newark, N. J.	190	"
WCAU	Philadelphia, Pa.	200	"
WLAK	Bellows Falls, Vt.	150	"
WIP	Philadelphia, Pa.	200	"
WFI	Philadelphia, Pa.	200	"
WOO	Philadelphia, Pa.	200	"
WMAF	Dartmouth, Mass.	110	"
WGR	Buffalo, N. Y.	175	"
WWJ	Detroit, Mich.	500	"
KYW	Chicago, Ill.	725	"
WJAX	Cedar Rapids, Ia.	800	"
WHK	Cleveland, O.	400	"
KSD	St. Louis, Mo.	915	"
WOC	Davenport, Ia.	1125	"
KGW	Portland, Ore.	2650	"
WBL	Anthony, Kans.	1050	"
WAAS	Decatur, Ga.	950	"
WSB	Atlanta, Ga.	950	"
WHAS	Louisville, Ky.	650	"
WGAB	Houston, Tex.	1500	"
NOF	Annapolis, Md.	300	"

Molly Darling

(*Continued from preceding page*)

Broadway show this year that has a radio number. "Daffy Dill," starring Frank Tinney, is another. And the Ziegfeld Follies is a third among the superproductions. And there are others. Even on the vaudeville stage we find them. A few weeks ago Vincent Lopez and his Pennsylvania Orchestra, playing an extended engagement at B. F. Keith's Palace Theater in New York, worked up the idea to a point where they had the audience leaping to their feet in enthusiasm.

Lopez played the song "Kiss Me By Wireless." The stage grew dark and the orchestra started the selection softly, increasing the volume of sound gradually until the chorus burst forth in a full wave of melody. Meanwhile, as the tone volume increased, a miniature antenna, strung across the stage over the heads of the musicians, commenced to show more and more signs of activity, and sparks were seen and the crackling of electricity heard.

Radio has found a permanent home in the technique of "theatrical effect." In years to come, its use will grow, until few productions will be without the radio touch, which will be as usual and necessary as the wire telephone, on the stage as well as in the home.

NATIONAL RADIO WEEK

December 23rd to 30th

BY unanimous and enthusiastic agreement, and under the leadership of publishers of magazines and newspapers dealing with radio, the week of December 23 to December 30, inclusive, has been designated for a co-operative effort on the part of all radio interests, to introduce wireless reception to the millions that have no knowledge of the fascination of ether-wave entertainment.

It is proposed that every radio fan will seek to interest at least one other person in radio during that period, so that the ranks of the broadcast listeners and the experimental enthusiast will be doubled in numbers.

An extensive campaign of publicity is to be instituted and special programs are to be arranged at broadcasting stations throughout the country. All radio enthusiasts who now have receiving sets will be urged to invite neighbors and friends to listen to these special programs, and to get up novel forms of entertainment of all kinds.

NATIONAL RADIO WEEK will follow immediately after the pre-holiday drive on the part of publishers, manufacturers, dealers and listeners to introduce the phrase:

This is a Radio Christmas

Millions of messages will be exchanged through the air and through the mail, and in somewhat the following form:

> Amid health and wealth; in poverty, loneliness, joy and grief; at the side of the sick, the cripple, the shut-in; at bedside and fireside; in the drawing room, the attic, the barn; in city, suburb and crowded slum; in camp and mine and farm; mountain top and darkened valley; in the snows of the north and amid the flowers of the south—there radio brings cheer.
>
> You who know what radio means, can enter into the true spirit of the holiday season by sharing the broadcast programs with your friends, for **This is a Radio Christmas**

At a meeting held October 23rd at the Bankers Club, New York City, which was attended by the editors and publishers of the principal radio publications of the East, an organization was created to handle the campaign for further popularizing radio through NATIONAL RADIO WEEK. Publishers, manufacturers and dealers represented at that meeting pledged enthusiastic support of the plan and program to launch the project on a nation-wide scale.

Everybody is invited to send in suggestions, everybody's co-operation is asked. Listeners, manufacturers, dealers, editors and publishers, desiring to cooperate in this movement are invited to forward any suggestions or offers of co-operation to:

J. ANDREW WHITE, *Chairman*, National Radio Week,
Wireless Age, 326 Broadway, N. Y. City.

"A QUESTION and Answer Department for the Broadcasting Program"

An interview with

Anita Loos

By Paul S. Gautier


Anita Loos

FEW of the 2,500 or more daily newspapers in the United States are without question and answer departments. These at first catered to the love-sick youth. Either he was heartbroken because she did not smile and show her teeth; or it was she who had a quarrel after the barn dance and thought of writing to the all-knowing Mrs. Beeswax to secure advice on making up.

Then there was a change in the type of such departments. The papers commenced to give their readers more genuine information on every conceivable subject. Ask a question and enclose a stamp, they shouted gloriously in the printed columns, and you'll get an answer. How old is Chauncey Depew? What makes the movies move? When is the next eclipse of the sun?

And now there arises, to ask why this splendid feature of the dailies cannot be incorporated in the broadcasting programs, a young woman whose name is, or ought to be, familiar to most of the thirty or forty millions of movie patrons of the country.

She is Miss Anita Loos, who, with her husband, Mr. John Emerson, writes scenarios. Miss Loos—or Mrs. Emerson—unquestionably is the highest paid woman writing original stories for the silent drama. Some newspaper correspondent at one time printed a story stating that the talented couple make a million dollars a year out of their writing, but that was only a flight of fancy. The reason I mention the tale is to impress in a forcible way the fact that Miss Loos is at the top of her profession. And for that reason a suggestion from her is to be listened to attentively. Not alone is the motion picture audience acquainted with Miss Loos. The radio public also, is, for she has talked over the air, giving a lengthy and instructive discussion on the art of writing movie scenarios.

I met Miss Loos in her apartment at the Savoy Hotel in New York City, while she was stopping there immediately after her return from Europe, where she had been during the summer.

The topic of conversation, of course, turned to radio and how it may, or will, be used in connection with motion pictures.

"It would seem to me," she said, as she curled up in a huge plush chair, "that its most valuable function now would be to educate the public further in the inside workings of the motion picture industry.

"You have no idea of the thousands of men, women, and even boys and girls, who want to get into the movies—not as actors and actresses alone—but as directors, writers and in a score of other ways.

"In the course of our work—Mr. Emerson's and mine—we have been asked repeatedly to speak before colleges, clubs, high schools and public gatherings. We always do our utmost to accommodate and only recently we spoke at a college up in New England.

"Now, our experience repeats itself in each case. Those in the audience are filled to the brim with questions they want answered. We have had thousands of such questions hurled at us. And I can say that these thousands are only as many variations of but twenty basic questions.

"Yes, I am quite safe in saying that I could prepare a list of twenty questions and cover all the thousands of queries that have been asked us.

"Strange to say, the question most asked is: 'Should the manuscript be typewritten?' The second is: 'Is it necessary that it be written in scenario form?'—that is to say in technical, scene by scene style. And the third one is: 'How much will I get for it if it is accepted?'

"We are speaking of radio now, and the answers to those questions are unimportant. But to satisfy any curious readers I will say that the answer to the first is 'yes,' to the second 'no,' and the third depends on how badly it is wanted by the company, and what it is worth to them.

"Because we know what our audiences want we always start off such a meeting by asking for questions, to be written on a piece of paper. These are collected and the audience is thoroughly satisfied in merely getting answers.

"It is the old story of the inborn curiosity of people. Radio could be used to satisfy this craving. Each broadcasting station could advertise that on such and such a day Doug Fairbanks, or Mary Pickford, or William S. Hart will answer any questions on a given subject, that have been sent to the station by a certain time.

"In other words, the radio public to send questions, the speaker to answer.

"Not only on the movies, but on other subjects as well. One week the station could have an expert on short story writing answer questions. The next on salesmanship. And so on indefinitely. The speaker would say something like this: 'Jim Brown wants to know, etc., etc., etc.; I would say that, etc., etc., etc.'"

Miss Loos added that she could see no way radio could be made to serve the movies in the making or exhibiting but that the future development of radio alone could decide that.

Miss Loos has been associated with the movies for more than ten years, despite her youth. She started to write when 15 years old, and, as she says, was fortunate enough to have her first story accepted. This encouraged her, and despite the fact that many rejections followed, it made her stick to the thing she liked. Her first picture was a very short film called "Her New York Hat," and old-time movie fans will still remember it. Mary Pickford acted in it, and so did other stars of today.

The scenario writer was born and educated in California. And listen: She went on the stage at the mature age of four years—she was carried on! Her father was a theatrical manager and newspaper man, and her entire life has been woven about the stage and the movies. She quit acting to write for the pictures, and when she really got under way in this profession, she had an average of three scenarios accepted each month.

Her first regular job was with D. W. Griffith on the Pacific Coast. Griffith sent for her after she had been selling him plots for two years.

The next time you see a picture starring Constance Talmadge, look for the name of Anita Loos, for most of the Constance Talmadge films are written by the dainty writer and her husband.

William J. Flynn

"RADIO'S most valuable service to the community from the viewpoint of crime detection will lie in its ability to spread the news quickly and to broadcast a description of the criminal being sought," says Wm. J. Flynn

Interviewing a Former

Secret Service Chief

By T. J. Dunham

HOW can the radio telephone assist in the detection of crime and the apprehension of criminals? To the average American the mention of the words "Secret Service" have an alluring appeal. They spell adventure.

But to the average citizen there rarely is permitted a glance behind the scenes with those who have command of the nation's secret agents. When William J. Flynn, former head of the United States Secret Service, spoke from the Radio Corporation-Westinghouse Station at Newark, many thousands listened in because of the glamour the magic words held.

The detective spoke to the radio audience about the detection of check forgeries. To get a more intimate picture of the man himself and to learn from him just how the broadcasting stations could be used in apprehending criminals, I called upon Mr. Flynn in his office at Times Square, New York City.

"Can you tell me about at least one experience you had as head of the Secret Service wherein, had radio been in existence, your work in capturing the man you were after would have been very much easier?"

There was no hesitancy on the part of Mr. Flynn when he replied, "Yes."

He told about the case of a Mr. X, who he says is beyond question the most dangerous counterfeiter this country has had to deal with. Mr. X, as he called him, for he did not want to reveal the man's real name, succeeded in making a fibre paper which could hardly be distinguished from the genuine fibre paper which is manufactured expressly for the U. S. Government's paper money.

Manufacturers of Government paper themselves had difficulty in telling it from the genuine article. The next step of Mr. X, continued Mr. Flynn, was to make a plate for a one dollar bill and this he did with the same degree of success, from his point of view, as in the case of the paper itself. There were only a few insignificant and minor flaws in the one-dollar bill which the young Mr. X manufactured.

"He would take a bunch of these fake one-dollar bills," said Mr. Flynn, "and cross the continent, starting at say New York and winding up at San Francisco, leaving a trail of counterfeit bills in his wake. Then he would recross the country using a different route and once more a trail of fake one dollar bills would be left behind him. He never spent more than one night in one town, and he would cross and recross the country many times, tossing out his spurious notes.

"Then he made five-dollar bills and the method he had of disposing of them was the same as in the case of the bill of smaller denomination; and finally he made a ten-dollar bill. All three were pronounced time and again as being genuine, but all three did have minor flaws, which were revealed only when the bills were scrutinized under a microscope.

"He seemed to play a lone game; we had no description of him and his movements were so fast that by the time we appeared in a town where he had left some of his notes, he was miles away.

"The method of capturing him was that of anticipating his route. If a fake bill would show up one day in Rochester, we would send our men to Buffalo with the hope that he might choose that city as his next victim. It took us five years to get this man and then he was only caught through what might be called an accident.

"A store keeper in a small town had been warned months before to be on the lookout for such fake bills, this town being on Mr. X's supposed route. One day Mr. X came into his store, threw down a ten-dollar bill and asked for a fountain pen which cost five dollars. The thing that attracted the attention of the storekeeper was not the ten-dollar bill, which appeared perfectly genuine, but the fact that the purchaser failed to try the pen but merely took it and put it in his pocket. The storekeeper said nothing but waited until Mr. X had left.

"Then he ran across the street to a bank to get its opinion of the note. Officials there told him it was genuine. Still unsatisfied, he went to a second bank and there after a more thorough investigation the bill was pronounced a counterfeit. The storekeeper called a policeman and together they went to the railroad station for the next outgoing train, figuring that the suspected man might take it. That is what happened and Mr. X was arrested, convicted and sentenced to fifteen years hard labor."

Mr. Flynn flecked the ashes from his Corona and leaned back in his swivel chair.

"Had radio broadcasting been in existence at that time, I have no doubt at all but that Mr. X would have been apprehended long before the end of the five years that it actually took to get him. A warning could have been sent out throughout the entire country and no one would have been uninformed of the existence of his counterfeit notes."

And then he went on to say that the example he cited was only one of many that he could tell wherein the radiophone could be called into action in the apprehension of criminals. He believes that its greatest service will lie in its ability to quickly spread the news and description of people desired by the authorities and that in this one phase alone its service to the community will be exceedingly valuable. He thinks that the local police departments will more and more make use of radio and that possibly the time will come when the volume of crime will be materially lessened as a result of the use of the radio telephone.

Troop 5, Providence, R. I., entertains patients in the hospital ward

The Boy Scouts Recruit Radio

By Ward Seeley

"DO a Good Turn Daily." Such is one of the mottoes of the Boy Scouts. Radio is helping them to make the motto alive and real for themselves and for the people they aid and befriend.

It is nothing new for the Boy Scouts to use radio apparatus. Various troops long ago made and purchased receiving instruments, and even before the advent of broadcasting the Scouts numbered among them some well-known radio amateurs.

Now that broadcasting is here, however, they are finding new fields for the use of radio. Instead of using it only for their own instruction and recreation, as they virtually were compelled to do in the days when only code could be heard, now they are placing it before others who need to enjoy the radio telephone, but for one reason or another are unable to do so.

Thereby good turns are done daily by the Scouts using radio receiving apparatus. Concerts and lectures are given in hospitals and similar institutions; invalids, the bed-ridden and the shut-in are cheered up, and in some cases funds are raised and receiving instruments purchased or constructed by troops to be given to those who may need them.

This is taking place everywhere. The Boy Scouts comprise the picked youth of the country—it is no wonder that in every state they have been quick to realize the advantages of radio broadcasting not only for themselves but for others, and have acted on their understanding!

Only a few typical instances can be given in these pages. One is that of Troop 5, Providence, R. I., which began its radio work nearly a year ago and has been consistent ever since in doing good turns by radio. It managed to secure a Westinghouse tuner and amplifier, and a loud speaker, which enabled large audiences to listen. After the outfit had been installed at troop headquarters and a radio expert had explained radio principles and operation in a series of lectures, the boys became familiar enough with the set to operate it. Promptly thereafter the troop offered to give concerts in the Rhode Island Hospital. The offer was accepted, the apparatus moved to the hospital where a temporary installation was made, and the first concert given in the hospital's largest ward, this being chosen as it afforded a large audience. Many patients from other wards were wheeled into the main ward for the concert.

Troy Boy Scouts who made a set for an invalid: standing, Henry Nyhoff, Stewart Jones, William P. Stanton and Grant Thompson; seated, W. Levis Burk, scoutmaster, and Spencer Neemes

Some of them had never heard a radio concert before, and were not only delighted with the program, but amazed with the fact that music could be gotten without wires from such distant cities as Detroit, Pittsburgh and Newark. After the possibility of hearing distant broadcasters was demonstrated, a special concert was received from 1AMD, a well-known amateur operator, Mr. Howard Thornley, Pawtucket, R. I., a few miles to the north of Providence. This concert, given especially for the hospital patients, included selections by a trio, and vocal and instrumental solos.

In succeeding evenings, the receiving set and loud speaker were installed in other wards, until everyone in the hospital had been entertained. The doctors, who at first were indifferent, became enthusiastic as they saw the beneficial effect on their patients. Dr. John M. Peters, superintendent of the hospital, not content with expressing his appreciation verbally, wrote to the Scoutmaster of the troop as follows: "Please let us thank you, and the members of Boy Scout Troop No. 5, for your kindness in coming here and giving radio concerts to the patients under our care. We appreciate your thoughtfulness in giving these concerts, and want to assure you that our

(*Continued on page* 42)

Politics by Radio

MOST of the radio broadcasting stations in the country followed the lead of WJZ, the Radio Corporation—Westinghouse Station at Newark, N. J., and adopted a non-partisan, unbiased policy during the days immediately preceding the Fall elections.

Candidates from each of the big parties were invited to "display their wares" and shout their own praises into the air. And, naturally, the office seekers were quick to seize the opportunity to address audiences of such magnitudes as those gathered together by radio.

The interest in campaigns, local and state, was greatly increased as a result of the introduction of radio into the political life of the country. People who never would attend a political meeting found themselves listening in their homes to the candidates' arguments as to why they should be elected.

Women voters especially welcomed the opportunity to receive their political leaders' messages in the privacy of their homes.

Politicians are predicting that the 1924 presidential campaign will be waged largely through the medium of the radio telephone.

WJZ's Anniversary Night

THE Radio Corporation-Westinghouse Station WJZ at Newark, N. J. celebrated its first anniversary on the night of Oct. 5, with a program that brought back a flood of memories.

Officials in charge treated the radio public by getting many of the artists who broadcast in the early days of the station, some of them on the very first night it was in general operation.

These included Sara and Nellie Kouns, phonograph artists, Billy Jones, the comedy singer, and his partner Ernest Hare, the Shannon Four, Constance Karla and Anna Welch, Betsy Lane Sheppard and others.

When these artists first sang from WJZ they did so from the old studio, a small affair indeed. But a year later they entertained from the magnificent new studio, considered one of the best among the country's broadcasting stations.

"Listening In" in Switzerland

By ETHEL HUGLI

WE were all in our places promptly at five o'clock in the private office of the chief radio wizard of Switzerland, in the little old town or Berne, the receivers securely clamped on our heads and awe and joy in our hearts. For we were to have a taste of that weird new pleasure known as "listening in," a pleasure we had believed would be denied us from the geographical peculiarities of Switzerland.

The sonorous voice of the broadcaster at the Eiffel Tower distributing station suddenly broke out with "Allôh, Allôh!" and seemed to take real pleasure in the following announcement in vibrant French: "Mesdames et Messieurs, you will now hear a song of Vincent d'Indy's sung by the celebrated American tenor, Hubbard."

This was as much of an event in European radio circles as the listening in was for us, as Hubbard is the first American to sing in the Eiffel Tower concerts and consequently the first American whose voice has been broadcast in Europe.

He has lived for fifteen years in Paris, has identified himself with French modern music and earned the gratitude of the whole French nation by his devotion to this particular branch of their culture.

His tones seemed especially suited to radio transmission. We had long wished that he would come to Switzerland and give a concert here, but never supposed that his voice would arrive before he did!

There were many imperfections in the transmission of the music, the static completely drowning out the piano accompaniment, but Hubbard's voice triumphed and was at all times perfectly clear and pure.

When one reflects that the Eiffel Tower station uses only 1½ kilowatt, the wonder is that the concert reached us at all.

Switzerland's position in the midst of her mountains will always prevent her from having the intense radio development of a flat country. Wherever sound waves have to pass over a mountain there is a triangular space on the farther side which gets no sound at all, or at best very little. Stations therefore cannot be erected at random nor without due precautions to avoid these conditions.

A small, but enthusiastic band of amateurs here have bought radio outfits and clamp their receivers in place to listen in every evening at 6.10 (about 1.10 P. M. New York time) and get the latest news from the Eiffel Tower.

At Parisian cafés while sipping their—ahem, beverages—patrons listen to concerts sent from Eiffel Tower

That this news consists principally of the weather reports seems in no way to dampen their enthusiasm, and the fact that two or three phonograph pieces are added to the weather keeps them hoping for still more interesting things to come. When the daily programs grow really interesting like this program of Hubbard's, the Swiss will follow the tradition that has made them excel in so many other lines, and join enthusiastically with the rest of the radio world. The radio amateur in Switzerland at present pays a government tax of five francs (one dollar) on buying his apparatus and in addition has an annual tax of ten francs.

The Marconi station near Berne is a very powerful plant with a radius of more than a thousand miles. Plans are on foot to enable Switzerland to compete in every way with the latest and best in radio broadcasting within her limitations.

It is yet too early to reveal what these plans are, but the seed has been sown, and within the next year we may expect to see Switzerland taking her place in the radio world.

Discusses Football Rules

AN interpretation of this year's football rules and a general discussion of college athletics was given from WGY, Schenectady, N. Y. on October 12, by Lieut. Elmer O. Oliphant, director of physical education at Union College.

Lieut. Oliphant is considered one of the greatest athletes ever developed in an American university. He is the only graduate of Purdue University or West Point to win four letters, making the Varsity teams in baseball, football, basketball and track. He was All-American choice for halfback in 1915, 16 and 17 and in 1915 was also All-American choice in basketball and as catcher in baseball. He is also one of two men to receive two sabres at West Point, one sabre being awarded as the best all-round athlete and the second as captain of the football team.

The address by Lieut. Oliphant was part of a "college night" program put on by the instrumental and glee clubs of Union College. The program included the songs and cheers of many colleges and universities. Dr. A. R. Brubacher, president of New York State College For Teachers also spoke on "Tradition in College Education."

Football results by Radio—See December issue of THE WIRELESS AGE.

Radio Cheers Lonely Lighthouses

Wireless Telephone Receiving Equipment Authorized by Government—"The Biggest Thing That Could Have Happened in the Lighthouse Service"

By Sam Loomis

Minot's Ledge Lighthouse in swirling seas took four years to build

IF ROBINSON CRUSOE had had a radio telephone set, Defoe's tale might never have been written, and the world would have been the loser by one good book—which it might very well sacrifice if so doing would take loneliness and despair from the life of just one man.

Today the radio telephone is relieving the loneliness of hundreds of unnamed, unwritten, unsung Robinson Crusoes, men whose lives are dedicated to the safety of travelers, and yet who are passed by ignorantly by hundreds of thousands of them.

They are the men in the United States Lighthouse Service.

Suppose you were marooned on a tiny rocky island, on which was not a single blade of grass. Suppose you had plenty of canned food, good shelter, but the society of only two other men. Occasionally you would see a passing ship, far off on the horizon, but only once in six months would a vessel come close enough for you to escape to the shore for a few weeks, after which you would have to return to your island.

Many men are living under such conditions today, in lighthouses and lightships, off all American coasts. In the world, but not of it, they are virtually prisoners on tiny islets, confined for weeks and months at a time, cramped in their movements, not having enough to do to keep them busy. They are lonely. Sometimes friction arises among them and they quarrel bitterly, or else do not speak to each other for weeks at a time.

Hundreds of them today are listening in on the radio telephone. The world that used to pass them by no longer ignores them. One of the many acts of public charity unconsciously performed by the radio telephone has been the relieving of the tedium of life on the lights. Now for the first time in all history these guardians of the deep can keep in close touch with the world that used to pass them by. They draw from the very space whose former emptiness used to bore them, the entertainment and mental stimulus of the broadcast program.

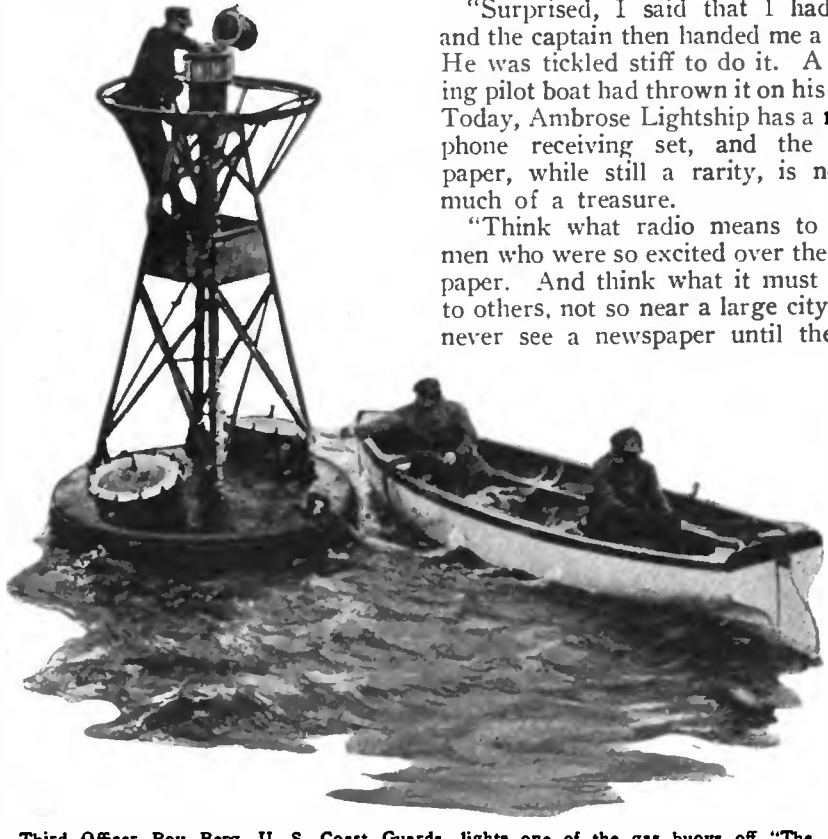
So says J. T. Yates, Superintendent of Lighthouses for the Third District. Sitting in his office in Tompkinsville, Staten Island, N. Y., he told how the radio equipment of lighthouses, lightships, and lighthouse tenders was being added to so that the men can receive the broadcast programs.

"Radio is greatly appreciated by the men on the lights," said Yates. "Of course, some of them are old seamen, who know no interest except the sea, and to a few the radiophone therefore has no appeal. But to many, perhaps the majority, it is a welcome diversion, one that brightens their lives and adds to their knowledge.

"Some time ago I was returning from a trip along the coast, inspecting the lights, and on the way into New York Harbor we stopped at Ambrose Lightship. The captain met me with a smile, and said, almost gleefully, 'Have you seen the morning paper?'

"Surprised, I said that I had not, and the captain then handed me a copy. He was tickled stiff to do it. A passing pilot boat had thrown it on his deck. Today, Ambrose Lightship has a radiophone receiving set, and the daily paper, while still a rarity, is not so much of a treasure.

"Think what radio means to these men who were so excited over the daily paper. And think what it must mean to others, not so near a large city, who never see a newspaper until they go



Third Officer Roy Berg, U. S. Coast Guards, lights one of the gas buoys off "The Graveyard of the Atlantic"—Pollock's Rip Slue, near Cape Cod. By such perilous work as this the safety of the sea is assured

on their very infrequent leaves. Radio is the biggest thing that could have happened for the Lighthouse Service."

Mr. Yates then pictured the life on the average lighthouse, which has a "crew" of from three to four men, one of whom is regularly off on leave. The two or three men who are left must find within each other and in the meagre resources of their surroundings all the diversion and recreation they need.

Why do men live such lives? That is a question that is natural enough, and the answer is that some few of them really like it, and the others endure it because it seems to be the only occupation in which they are sure they can make a living. Man is a sociable animal, and it is entirely unnatural for him to be separated from his kind. The lighthouses and lightships have to be manned. They are absolutely vital for the commerce of the world. And the radio telephone has become vital in bringing happiness and contentment to the men who maintain the lights.

Most of the lighthouses have been equipped for radio telegraphy for some time, and the authorities have recently ordered the modification of existing equipment for broadcast reception.

Such modification, of course, is slight. In most cases the receiving equipment consists of a long-wave tuner, a crystal detector and a pair of phones. At slight expense, there are added a bulb detector, two or three extra pairs of phones, and if necessary, one or two stages of amplification, enabling the broadcast matter to be received. Though the cost of this new equipment is minor, its authorization from Washington is considered remarkable, in view of the current economy campaign in Governmental circles. "Save money" is the cry in all departments. The fact that even this small expenditure has been permitted gives an impressive measure of the importance with which broadcasting is regarded in the service.

Many of the lighthouses are in lonely spots, far from civilization, and the only resources they have are to be found within the light itself and in the waters surrounding it. True, this is not always the case. In some instances lighthouses are located at or near important Summer resorts, and of course all the ports are provided with lights whose keepers usually can reach the city by means of motor boats.

Liberal leaves are allowed, usually amounting to two days a week, one week a month, one month in three and so on up to every fourth year, which is the arrangement for some of the Alaskan lights. In each case the nearness of civilization, weather conditions, and the visits of the lighthouse tenders govern the leaves. Where the light is near a city it is frequently the case that the men very seldom take advantage of the leave period, preferring to stay on the light, which is home, and visit the land only two or three times a year, much as do farmers living at the same distance. Keepers of the more distant posts, however, eagerly depart as soon as their leaves are due, and return reluctantly.

Even when the light is in the vicinity of large cities it is not possible for the men to reach shore at all times of the year. Stratford Light, in the middle of Long Island Sound, for instance, is isolated each Winter, sometimes for four or six weeks or even more, by ice and bad weather. Fire Island Lightship in Winter can be reached only by the Government tender, which delivers supplies once a month. There are many other stations similarly subject to periodic isolation.

Off the wilder coasts, particularly in Alaska, conditions are much worse, due to distance and weather. Going without mail for ten months, and without leaving the light for three years is not unusual. Tillamook Light, south of the mouth of the Columbia River, is reached only by a crane operating over a precipice, and storms have cut this off from even the lighthouse tender for ten and more months at a time.

In fact the leave of absence has proved a troublesome problem in the lighthouse service, as in most cases the man has to go ashore in his own little motorboat, which is not safe in all weathers. This fact gives the man on leave an excellent excuse for prolonging his stay. It is said that a lighthouse man on leave has the keenest eye in the world for bad weather—let a cloud appear and he takes another day off when he should be back on duty. The radiophone by relieving some of the tedium of life on the light is helping to solve this "weather" problem.

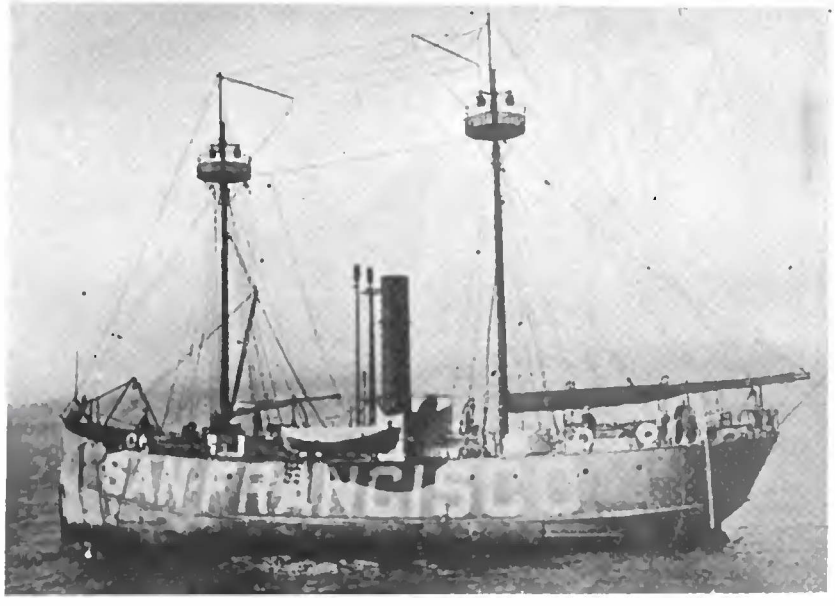
The men have much time to listen, as their duties are few. While the light is burning, one man has to be on watch continually, in a small watchroom just beneath the great glowing eye, alert to keep the light burning. The men stand watches during the night, and the tedium of this idle waiting for something that very seldom happens is relieved greatly by radio.

During the day, there are a few tasks to perform about the mechanism. Revolving lights are operated by gears and weights, and each morning the weights must be wound up. This is not a great task since they are not heavy, as the revolving part, which is the lens, is mounted either on ball bearings or on mercury and needs little power to move it. The burners, which are kerosene or acetylene, need a small amount of attention. Meals have to be cooked, and the place kept clean and neat.

Outside of that, the keeper of a lighthouse has nothing to do, unless he wants to go fishing, which is not always possible. Practically the same routine is observed on the lightships, with additions necessitated by conditions.

Use of radio by the Lighthouse Service is divided into three fields. There is, first, the radio fog signal—or radio beacon—a signal sent out at regular intervals during foggy weather to warn passing ships of the bearing and distance of the lights and lightships. Since this beacon was described in THE WIRELESS AGE of March of last year, it has been placed in operation on all coasts, and has saved many

(*Continued on page* 42)



Despite the daily passing of many ships in and out of San Francisco Harbor, this lightship is a lonely one. Supplies and mail are delivered twice a month, weather permitting, and radio now relieves the tedium of the crew

Dean Herman Schneider says

Radio Is an Educational Force

Originator of the Cincinnati Co-operative Plan at the University of Cincinnati Interviewed

By Ruth Neely

Dean Herman Schneider

ALL educators in science and college heads generally may not be as ready, perhaps, as is Dr. Herman Schneider, dean of the College of Engineering and Commerce, University of Cincinnati, to take a tip, or hint, or whatever you may wish to call it.

Nothing, however, in the way of professional inhibitions seems ever to have hedged in Dean Schneider, which explains, possibly, how he came to originate the Schneider (or Cincinnati) co-operative plan of higher education, introduced by him at the University of Cincinnati in 1900, and since copied by a dozen or more leading American colleges, including Harvard and Massachusetts Institute of Technology, and also, of late, subject of thorough scrutiny by representatives from universities abroad.

Originally this plan of part time work, for pay, by college students, was just a "tip"—as he himself called it—taken by the distinguished educator from his own experience while working his way through Lehigh University.

Now there is a hint, equally or more important for all educators, Dr. Schneider believes, in the rage for radio among all, but especially the youth of America and foreign countries.

"When youngsters in knee breeches," said Dean Schneider, "talk earnestly of vario-couplers, of regenerative circuits, of grid leaks and what not, it should surely suggest something to educators in general and scientists in particular.

"What it must suggest, one feels, is the ease with which the most advanced scientific discoveries may be taught, in principle and practice, if you only go about it in the right way."

The right way, according to Dean Schneider, could not be better exemplified, as an educational process, than in the unlimited popularity, among girls and boys, young men and women, of radio telephone outfits and consequent spread of technical knowledge of radio apparatus and its construction and operation.

First comes a stirring of devoted interest in new phenomena, then the scientific explanation is sought, although the two should go hand in hand as far as possible. This is the conviction of the originator of the co-operative engineering college plan. And the courage of this conviction is responsible for the fact that freshmen students of Dean Schneider's college go forth with pick and shovel before they make the blue prints of the bridges they later construct.

It is also responsible for the fact that on the roof of the Engineering College Building, and on that of the Chemistry Building adjoining, one sees radio antennae put up by students in the Department of Electrical Engineering.

Professor A. M. Wilson is head of this department, assisted by Professor W. C. Osterbroch, and it is under their supervision that students make and set up their own apparatus for trying out circuits, using wave meters, transmitters and receivers, and all other radio equipment necessary for practical laboratory work.

Perhaps the best evidence of Dean Schneider's interest in radio telephone possibilities is the fact that every day, from 11.30 to 12.30, radio fans among the engineering students meet for a "hobby hour" devoted to their favorite activity.

This "hobby hour" plan was inaugurated by Dean Schneider more than a year ago and has been very popular.

"What perhaps appeals to me more than any other phase of the possibilities of the radio telephone as an educational force," Dean Schneider said, "is its potent influence in bringing together all peoples of the world, in cementing human relationships, in doing away with discord, in promoting international understanding and sympathy."

"Consider the possibilities of the international exchange, not only of messages, but also of lectures and instruction of all kinds. Immediate delivery and no waste motion. It arouses a wholesome interest in the things of science.

"Imagine what would have been accomplished, in the other branches of science, if their technique could have been popularized as has that of the radio telephone. Astronomy, biology, all the others, have phases of great human interest. But they have not found the high road to popularity, the entrée to the mind and heart of youth, as has this special development. Naturally enough, for the challenge to universal interest was not put forth. But there is a hint, and a broad one, in this, for all educators.

"No one who has noted developments since the achievements of Marconi at the very beginning of the twentieth century can fail to be optimistic regarding the future of radio.

"Of course, there are always those who cry impracticable. Chancellor Livingston once demonstrated that to use a railroad was impossible. Use of illuminating gas was ridiculed by Sir Humphrey Davy and Sir Walter Scott, and so on and on, but not in the path of progress.

"True, there is no present indication

(*Continued on next page*)

One of the disadvantages of being an expert and famous is the drain others make upon your time and services. Probably no other man closely identified with higher institutions of learning has been so eagerly sought after by colleges and universities as Dean Herman Schneider.

He has just passed the fiftieth milestone of life, but, as often happens with active men, does not look his age. The small town of Summit Hill, Pa., claims him as his birthplace. The Lehigh University and University of Pittsburg gave him degrees, the latter bestowing the degree of Doctor of Science following his graduation from the former.

He has always preferred to remain at the University of Cincinnati, which accepted his co-operative plan back in 1904. There he has remained despite many attractive offers, with the brief exception of parts of 1917 and 1918, when he served as chief of the Industrial Service Section of the War Department.

Radio and Boy Scouts

(*Continued from page 37*)

patients certainly enjoy them very much. Thank you again in their behalf."

Since then, this troop has used its radio outfit on its hikes, has given other concerts to those needing cheer, and has taken considerable interest in the boys of the local reform school, using radio with them in an educational way. So good has been the work with the reform school boys, in fact, that a number of them, stimulated by interest in radio, have shown such marked improvement as to win their releases on probation, while others have been given ten-day leaves of absence in charge of the Scoutmaster.

Troy, New York, furnishes another example of the many humanitarian deeds performed by the Scouts with the aid of the radio telephone. Troop 16 of Troy, of the First Presbyterian Church, decided that a receiving set was needed by an old lady whom they knew. She was an invalid, and after a painful fall had been confined to her bed for two years, held in a plaster cast. The boys knew that nothing would be of greater service to her than the broadcast lectures, news and concerts, and after an enthusiastic meeting decided to raise funds to buy the necessary parts and materials, and make a set for her. Spencer Neemes and Grant Thompson, who were best fitted by experience to construct the set, were selected to do the work, and the entire troop hustled to raise the necessary money, about $16, for a simple crystal tuner and headphones.

When the set was complete, other boys aided in installing the antenna and ground. Henry Nyhoff, Stewart Jones and William P. Stanton assisted the two who had constructed the receiver, placing the instrument where it was most convenient to the invalid, and erecting the antenna in such a way that the loudest possible signals were received.

The set has been in constant use since then by the invalid, to her great joy and delight, and the boys, seeing her days brightened by it, feel repaid many times over for the week they spent in working to make it for her.

Radio Is an Educational Force

(*Continued from preceding page*)

that wireless can replace the wire telephone and telegraph, where the dominating factor is privacy. But perhaps it is the special mission of the radio to secure the widest publicity, the fullest audience for its messages, the broadcasting of knowledge and wisdom to listeners everywhere.

"Then there is another opportunity open to the radio telephone. So great has been the desire of human beings to congregate in cities that careful study is being given to causes and prevention of alarming congestion.

"Any development of science which will help to counteract this tendency is welcomed by all thinkers.

"So when any one, even in the most isolated section, can be in close touch with the best of music, the best of literature, the latest news from the ends of the earth, the best market reports; when he can hear the voices of those who most interest him, can absorb the best thoughts of his time; all by means of a reliable device, easily adjusted in his home, certainly the fundamental cause for deserting the rural communities and flocking to the city will have been removed. Isolation is at an end for one and all.

"It is well indeed that at this time there is active an interest which stirs the imagination and stimulates the interest of all the people.

"We need, and badly, in these days of industrial, political and economic unrest, just the steadying influence on young and old, the wholesome absorption and interest in research to which the popularity of radio can lay just claim, as a scientific educational treasure of inestimable value."

Showing McMicken Hall, University of Cincinnati, on the left. In center with dome, is the University Library, while just to the right through the trees may be seen the building housing the College of Engineering of which Dr. Schneider is dean. This building is liberally equipped with radio apparatus

Radio for Public Parks

WIAY, at Washington, D. C., has expanded its service to the public by installing loud speakers in several of the Capital's parks. Hundreds of people gather weekly to listen to Saturday night concerts.

First Alaskan Station

THIRTEEN regular broadcasting licenses, now known as Class "A," were issued by the Department of Commerce during the week ending September 30, among them the first station in Alaska, WLAY. This station of the Northern Commercial Company, located at Fairbanks, nearly in the center of that territory, will broadcast a program of entertainment for the benefit of the citizens within a radius of about 500 miles.

Lonely Lighthouses

(*Continued from page 40*)

ships and thousands of dollars of property.

A second use of radio in the lights is that of the telegraph transmitter, which comes into play for communicating with headquarters, with passing ships and with the tenders of the Lighthouse Service. At important ports these transmitting sets give the first news of arriving steamers. They also save much time and money by notifying the lighthouse tenders which do repair work, when they are needed for such things as dragged, drifted or otherwise displaced buoys.

The third and newest radio advantage is that offered by the radio telephone. As yet this is mostly confined to receiving apparatus as radio telephone transmitting sets have been installed in but a few cases. One such is that of the Fire Island Lightship, off Long Island, near the entrance to New York Harbor. During the war this was taken over by the Navy, and a Navy radio telephone transmitting set installed for use in reporting vessel movements. Only recently the lightships have been taken back by the Lighthouse Service, and a few such telephone transmitting installations with them. The Fire Island radio equipment is most complete, including the radio beacon, telegraph and telephone transmitter, and complete receiving instruments.

Today the radio telephone is the book, the newspaper, the phonograph, it is the life of the world itself brought into the lonely lives of the lights.

Rebuilding a Broadcasting Station

Explaining Why the Voice of WBZ at Springfield, Mass., is Louder and Clearer Than Ever

By R. P. King

MANY radio fans have doubtless noticed that the voice of WBZ, the Westinghouse radio station at Springfield, Mass., is considerably louder and clearer than it was last winter. There is a good reason for this improvement. The station was entirely rebuilt during the summer and is now one of the finest in the country.

The original station was opened in September, 1921, and was one of the pioneers in the broadcasting field. Only two or three stations now in operation have a longer record. It was designed to serve New England only, so that its power was limited. But, though it was found to have a consistent range of about 500 miles to the south and west under good atmospheric conditions, it did not entirely fulfil its purpose. New England is peculiar from a radio standpoint, and for some unknown reason there were several areas in its territory that WBZ could not reach. The new station, however, has remedied this situation and can be clearly heard on a detector tube alone all over the northeastern part of the country. So much power is used, in fact, that it has been heard easily in other sections at considerable distances.

The new transmitting apparatus is of standard Westinghouse construction, and is of the same type as that used at KDKA, KYW, and WJZ, although somewhat smaller. It has two oscillating tubes and three modulator tubes, each rated at 250 watts. Ten-volt alternating current for the filaments of the tubes is supplied by a transformer on a 110-volt circuit, and 2,000-volt direct current for the plates is supplied by a motor-generator set located outside of the station and remotely controlled from the transmitter. The tubes which develop considerable heat in operation are kept cooled by a fan mounted behind the transmitter.

The transmitting antenna is supported by two structural steel towers, 142 feet high. These towers are located on the roof of the Company's radio factory, so that the height of the antenna above ground is 200 feet. The antenna is made up of six phosphor-bronze cables spaced five feet apart, 220 feet long. A counterpoise, of similar dimensions, is suspended 130 feet below the antenna. Special arrangements have been made to prevent breakage of the antenna and counterpoise by ice, and a heavy current can be circulated through the antenna wires and down leads to heat the metal and prevent accumulations during ice storms.

The studio, which is located on the third floor of the building, is a room of 20 x 23 feet. Heavy carpet on the floor and shirred monk cloth on the walls and ceilings eliminate all echoes. Among the musical instruments used are a Knabe-Ampico reproducing grand piano, a Victrola, and a Brunswick talking machine.

The microphone is a standard condenser type device, and is hung from a movable and adjustable stand. Its output passes through three stages of amplification in the studio before it goes to the transmitting room, where three more stages of amplification are provided. The studio amplifiers are housed in a cabinet padded with felt. An Aeriola Junior crystal receiver with a loop aerial is used to check the character of the performances as broadcasted.

WBZ operates every night from 7.30 to 9.00 P. M. Eastern Standard Time. Its regular weekday program includes childrens' stories, agricultural reports, addresses, and music. On Sunday, chapel services are broadcasted at 3.00 P. M. and church services at 8.00 P. M.

Small photo in center column shows antenna equipment at WBZ, which is described by Mr. King in the article. The roomy studio is pictured above

Diary of an Amateur at Sea

Being the Log of Maurice J. Grainger, Operator on the S. S. "Alice," Bound for Cuba

"——who recognized me by my N. A. W. A. button."

May 3rd: Left New York 8:00 a. m. after unloading a full cargo of bananas in 36 hours. Bound for Havana and Cien Fuegos, Cuba.

The receiving set that's on this scow is rotten. Can't hear anything. It has a galena detector and the galena has been in too long so that the cup has rusted in. Will have to take the set all apart and connect with the detector tube. When looking for my B batteries, found that I forgot to bring them! Will have to use the ship's storage batteries.

May 4th: 1:00 p. m. Now passing Cape Hatteras. The ship is beginning to pitch and roll. The smell of the wireless set changes with the latitude, I guess, and we have struck a particularly poor parallel.

May 5th: The skipper told me to ask Norfolk (NAM) if they had any messages for us. We were right in the middle of a big thunder storm and sparks were jumping across the safety gap very fast and regular. NAM said "Sweet *Alice,* nothing for you, dear!"

They gave me the razz at dinner about the press reports. Somehow I got the sheets mixed and gave them press that had been copied by the last operator on the last trip.

Darn it! Somebody put poison in the captain's coffee, but he smelled it in time and threw it at a messman. They had a "Board of Inquiry" this afternoon to find out who did it, but nothing doing.

May 9th: Havana. The first mate had a loud argument with the skipper today, which was witnessed by all the beach-combers and longshore men in Havana. We had anchored off Morro Castle this morning and then proceeded to the dock. The argument was as to whether the seamen could have the day off tomorrow, which is a Cuban holiday. They did not get it. This evening one of the firemen fell down a hatch about 40 feet and broke his leg.

May 10th: Went over to the Plaza Hotel for supper and met two operators from the *Tanamares,* who recognized me by my N. A. W. A. button. After supper we went to the movies, but the sub-titles were in Spanish, and we didn't know what it was all about. We went back to the ship to listen in for music from WJZ, but the static was too heavy.

May 11th: Loading sugar all day. We sail tomorrow for Cardenas. Tonight talked with the chief engineer who writes books for a hobby. He is interested in astronomy. He told me a lot about the stars, including a story about a fellow who took a nap out on a hatch one night and the moon pulled his face all out of shape.

May 14th: The skipper, the chief engineer and I listened in and heard WJZ fine. Great stuff. This music provides entertainment for people like ourselves.

May 17th: The skipper found out it was the cook who put poison in his coffee. It seems they had a little argument. These brutes are vindictive *hombres!* He came aboard to-night under the influence of liquor and started to brag. Am beginning to wonder whether we will get home before the 4th of June. Guess not.

May 20th: Thunder storms. Heavy rains. The radio shack has a foot or two of water, and it got into the transformer, so I spent all afternoon after the rain had stopped taking the core of the transformer out. Forgot to mention that we are at Cien Fuegos, having arrived on the 17th.

THE diary of Maurice J. Grainger of Allenhurst, New Jersey, is typical of that of many other wireless operators. It contains at least one exciting incident, but the picture it gives of the everyday life of the wireless operator will be of interest to those not familiar with the radio man's career. The names of the vessel and of the characters mentioned are fictitious, according to Mr. Grainger, though, of course, the facts are actual occurrences.

May 23d: Finished loading sugar, and we leave today for New York.

May 24th: We sailed this morning. We were supposed to sail last night, but the skipper got lost and couldn't find the dock, so we had to wait. WJZ came in great tonight. So did KDKA, but WJZ is louder. Had to fix my tube. I hope it lasts until we get to New York.

May 25th: 1:00 a. m. Was sleeping soundly when all of a sudden the ship gave a mighty lurch. I fell out of my bunk and hit my head on the door knob. The ship was bumping around something awful, and the men were shouting. The whistle started to blow as my telephone rang. Then the anchor dropped with loud rattles, as if the ship was choking. I grabbed my license down from the bulkhead, got my money out of my suitcase, put some clothes on, started the motor generator, and then went up to the bridge, where the skipper gave me a message for NAR, saying we were aground off Lowey's Reef. The last letter I got from home said there was going to be a dance on June 4th, and I was to be sure to get home in time for it. Oh, yes! My head was damaged from the crash against the door knob, but it looks like that was the only damage aboard. The next morning there were about forty little row boats out there to help us get away in case the ship should sink, but the skipper said they would kill us if the ship did sink, and he gave all of us guns, but they didn't try to get aboard. In the afternoon the salvage ships hove in sight from Key West. About sundown we slid off and started for New York again.

May 27th: On our way to New York. The ship is leaking, but not enough to sink her. We passed the *Tanamares,* and the operator on watch said "QSY 300" and wished me better luck on my next trip. Whaddye mean, "Next trip? ?"

May 28th: Sent a message saying we would arrive May 30th, which means I will be home in time for the big dance. No more ocean for me. I would rather have my set down in the cellar.

May 29th: Off the Jersey coast. Got a message telling us where to dock and I looked for my Erie R.R. timetable.

Listenin' In With the Broadcasting Fan

Read what a few of the enthusiasts say and then send in your impressions

Just a line to let you know that your concert lecture and weather broadcasting is heard in this part of the country. They are about six of us in Sidney, N. S., here who have been listening in to these concerts all winter. Four of us are using a short-wave regenerative circuit with home-made variocoupler and one Radiotron UV-200. And we receive the music and lectures clear and strong. Sometimes with Baldwin phones we can put the phone on the table and listen. The other two are using a different circuit and have to use one or two steps of amplification. I was listening last night and heard Chicago first and then WJZ, hearing the piano, violin and voice very clearly and finally the phonograph selections. I haven't heard WDY lately but have been hearing WGI and KDKA. Also heard KDOW and 2XJ and 2XR for quite a while but haven't heard them lately. We also hear Springfield. With a couple of stages of amplification, I hope to hear them through a loud speaker.

ANDREW P. WATSON,
Secretary, Boy Scouts
Sydney, N. S.
Local Association.

We certainly did enjoy your program tonight. It was fine and enjoyed by quite a number of guests who come to my study every night to hear the broadcasters.

We thank you for this splendid entertainment. It cannot be imagined how much we enjoy them, as we live in the country and never get such high class music only by radio. My set was the first one set up in this part of the state and I relay it by telephone, and thousands have become radio fans, and amateurs are putting in receiving stations every day. The people come for miles to hear my receiving set, which has a power amplifier and loud-speaker hooked to it, making it come in very loud.

A. M. SMITH.
Colburg, W. Va.

We have an RC set here in our store in operation and every evening we have at least twenty to twenty-five farmers in to listen to the market reports.

FRANK MULDOON,
Freehold, N. J.

During my many nights of pleasure listening to your daily programs, I sometimes try to consider the vast amount of other people who may also be pleasure seeking at your vast expense.

The arrangement of your program is very good. The transmitter in my opinion is also very good; the oscillations are powerful while the modulation is the best I have heard as yet, allowing for conditions.

In proof of the above, I may state that some time ago while listening-in I picked up the *Majestic* while she was 600 miles at sea and heard the operator call a friend by land phone through the telephone company, and he stated that, "We were just listening to WJZ, although I did not think we could pick her up." He was then informed that your conservative range was over 1,000 miles.

"How You Have Shrunk!"

—*San Francisco Examiner*

JOSEPH J. KRANE,
New York.

More than enjoyed your broadcasting this rainy, stormy night while seated in a big easy chair at home. Have a crystal set and combined with the rainy atmosphere (always comes across better in rainy weather) surely had one quiet evening at home.

Yours for fun with the radiophone,
A. J. DEPPERT.
Carlstad, N. J.

I have long been going to drop you a few lines but it seems I never get time as I am always experimenting on radiophone receiving, but here goes: I want to say that I never appreciated anything more in my life than I did your broadcasting last evening as we all had the flu here and I was nurse, chief cook and bottle washer. As none of us could get out it was the only thing that cheered us up and we certainly enjoyed your concerts immensely. My little girl kept saying "I wish it was Tuesday night," or she wished it was Friday night. Now that she is up she brings all the kids in the neighborhood here. She has as high as a dozen of them here at a time. Hoping it gives you as much pleasure to send as it does me to receive I will say good night.

WILLIAM R. PRICE,
Woodbridge, N. J.

Don't think your audience is going dead. We're all here. I hear you every day. I get at least three-fourths of your hourly programs every day. Arlington time at least once, and the weather I want to know at least once a day, even if the professor makes a mistake once in a while.

OSCAR TIELMAN,
Paterson, N. J.

I am very happy to say we are receiving your wonderful entertainment every evening.

I am specially grateful as since listening-in I have gained much knowledge from the wonderful talks which I think an education to all,

GEORGE W. LUTHER,
Brooklyn, N. Y.

As I was listening to your eight o'clock concert I thought I would write and let you know that I enjoyed it very much. We have a receiving set all by ourselves, as we are in a small ward in in the Home for Crippled Children I am the one that works it as I am able to get around in a wheel-chair.

FRANK GRANGER, Newark, N. J.

Don't know how I ever got along without radio—right here in New York City, too! This sure is the Wireless Age!

WILLIAM VEEBY,
New York, N. Y.

World's Series by Radio

(*Continued from page 32*)

ered the broadcast description before all else was shown right in the city of Newark, N. J., by the vehement way in which possibly a hundred or so local listeners protested when interference cut them off from the Series. WJZ operates on 360 meters. Play by play the game was detailed over a Western Union wire telephone from the Polo Grounds to Newark, and directly broadcast. However, station WOR in Newark, operates on 400 meters, and causes no interference normally except to the few who are quite close to it, in its shadow, so to speak. Until the Series came on these were quite content to hear only WOR when that station was working. When, however, they found that they could not tune out the 400-meter transmitter and get the Series through WJZ, they set up a terrific howl, a howl that was heard as far as the Battery in New York City, in fact, where the Second District radio inspector was advised of the situation. The 400-meter station said that only a few local listeners were having trouble but rather than get in anybody's way they'd shut down during the Series, if that was all right with the inspector. He said to go ahead, and so 400 meters were quiet and listened happily too, all for the benefit of a few score fans within a radius of a mile of the transmitter.

Grantland Rice's voice describing the games was not heard only in homes and offices, but by ships out at sea, which were listening, too. And keepers of lonely lighthouses equipped with radio sets likewise heard the biggest sporting event of the Fall. The sick, the shut-in, the farmer, the forest, all listened.

The voice came over, clear and strong. The noise of the crowd and the cheering. The band. The program boys. And even the side talk in the press box where were gathered the cream of the counry's sports writers.

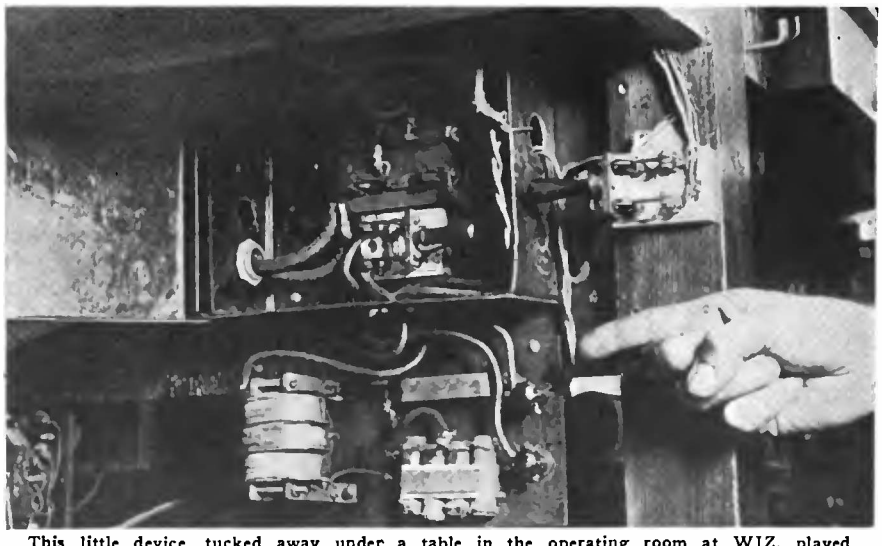
We heard the ovation given Jack Dempsey, the heavyweight champion, as he entered the stand. We heard the cheering for Christy Mathewson, who came down to see the game and write about it, after his two years' successful battle against tuberculosis. Several times we even heard the crack of the bat on the nose of the ball—or was it just our imagination? We all but saw!

The public was quick to express its appreciation of the service rendered. Telephone calls from points in Connecticut, New York, Maryland, and other neighboring states poured into WJZ station at Newark, from scores of grateful listeners. Hundreds of letters were received daily.

One queer combination of circumstances resulting from the broadcasting description was to be seen within the Polo Grounds. A comfortable clubhouse for the employees of the Sixth and Ninth Avenue Elevated roads is located across the street from the grounds, and its windows and roof of course were crowded with motormen and conductors who enjoyed the Series free when off duty at the appropriate hours.

This clubhouse is equipped with a radio set, which regularly brings in the broadcast concerts and other entertainment sent out by local broadcasting stations. Of course it brought in Grantland Rice's voice. And so these fortunate few not only had the pleasure of seeing the game, but of hearing it play by play as it progressed, despite the fact that the voice they heard first went by wire to Newark, and then to them by wireless. But so quickly does human nature adapt itself to the progress of science, that there were few exclamations of surprise at the wonder of it all.

Well—why go on? We heard it all. Almost literally, we were really at the Polo Grounds.



This little device, tucked away under a table in the operating room at WJZ, played its part in the successful transmission of the baseball results. It consists of resistance coils and transformers and its duty was to eliminate distortion on the wire line from the Polo Grounds to the broadcasting studio

WJZ Broadcasts Football Games

IMMEDIATELY following its great success with the World's Series, WJZ commenced to broadcast the fall collegiate football games, opening on October 14 with the Princeton vs. Colgate event at Princeton. This was reported by telegraph. On October 21, Fordham vs. Georgetown was broadcast direct from the Polo Grounds, the radio audience being able to hear the cheering and songs of the students as well as the description of the game, play by play, from the press box. On October 28, Syracuse vs. Penn State, at the Polo Grounds, was put on the air. The games scheduled to be broadcast during November are as follows:

Nov. 4—Lafayette College vs. Wash.-Jefferson College.
(Direct from the Polo Ground.)

Nov. 11—Cornell University vs. Dartmouth College.
(Direct from the Polo Grounds.)

Nov. 18—Columbia University vs. Dartmouth College.
(Direct from the Polo Ground.)

Nov. 25—Army & Navy at Philadelphia.

Nov. 30—University of Pittsburgh vs. Penn State College, at Pittsburgh.
(By Telegraph.)

Airplane Races Reported

FOR the first time in history, airplane races have been reported by radio. The National Airplane Races, held in Detroit the week of October 9, were described from the cockpit of a high-powered flying boat, which had been equipped with a 50-watt radio transmitting set, built by the General Electric Company. So as not to interfere with other broadcasting stations, reports from this airplane were transmitted on a wave length of 507 meters, a length not too great for even the small crystal sets to tune to.

Soaring at a height of 3,000 feet, this flying boat sailed along with the contestants in the various events and made radio reports on the progress of the races and other notes of interest. Several special receiving sets were placed about the flying field and the grandstand.

Laughter on the Radio Wave

Whoo Ooo! Yoo Hoo!!

TREMENDOUS possibilities, from a health-viewpoint, are literally shoving themselves at the people these days. You just naturally can't get away from them. And nature, in her wisdom, is directing them especially toward those who need them most. The Night Owl, a species of bird found in the lobster palaces in the wee small hours of the mornin' riotously tossing down sarsaparilla after sarsaparilla—he is the one who is being Made Over by radio.

Reports from everywhere tell how the Proprietors of Dens of Laughter and Hokum are using radio to get the Night Owls home, so that they may close up the doors and Be Respectable.

Just about the time when the uproar is at its peak and the Night Owls are madly dancing the Minuet, the proprietors turn on their radio sets and receive a Bedtime Story. The Power of Suggestion is so forceful that the Night Owls just naturally stop to Yawn. "To bed, to bed, you sleepy head," merrily chuckles each waiter. Immediately the patrons who just before had been Living Riotously, drift towards the exits, Yawning still more.

Another Good Turn done by the Proprietors of These Places is as follows:

Night Owls never get any exercise other than that necessary to develop the muscle of their right arm if they are righthanded, and their left arm, if they are Vice Versa, so that they may without effort and continuously Pack Away their sarsaparillas. The Proprietor therefore waits until everyone is enjoying himself and herself, and then tunes the radio set to the nearest gymnasium class. As soon as the "lunge right—halt—lunge left—halt" is heard, all the Night Owls, experience has shown, immediately quit what they were doing, whether it was dancing the Minuet or drinking Sarsaparilla, and all line up and exercise.

Can you picture beautiful women in Evening Gowns, and good looking men with Card-Board Brains standing up and exercising? Lunging this way and that, bending and trying to touch their Patent Leathers? It certainly is Smart of the Proprietors, and a mighty good thing for the Future of the Race.—*M. H.*

Mother Thankful for Radio

Says Fay King

"THE radio may accomplish great things for the world," writes Fay King in the Atlanta *Georgian*, "but it has done one thing for Willie's mother that she thinks is greatly worth while.

"She never has to tell Willie to wash his ears any more, because he discovered that when he tunneled the dirt out of them, he got better results than tuning the code out of his radio set.

"As a receiving station, clean ears are a great thing.

"Was a time when washing Willie's ears would start a civil war in the family, but now Willie uses a bar of laundry soap every morning without a whimper. Ma can't believe her eyes!

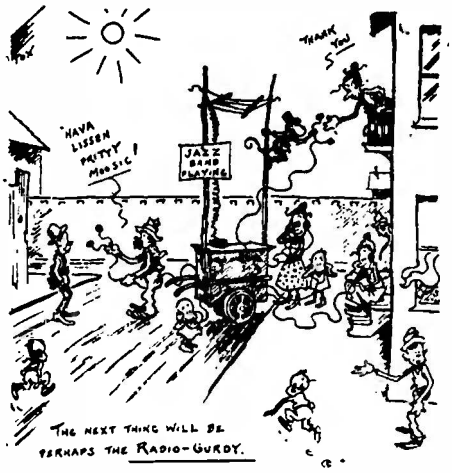
"A radio set has sent peace to the family, and Willie is not only a model child, but a model student of diction.

"He learns the pronunciation of big words and uses them on the family, knocking Pa for a home run every time he bats out some new YZX on a six-syllable sounding board.

"The only thing that gets Willie's goat is that he hasn't heard the bedtime stories since Uncle John came to the house to spend the week end.

"Willie has developed quite a knack of building radio sets. Ma's basting thread, Sister Sue's chin vibrator, Grandma's ear trumpet and Aunt Jennie's embroidery hoop have all disappeared and are now converted into new experimenting stations."

Why Not?



—*N. Y. Globe.*

Wise Crack-les

There being no laws as yet to regulate broadcasting by radio, the expected has happened. Some cruel persons are sending out free verse.—*Cincinnati Enquirer*.

BY RADIO

With black receiver tightly clamped
Against my eager ear
I listen to the sounds afloat
Upon the atmosphere;
A solo song, a monologue,
A bedtime tale for kids,
The daily news, a lecture on
The life of annelids.

But these are not the radiograms
I seek to gather from
The void where echoes of the past
Perhaps yet faintly hum;
I hope to hear on ether waves
Still drifting to and fro
Some word immortal Cæsar wrote
Long centuries ago.

MINNA IRVING.—*New York Herald.*

GET SET

First Kid—We've got radio; my big brother's got a set.

Second Ditto—That ain't nuthin'; my brother's got a setter.—*Baltimore Evening Sun.*

AN INFANT PRODIGY

By Charles Irving Corwin

The cable is conservative,
And very circumspect.
It goes the straight and narrow path—
The line that's most direct.

The radio is radical—
A wanton in its play.
It's free for all and also free
To wander any way.

The cable often feels a shock
That wireless acts so wild;
But that is nat'ral in old age,
When it observes a child.

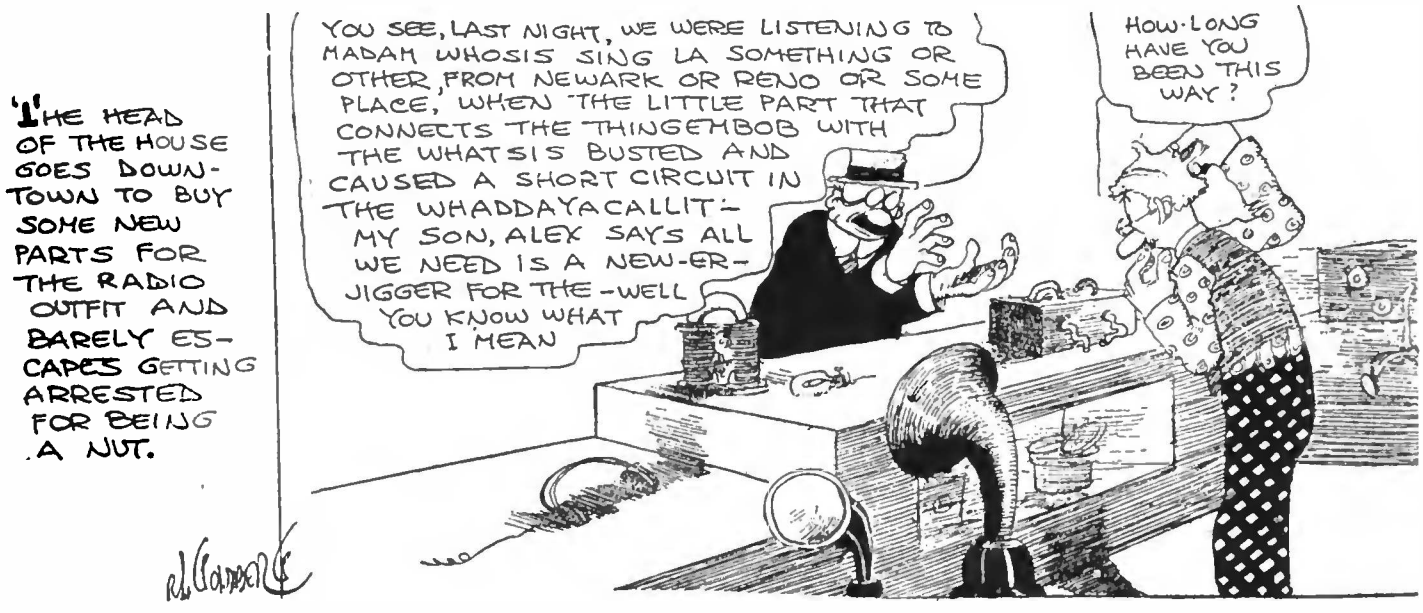
—*New York Globe.*

Notice

The author of that exciting serial story "Delirious Dave," which appeared in two previous issues writes us that he is busily preparing another. We hope to print it in an early issue. Mercifully, the name has not yet been selected.—*Ed.*

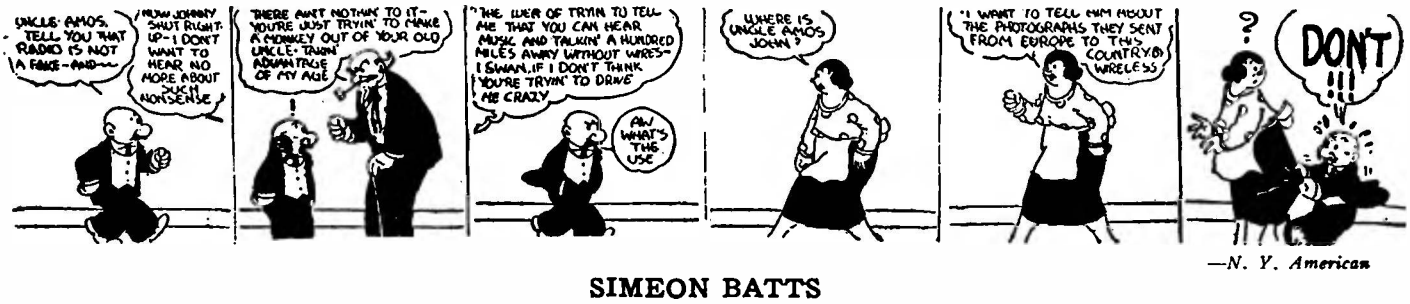
The Coming of Cold Weather and Revival of Interest in

WEEKLY RADIO RAVINGS



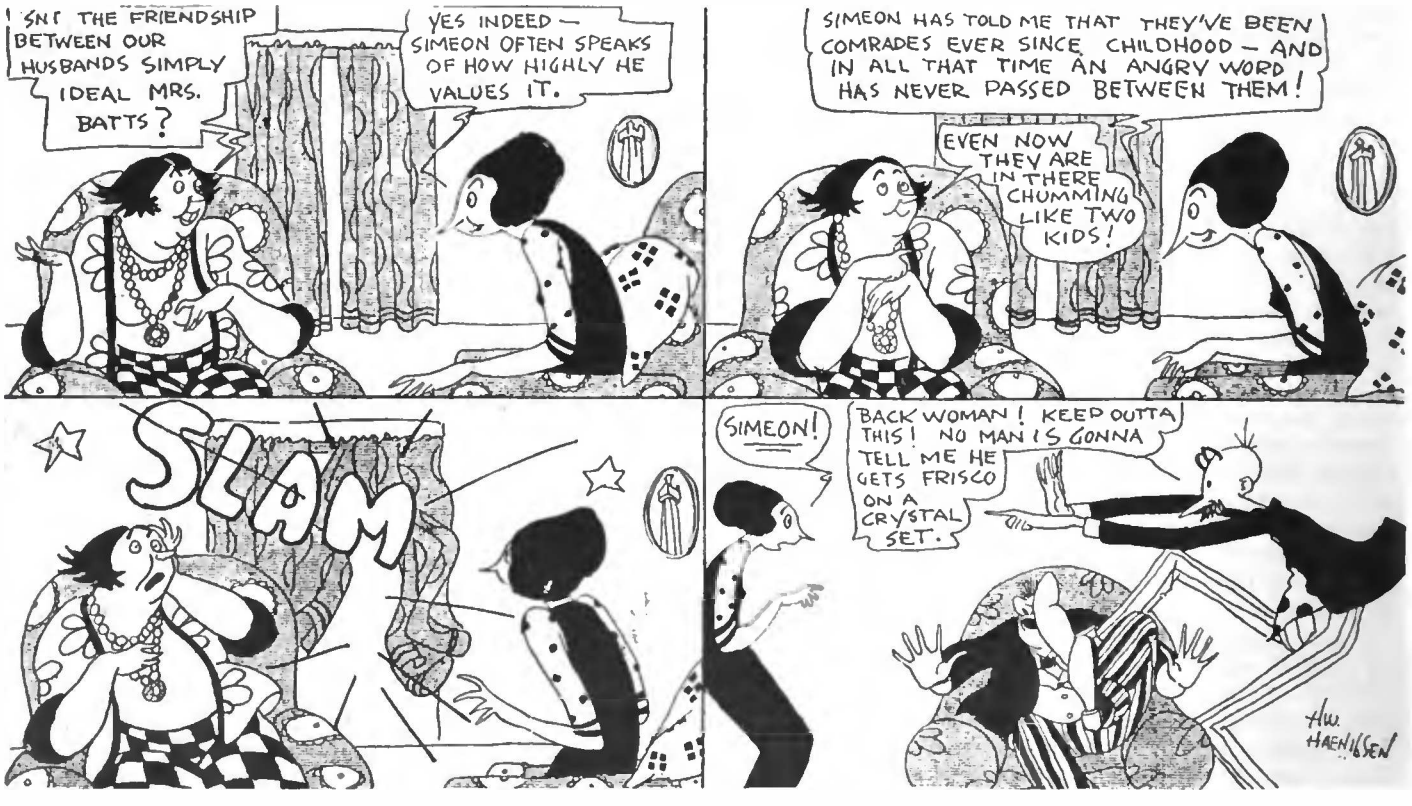
—*N. Y. Evening Mail*

THE 5:15



—*N. Y. American*

SIMEON BATTS



—*N. Y. Evening Mail*

Radio Broadcasting Whetted the Wits of Cartoonists

WHEN A FELLER NEEDS A FRIEND

The Simpleton

—N. Y. Tribune

EDDIE'S FRIENDS

—N. Y. American

HIS MIND WAS WORKING IN A DIFFERENT CHANNEL

—N. Y. American

CHILDREN OF ADAM

"Didn't I tell you to put up my clothesline?"
"Gee whiz, Ma! How d'ya expect me to climb that post?"
—(c) Public Ledger Company

LIFE ON THE RADIO WAVE

—San Francisco Chronicle

BROADCASTING STATION DIRECTORY

(Revised to October 26, 1922)

Class B stations, broadcasting on 400 meters are designated by a *

KAD Young Men's Christian Association.Denver, Colo.
KDN Leo U. Meyberg Co.....San Francisco, Calif.
KFC Northern Radio & Electric Co.....Seattle, Wash.
KFI E. C. Anthony.....Los Angeles, Calif.
KFV Foster Bradbury Radio Store....Yakima, Wash.
KYF Theatle Music Co.....San Diego, Calif.
KFZ Doerr Mitchell Elec. Co.....Spokane, Wash.
KGB Wm. A. Mullins Electric Co.....Tacoma, Wash.
KGF Pomona Fixture & Wiring Co.....Pomona, Calif.
KGG Hallock & Watson Radio Service....Portland, Ore.
KZM Preston D. Allen .....Oakland, Calif.
KGN Northwestern Radio Mfg. Co.....Portland, Ore.
KZN The Desert News .....Salt Lake City, Utah
KGD Altadena Radio Laboratory.....Altadena, Calif.
KGU M. A. Mulrony.....Honolulu, Hawaii
KGW Oregonian Publishing Co.....Portland, Ore.
KWG Portable Wireless Telephone Co...Stockton, Calif.
KGY St. Martin's College.....Lacey, Wash.
KHD Aldrich Marble & Oranite Co., Colorado Springs, Colo.
KHJ C. R. Kieruff & Co. .....Los Angeles, Calif.
KHQ Louis Wasmer .....Seattle, Wash.
KJC Standard Radio Co.....Los Angeles, Calif.
KJJ The Radio Shop.....Sunnyvale, Calif.
KJQ C. O. Gould.....Stockton, Calif.
KJR Vincent I. Kraft.....Seattle, Wash.
KJS Bible Institute of Los Angeles, Inc., Los Angeles, Calif.
KLB J. J. Dunn & Co.....Pasadena, Calif.
KLN Noggie Electric Works.....Monterey, Calif.
KLP Colin B. Kennedy Co.....Los Altos, Calif.
KLS Warner Brothers .....Oakland, Calif.
KLX Tribune Publishing Co.....Oakland, Calif.
KLZ Reynolds Radio Co.....Denver, Colo.
KMC Lindsay-Weatherill & Co.....Readley, Calif.
KMJ San Joaquin Light & Power Co.....Fresno, Calif.
KMD Love Electric Co.....Tacoma, Wash.
KNI T. W. Smith.....Eureka, Calif.
KNJ Roswell Public Service Co.....Roswell, N. M.
KNN Bullok's .....Los Angeles, Calif.
KNT North Coast Products Co.....Aberdeen, Wash.
KNV Radio Supply Co.....Los Angeles, Calif.
KNX Electric Lighting Supply Co...Los Angeles, Calif.
KDA Y. M. C. A.....Denver, Colo.
KDB New Mexico College of Agriculture and Mechanical Arts, State College, N. Mex.
KDE Spokane Chronicle .....Spokane, Wash.
KDG Western Radio Electric Co.....Los Angeles, Calif.
KDN Holawasser, Inc. .....San Diego, Calif.
KDP Detroit Police Dept.....Detroit, Mich.
KDQ Modesto Evening News.....Modesto, Calif.
KPD Halo Brothers.....San Francisco, Calif.
KQI University of California.....Berkeley, Calif.
KQP Blue Diamond Electric Co.....Hood River, Ore.
KQT Electric Power & Appliance Co...Yakima, Wash.
KQV Doubleday-Hill Electric Co. .....Pittsburgh, Pa.
KQW Charles D. Herrold.....San Jose, Calif.
KQY Stubbs Electric Co. .....Portland, Ore.
KRE Maxwell Electric Co. .....Berkeley, Calif.
*KSD Post Dispatch .....St. Louis, Mo.
KSL The Emporium .....San Francisco, Calif.
KSS Prest & Dean Radio Rsch. Lab..Long Beach., Cal.
KTW First Presbyterian Church.....Seattle, Wash.
KUD The Examiner Printing Co...San Francisco, Calif.
KUS City Dyo Worke & Laundry Co.Los Angeles, Calif.
KUY Coast Radio Co.....Del Monte, Calif.
KVQ J. C. Hobrecht .....Sacramento, Calif.
KWH Los Angeles Examiner.....Los Angeles, Calif.
KXD Herald Publishing Co.....Modesto, Calif.
KXS Braun Corporation .....Los Angeles, Calif.
KYG Willard P. Hawley, Jr.....Portland, Ore.
KYI Alfred Harrell .....Bakersfield, Calif.
KYJ Leo J. Meyberg Co.....Los Angeles, Calif.
*KYW Westinghouse Electric & Mfg. Co...Chicago, Ill.
KYY The Radio Telephone Shop...San Francisco, Calif.
KZC Public Market & Mkt. Stores Co...Seattle, Wash.
KZV Wenatchee Battery & Motor Co.Wenatchee, Wash.
KZY Atlantic Pacific Radio Supplies Co.Oakland, Calif.
*KDKA Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.
KDPT Southern Electric Co. .....San Diego, Calif.
KDYL Telegram Publishing Co....Salt Lake City, Utah
KDYM Savoy Theatre .....San Diego, Calif.
KDYN Grant Western Radio Corp...Redwood City, Calif.
KDYD Carson & Simpson .....San Diego, Calif.
KDYQ Oregon Institute of Technology....Portland, Ore.
KDYR Pasadena Star News Pub. Co.....Pasadena, Calif.
KDYS The Tribune, Inc .....Grant Falls, Mont.
KDYU Herald Publishing Co.....Klamath Falls, Ore.
KDYV Cope & Cornwell Co.....Salt Lake City, Utah
KDYW Smith Hughes & Co.....Phoenix, Ariz.
KDYX Star Bulletin Publishing Co....Honolulu, T. H.
KDZA Arizona Daily Star.....Tucson, Ariz.
KDZB Frank E. Siefert .....Bakersfield, Calif.
KDZD W. R. Mitchell .....Los Angeles, Calif.
KDZE The Rhodes Co. .....Seattle, Wash.
KDZF Automobile Club of So. Calif..Los Angeles, Calif.
KDZG Cyrus Peirce & Co.....San Francisco, Calif.
KDZH Fresno Evening Herald.....Fresno, Calif.
KDZI Electric Supply Co. .....Wenatchee, Wash.
KDZJ Excelsior Radio Co. .....Eugene, Ore.
KDZK Nevada Machinery & Electric Co.....Reno, Nev.
KDZL Rocky Mountain Radio Corp.....Ogden, Utah
KDZM E. A. Hollingworth .....Centralia, Wash.
KDZP Newberry Electric Corporation..Los Angeles, Cal.
KDZQ William D. Pyle .....Denver, Colo.
KDZR Bellingham Publishing Co.....Bellingham, Wash.
KDZT Seattle Radio Association .....Seattle, Wash.
KDZU Western Radio Corporation .....Denver, Colo.
KDZV Cope & Cornwell Co.....Salt Lake City, Utah
KDZW Claude W. Oerdes .....San Francisco, Calif.
KDZX Olad Tidings Tabernacle....San Francisco, Calif.
KDZZ Kinney Brothers & Sipprell.....Everett, Wash.
KFAB Pacific Radiofone Co. .....Portland, Ore.
KFAC Glendale Daily Press.....Glendale, Calif.
KFAD McArthur Brothers Mercantile Co..Phoenix, Ariz.
KFAE State College of Washington.....Pullman, Wash.
KFAF Western Radio Corporation.....Denver, Colo.
KFAJ University of Colorado .....Boulder, Colo.
KFAN Electric Shop .....Moscow, Idaho
KFAP Standard Publishing Co. .....Butte, Mont.
KFAQ City of San Jose.....San Jose, Calif.
KFAR O. K. Olsen .....Hollywood, Calif.
KFAS Reno Motor Supply Co. .....Reno, Nev.
KFAT Dr. S. T. Donohue .....Eugene, Ore.
KFAU Independent School District ...Boise City, Idaho
KFAV Cooke & Chapman .....Venice, Calif.
KFAW The Radio Den, Ashford & White, Santa Anna, Calif.
KFAY W. J. Virgin Milling Co.....Central Point, Ore.
KFBB F. A. Buttrey & Co. .....Havre, Mont.
KFBC W. K. Azbill .....San Diego, Calif.
KFBD Clarence V. Welch .....Hanford, Calif.
KFBE Reuben H. Horn.....San Luis Obispo, Calif.
KFBF F. H. Smith .....Butte, Mont.
KFBH Thomas Musical Co. .....Marshfield, Idaho
KFBJ Boise Radio Supply Co.....Boise, Idaho
KFBK Kimball-Upson Co. .....Sacramento, Calif.
KFBL Leese Brothers .....Everett, Wash.
KFBM Cook & Foster .....Astoria, Ore.
KFBN Borch Radio Corporation .....Oakland, Calif.
KFBQ Savage Electric Co. .....Prescott, Ariz.
KFBU Bishop, N. S. Thomas .....Laramie, Wyo.
KFBU Bishop N. S. Thomas.....Laramie, Wyo.
KFBV Clarence O. Ford.....Colorado Springs, Colo.
KFCB Nielsen Radio Supply Co. .....Phoenix, Ariz.
KFCC Auto Supply Co. .....Wallace, Idaho
KFCD Salem Elec. Co. .....Salem, Ore.
KFDA Adler's Music Store.....Baker, Ore.
KFDB Mercantile Trust Co.....San Francisco, Calif.
KFDD St. Michaels Cathedral.....Boise, Idaho
KFEB The City of Taft.....Taft, Calif.
KFEC Meier & Frank Co.....Portland, Ore.
WAH Midland Refining Co. .....El Dorado, Kans.
WBL T. & H. Radio Co. .....Anthony, Kans.
WBS D. W. May, Inc.....Newark, N. J.
WBT Southern Radio Corporation.....Charlotte, N. C.
WBU City of Chicago .....Chicago, Ill.
WBZ Westinghouse Elec. & Mfg. Co..Springfield, Mass.
WCE Findley Electric Co. .....Minneapolis, Minn.
WCJ A. C. Gilbert Co. .....New Haven, Conn.
WCK Stix-Baer-Fuller .....St. Louis, Mo.
WCM University of Texas .....Austin, Tex.
WCN Clark University .....Worcester, Mass.
*WCX Detroit Free Press.....Detroit, Mich.
WDM Church of the Covenant .....Washington, D. C.
WDT Ship Owners Radio Service .....New York, N. Y.
WDV John O. Yeiser, Jr. .....Omaha, Nebr.
WDZ James L. Bush .....Tuscola, Ill.
WEB Benwood Co. .....St. Louis, Mo.
WEH Midland Refining Co. .....Tulsa, Okla.
WEV Huriburt-Still Electriesl Co. .....Houston, Tex.
WEW St. Louis University .....St. Louis, Mo.
*WFI Strawbridge & Clothier.....Philadelphia, Pa.
WFD The Riko Kumler Co. .....Dayton, Ohio
WFY Cosradio Co. .....Wichita, Kans.
WGF The Register & Tribune .....Des Moines, Iowa
WGI American Radio and Research Corporation, Medford Hillside, Mass.
WGL Thomas F. J. Howlett .....Philadelphia, Pa.
WGR Federal Tel. & Tel. Co. .....Buffalo, N. Y.
WGV Interstate Electric Co. .....New Orleans, La.
*WGY General Electric Co. .....Schenectady, N. Y.
WHA University of Wisconsin .....Madison, Wisc.
*WHB Sweeney School Co. .....Kansas City, Mo.
WHD West Virginia University....Morgantown, W. Va.
WHK Warren R. Cox .....Cleveland, Ohio
WHN Ridgewood Times Printing & Pub. Co., Ridgewood, N. Y.
WHQ Rochester Times Union .....Rochester, N. Y.
WHU William B. Duck Co.....Toledo, Ohio
WHW Stewart W. Seelsy.....East Lansing, Mich.
WHX Iowa Radio Corporation.....Des Moines, Iowa
WIK K. & L. Electric Co.....McKeesport, Pa.
WIL Continental Electric Supply Co.Washington, D. C.
WIP Olmbel Brothers .....Philadelphia, Pa.
WIZ Cino Radio Mfg. Co.....Cincinnati, Ohio
WJD Richard H. Howe.....Oranville, Ohio
WJH White & Boyer.....Washington, D. C.
WJK Service Radio Equipment Co.....Toledo, Ohio
WJT Electric Equipment Co.....Erie, Pa.
WJX DeForest Radio Tel. & Tel. Co.New York, N. Y.
WJZ Westinghouse Elec. & Mfg. Co....Newark, N. J.
WKC Joseph M. Zamoiski Co.....Baltimore, Md.
WKN Riechman-Crosby Co. .....Memphis, Tenn.
WKY Oklahoma Radio Shop.....Oklahoma City, Okla.
WLB University of Minnesota.....Minneapolis, Minn.
WLK Hamilton Mfg. Co. .....Indianapolis, Ind.
WLW Crosley Mfg. Co. .....Cincinnati, Ohio
WMA Arrow Radio Laboratories.....Anderson, Ind.
WMB Auburn Electrical Co.....Auburn, Me.
WMC Columbia Radio Co.....Youngstown, Ohio
WMH Precision Equipment Co.....Cincinnati, Ohio
WMU Doubleday-Hill Electrical Co.....Pittsburgh, Pa.
WNJ Shotton Radio Mfg. Co.....Albany, N. Y.
WND Wireless Telephone Co. of Hudson County, N. J., Jersey City, N. J.
*WDC Palmer School of Chiropractic.....Davenport, Iowa
WDE Buckeye Radio Service Co.....Akron, Ohio
WDH Hatfield Electric Co.....Indianapolis, Ind.
WDI Iowa State College .....Ames, Iowa
WDK Arkansas Light & Power Co.....Pine Bluff, Iowa
*WDD John Wanamaker .....Philadelphia, Pa.
WDQ Western Radio Co.....Kansas City, Mo.
*WDR L. Bamberger Co. .....Newark, N. J.
WDS Missouri State Mktg. Bureau..Jefferson City, Mo.
WDU Metropolitan Utilities District.....Omaha, Nebr.
WDZ Palladium Printing Co.....Richmond, Ind.
WPA Fort Worth Record.....Fort Worth Tex.
WPE Central Radio Co. .....Kansas City, Mo.
WPG Nushawg Poultry Farm.....New Lebanon, Ohio
WPI Electric Supply Co.....Clearfield, Pa.
WPJ St. Joseph's College .....Philadelphia, Pa.
WPL Fergus Electric Co.....Zanesville, Ohio
WPM Thomas J. Williams.....Washington, D. C.
WPD United Equipment Co.....Memphis, Tenn.
WQX Walter A. Kushi .....Chicago, Ill.
WRK Doron Brothers Electric Co.....Hamilton, Ohio
WRL Union College .....Schenectady, N. Y.
WRM University of Illinois.....Urbana, Ill.
WRP Federal Institute of Radio Telegraphy, Camden, N. J.
WRR City of Dallas (Police and Fire Signal Department), Dallas, Tex.
WRW Tarrytown Radio Research Laboratory, Tarrytown, N. Y.
*WSB Atlanta Journal .....Atlanta, Oa.
WSL J. & M. Electric Co.....Utica, N. Y.
WSN Ship Owners Radio Service.....Norfolk, Va.
WSV L. M. Hunter and O. L. Carrington, Little Rock, Ark.
WSX Erie Radio Co.....Erie, Pa.
WSY Alabama Power Co.....Birmingham, Ala.
WSZ Marshall-Gerken Co. .....Toledo, Ohio
WTG Kansas State Agr. College.....Manhattan, Kans.
WTK Paris Radio Electric Co.....Paris, Tex.
WTP George M. McBride.....Bay City, Mich.
WVP Signal Corps, Bedloe's Island, N. Y. Harbor, N. Y.
WWB Daily News Printing Co.....Canton, Ohio
WWI Ford Motor Co.....Dearborn, Mich.
*WWJ The Detroit News .....Detroit, Mich.
WWL Lovola University .....New Orleans, La.
WWT McCarthy Brothers & Ford.....Buffalo, N. Y.
WWZ John Wanamaker .....New York, N. Y.
WAAB Valdmar Jensen .....New Orleans, La.
WAAC Tulane University .....New Orleans, La.
WAAD Ohio Mechanics Institute .....Cincinnati, Ohio
WAAF Chicago Daily Drovers' Journal.....Chicago, Ill.
WAAG Elliott Electric Co.....Shreveport, La.
WAAH Commonwealth Electric Co.....St. Paul, Minn.
WAAJ Eastern Radio Institute.....Boston, Mass.
WAAK Olmbel Brothers .....Milwaukee, Wisc.
WAAL Minnesota Tribune Co. & Anderson Bemich Co., Minneapolis, Minn.
WAAM L. R. Nelson Co. .....Newark, N. J.
WAAN University of Missouri .....Columbia, Mo.
WAAD Radio Service Co. .....Charleston, W. Va.
WAAP Otto W. Taylor.....Wichita, Kans.
WAAQ New England Motor Sales Co...Greenwich, Conn.
WAAR Groves-Thornton Hardware Co.Huntington, W. Va.
WAAS Georgia Radio Co.....Decatur, Ga.
WAAV Athens Radio Co.....Athens, Ohio
WAAW Omaha Grain Exchange .....Omaha, Nebr.
WAAX Radio Service Corp. .....Crafton, Pa.
WAAY Yahrling-Raynor Piano Co.....Youngstown, Ohio
WAAZ Hollister-Miller Motor Co.....Emporia, Kans.
WAJT Kelley-Vawter Jewelry Co.....Marshall, Mo.
WAJU Yankton College .....Yankton, S. D.
WAJV Indian Pipe Line Corp.....Princeton, Ind.
WBAA Purdue University .....West Lafayette, Ind.
WBAB Andrew J. Potter .....Syracuse, N. Y.
WBAD Sterling Electric Co. and Journal Printing Co., Minneapolis, Minn.
WBAE Bradley Polytechnic Instituto .....Peoria, Ill.
WBAF Fred M. Middleton .....Morristown, N. J.
WBAG Diamond State Fibre Co. .....Bridgeport, Pa.
WBAH The Dayton Co. .....Minneapolis, Minn.
WBAJ Marshall-Gerken Co. .....Toledo, Ohio
WBAN Wireless Phone Corp. .....Paterson, N. J.
WBAD James Millikin Univorsity .....Decatur, Ill.
*WBAP The Star Telegram.....Fort Worth, Tex.
WBAQ Myron L. Harmon .....South Bend, Ind.
WBAU Republican Publishing Co. .....Hamilton, Ohio
WBAV Erner & Hopkins Co.....Columbus, Ohio
WBAW Marietta College .....Marietta, Ohio
WBAX John H. Stenger, Jr.....Wilkes-Barre, Pa.
*WBAY American Tel. & Tel. Co.....New York, N. Y.
WBAZ Times Dispatch Publishing Co...Richmond, Va.
WCAB Newburgh News Printing & Publishing Co., Nowburgh, N. Y.
WCAC John Fink Jewelry Co.....Fort Smith, Ark.
WCAD St. Lawrence University .....Canton, Ohio
WCAE Kaufman & Baer Co.....Pittsburgh, Pa.
WCAG Daily States Publishing Co....New Orleans, La.
WCAH Entrekin Electric Co.....Columbus, Ohio
WCAJ Nebraska Wesleyan University, University Pl., Neb.
WCAK Alfred P. Daniel.....Houston, Tex.
WCAL St. Olaf College.....Northfield, Minn.
WCAM Villanova College .....Villanova, Pa.
WCAN Southeastern Radio Telephone Co., Jacksonville, Fla.
WCAD Sanders & Stayman Co.....Baltimore, Md.
WCAP Central Radio Service .....Decatur, Ill.
WCAQ Tri-State Radio Mfg. & Supply Co.Defiance, Ohio
WCAR Alamo Radio Electric Co.....San Antonio, Tex.
WCAS William Hood Dunwoody Industrial Institute, Minneapolis, Minn.
WCAT South Dakota State School of Mines, Rapid City, S. Dak.
WCAU Philadelphia Radiophone Co....Philadelphia, Pa.
WCAV J. C. Dice Electric Co.....Little Rock, Ark.
WCAW Quincy Herald & Quincy Electric Supply Co., Quincy, Ill.
WCAX University of Vermont.....Burlington, Vt.
WCAY Kesselmen O'Driscoll Co.....Milwaukee, Wisc.
WCAZ Robert E. Compton .....Carthage, Ill.
WDAA Ward-Belmont School .....Nashville, Tenn.
WDAB M. C. Sumner & Son.....Portsmouth, Ohio
WDAC Illinois Watch Co.....Springfield, Ill.
WDAD William Louis Harrison.....Lindsborn, Kans.
WDAE Tampa Daily Times .....Tampa, Fla.
*WDAF Kansas City Star .....Kansas City, Mo.
WDAG J. Laurence Martin .....Amarillo, Tex.
WDAH Mine & Smelter Supply Co.....El Paso, Tex.
WDAI Hughes Electriesl Corp.....Syracuse, N. Y.
WDAJ Atlanta & West Point R. R. Co.College Park, Ga.
WDAK The Courant .....Hartford, Conn.
WDAL Florida Times Union.....Jacksonville, Fla.
WDAM Weston Electric Co. .....New York, N. Y.
WDAN Olenwood Radio Corp. .....Shreveport, La.
WDAD Automotive Electric Co. .....Dallas, Tex.
WDAP Midwest Radio Central, Inc. .....Chicago, Ill.
WDAQ Hartman-Riker Elec. & Mach. Co.Brownsville, Pa.
WDAR Lit Brothers .....Philadelphia, Pa.
WDAS Samuel W. Walto.....Worcester, Mass.

WDAT Delta Electric Co.....Worcester, Mass.
WDAU Slocum & Kilburn.....New Bedford, Mass.
WDAV Muskogee Daily Phoenix.....Muskogee, Okla.
WDAW Georgia Railway & Power Co.....Atlanta, Ga.
WDAX First National Bank .....Centerville, Iowa
WDAY Kenneth M. Hance .....Fargo, N. D.
WEAA Fallain & Lathrop .....Flint, Mich.
WEAB Standard Radio Equipment Co..Fort Dodge, Iowa
WEAC Bainca Electric Service Co.....Terre Haute, Ind.
WEAD Northwest Kansas Radio Sup. Co..Atwood, Kans.
WEAE Virginia Polytechnic Institute,...Blacksburg, Va.
*WEAF Western Electric Co. .....New York, N. Y.
WEAG Nichols-Hineline-Bassett .....Edgewood, R. I.
WEAH Wichita Board of Trade & Landers Radio Co., Wichita, Kans.
WEAI Cornell University .....Ithaca, N. Y.
WEAJ University of South Dakota..Vermillion, S. Dak.
WEAK Julius B. Abercrombie.....St. Joseph, Mo.
WEAM Borough of North Plainfield, North Plainfield, N. J.
WEAN Shepard Company .....Providence, R. I.
WEAO Oblo State University .....Columbus, Ohio
WEAP Mobile Radio Co., Inc.....Mobile, Ala.
WEAQ Y. M. C. A. .....Berlin, N. H.
WEAR Baltimore Am. & News Pub. Co..Baltimore, Md.
WEAS Hecht Company .....Washington, D. C.
WEAT John J. Fogarty.....Tampa, Fla.
WEAU Davidson Brothers Co.....Sioux City, Iowa
WEAV Sheridan Electric Service Co.....Rushville, Nebr.
WEAW Arrow Radio Laboratories.....Anderson, Ind.
WEAX T. J. M. Daly.....Little Rock, Ark.
WEAY Will Horwitz, Jr. .....Houston, Tex.
WEAZ Donald Redmond .....Waterloo, Iowa,
*WFAA A. H. Belo & Co.....Dallas, Tex.
WFAB Carl F. Woese .....Syracuse, N. Y.
WFAC Superior Radio Co. .....Superior, Mich.
WFAD Watson, Weldon Motor Supply Co..Salina, Kans.
WFAF Henry C. Spratley.....Poughkeepsie, N. Y.
WFAG Radio Engineering Laboratory...Waterford, N. Y.
WFAH Electrical Supply Co. .....Port Arthur, Tex.
WFAJ Hi-Grade Wireless InstrumentCo., Asheville, N. C.
WFAL Houston Chronicle Pub. Co.....Houston, Tex.
WFAM Times Publishing Cn. .....St. Cloud, Minn.
WFAN Hutchinson Elec. Service Co....Hutchinson, Minn.
WFAP Brown's Business College .....Peoria, Ill.
WFAQ Missouri Wesleyan College and Cameron Radio Company.....Cameron, Mo.
WFAR Hall & Stubbe .....Sanford, Me.
WFAS United Radio Corporation.....Fort Wayne, Ind.
WFAT Daily Argus Leader.....Sioux Falls, S. D.
WFAU Edwin C. Lewis, Inc.....Boston, Mass
WFAV University of Nebraska.....Lincoln, Nebr.
WFAW Miami Daily Metropolic.....Miami, Fla.
WFAX Arthur L. Kent.....Binghamton, N. Y.
WFAY Daniels Radio Supply Co.....Independence, Kans.
WFAZ South Carolina Radio Shop .....Charleston, S. C.
WGAB QBV Radio Co. .....Houston, Tex.
WGAC Orpheum Radio Stores Co.....Brooklyn, N. Y.
WGAD Spanish Am. Schl. of Telegraphy, Ensonada, P. R.
WGAF Ooliey Radio Service.....Tulsa, Okla.
WGAH New Haven Elec. Co.....New Haven, Conn.
WGAJ W. H. Glass .....Shenandoah, Iowa
WGAK Macon Electric Co.....Macon, Ga.
WGAL Lancaster Elec. Supply & Const. Co., Lancaster, Pa.
WGAM Orangeburg Radio Equipment Co., Grangeburg, S. C.
WGAN Cecil E. Lloyd.....Pensacola, Fla.
WGAQ W. G. Patterson.....Shreveport, La.
WGAR Southern American.....Fort Smith, Ga.
WGAS Ray-di-co Organization .....Chicago, Ill.
WGAT American Legion, Dept. of Nebr., Lincoln, Nebr.
WGAU Marcus G. Lumb.....Wooster, Ohio
WGAV B. H. Radio Co.....Savannah, Ga.
WGAW Ernest C. Albright.....Altoona, Pa.
WGAX Radio Electric Co., Washington Courthouse, Ohio
WGAY North Western Radio Co.....Madison, Wisc.
WGAZ South Bend Tribune.....South Bend, Ind.
WHAA State University of Iowa.....Iowa City, Ia.
WHAB Clark W. Thompson.....Galveston, Tex.
WHAC Cole Brothers Elec. Co.....Waterloo, Iowa
WHAD Marquette University.....Milwaukee, Wisc.
WHAE Automotive Electric Service Co., Sioux City, Ia.
WHAF Radio Electric Co.....Pittsburgh, Pa.
WHAG University of Cincinnati.....Cincinnati, Ohio
WHAH J. T. Griffin.....Joplin, Mo.
WHAI Radio Equipment & Mfg. Co.....Davenport, Iowa
WHAJ Bluefield Daily Telegraph.....Bluefield, W. Va.
WHAK Roberts Hardware Co.....Clarksburg, W. Va.
WHAL Phillips, Jeffrey & Derby.....Lansing, Mich.
WHAM School of Music, Rochester, Univ. Rochester, N. Y.
WHAN Southwestern Radio Co.....Wichita, Kans.
WHAO F. A. Hill.....Savannah, Ga.
WHAP Dewey L. Otta.....Decatur, Ill.
WHAQ Semmes Motor Co.....Washington, D. C.
WHAR Paramount Radio & Elec. Co. Atlantic City, N. J.
WHAS Courier Journal & Louisville Times, Louisville, Ky.
WHAT Yale Democrat & Yale Tel. Co.....Yale, Okla.
WHAU Corinth Radio Supply Co.....Corinth, Miss.
WHAV Wilmington Elec. & Supply Co., Wilmington, Del.
WHAW Pierce Electric Co.....Tampa, Fla.
WHAX Huntington Press.....Huntington, Ind.
*WHAZ Rensselaer Polytechnic Institute.....Troy, N. Y.
WIAA Waupaca Civic & Commerce Assn., Waupaca, Wis.
WIAB Joslyn Automobile Co.....Rockford, Ill.
WIAD Ocean City Yacht Club.....Ocean City, N. J.
WIAE Mrs. Robt. E. Zimmerman.....Venton, Ia.
WIAF Gustav A.. DeCortin.....New Orleans, La.
WIAG Matthews Electric Supply Co...Birmingham, Ala.
WIAH Continental Radio Mfg. Co.....Newton, Ia.
WIAI Heers Stores Co.....Springfield, Mo.
WIAJ Fox River Valley Radio Supply Co., Neenah, Wisc.
WIAK The Stockman Journal.....Omaha, Nebr.
WIAL Standard Radio Service Co.....Norwood, Ohio
WIAN Chronicle & News Pub. Co.....Allentown, Pa.
WIAP J. A. Rudy & Sons.....Paducah, Ky.
WIAQ Chronicle Publishing Co.....Marion, Ind.
WIAS Burlington Hawkeye-Home Elec. Co., Burlington, Ia.
WIAT Leon T. Noel .....Tarkio, Mo.
WIAU American Sec. & Sav. Bank.....Le Mars, Ia.
WIAV New York Radio Laboratories..Binghamton, N. Y.
WIAW Saginaw Radio & Elec. Co.....Saginaw, Mich.
WIAX Capital Radio Co.....Lincoln, Nebr.
WIAY Woodward & Lothrop.....Washington, D. C.
WIAZ Electric Supply Sales Co.....Miami, Fla.
WJAB American Radio Co.....Lincoln, Nebr.
WJAC Rodoli Co. .....Joplin, Mo.
WJAD Jackson's Radio Eng. Lab.....Waco, Tex.
WJAE Texas Radio Syndicate.....San Antonio, Tex.
WJAG Huse Publishing Co.....Norfolk, Nebr.
WJAH Central Park Amusement Co.....Rockford, Ill.
WJAJ Y. M. C. A. .....Dayton, Ohio
WJAK White Radio Leboratory.....Stockdale, Ohio
WJAL Victor Radio Corporation.....Portland, Me.
WJAM D. M. Perham.....Cedar Rapids, Ia.
WJAN Peoria Star & Peoria Radio Sales Co..Peoria, Ill.
WJAP Kelly-Duluth Co.....Duluth, Minn.
WJAR The Outlet Co. .....Providence, R. I.
WJAS Pittsburgh Radio Supply House, Pittsburgh, Pa.
WJAX The Union Trust Co.....Cleveland, Ohio
WJAZ Chicago Radio Laboratory.....Chicago, Ill.
WKA Landaus Music & Jewelry Co...Wilkes-Barre, Pa.
WKAA H. F. Paar & Republican Times, Cedar Rapids, Ia.
WKAC Star Publishing Co.....Lincoln, Nebr.
WKAD Charles Loof.....East Providence, R. I.
WKAF W. S. Radio Supply Co. and Wm. Schack, Wichita Falls, Tex.
WKAG Edwin T. Bruce, M.D.....Louisville, Ky.
WKAH Planet Radio Co.....West Palm Beach, Fla.
WKAJ Fargo Plumbing & Heating Co.....Fargo, N. D.
WKAK Okfuskee County News.....Okemah, Okla.
WKAL Gray & Oray .....Orange, Tex.
WKAM Adam Breede, Hastings Daily Tribune, Hastings, Nebr.
WKAN Alabama Radio Mfg. Co.....Montgomery, Ala.
WKAP Flint, Dutee Wilcox .....Cranston, R. I.
WKAQ Radio Corporation of Porto Rico, San Juan, P. R.
WKAR Michigan Agri. College....East Lansing, Mich.
WKAS L. E. Lines Music Co.....Springfield, Mo.
WKAT Frankfort Morning Times.....Frankfort, Ind.
WKAV Laconia Radio Club.....Laconia, N. H.
WKAW Turner Cycle Co.....Beloit, Wisc.
WKAX Wm. A. MacFarlane.....Bridgeport, Conn.
WKAY Brenau College.....Janesville, Oa.
WLAB George F. Grossman.....Carrollton, Mo.
WLAC North Carolina State College.....Raleigh, N. C.
WLAD Arvanette Radio Supply Co.....Hastings, Nebr.
WLAF Johnson Radio Co.....Lincoln, Nebr.
WLAG Cutting & Washington Radio Corp. Minneapolis, Minn.
WLAH Samuel Woodworth .....Syracuse, N. Y.
WLAJ Waco Electrical Supply Co.....Waco, Tex.
WLAK Vermont Farm Mach. Co.....Bellows Falls, Vt.
WLAL Tulsa Radio Co.....Tulsa, Okla.
WLAM Morrow Radio Co.....Springfield, O.
WLAN Putnam Hardware Co.....Houlton, Me.
WLAD Anthracite Radio Shop.....Scranton, Pa.
WLAP W. V. Jordon.....Louisville, Ky.
WLAQ A. E. Schilling.....Kalamazoo, Mich.
WLAR Mickel Music Co.....Marshalltown, Iowa
WLAS Hutchinson Grain Radio Co.....Hutchinson, Kans.
WLAT Chas O. Bosch Co. .....Burlington, Iowa
WLAV Electric Shop, Inc.....Pensacola, Fla.
WLAW New York Police Dept.....New York City, N. Y.
WLAX Greencastle Community Broadcastlag Station, Greencastle, Ind.
WLAY Northern Commercial Co. of Alaska Fairbanks, Alaska
WLAZ Hutton & Jones Elec. Co.....Warren, Ohio
WMAB Radio Supply Co.....Oklahoma City, Okla.
WMAC F. Edward Page.....Fernwood, Cazenovia, N. Y.
WMAF Round Hills Radio Corp.....Dartmouth, Mass.
WMAG Tucker Electric Co. .....Liberal, Kans.
WMAH General Supply Co. .....Lincoln, Nebr.
WMAJ Drovers Telegram Co.....Kansas City, Mo.
WMAK Norton Laboratories .....Lockport, N. Y.
WMAL Trenton Hardware Co.....Trenton, N. J.
WMAM Beaumont Radio Equipment Co., Beaumont, Tex.
WMAN Broad Street Baptist Church.....Columbus, Ohio
WMAP Lumy Battery Service.....Easton, Pa.
WMAQ The Chicago Daily News.....Chicago, Ill.
WMAR Waterloo Electrical Supply Co.....Waterloo, Iowa
WMAT Paramount Radio Corporation.....Duluth, Minn.
WMAU Louisiana State Fair Association, Shreveport, La.
WMAV Alabama Polytechnic Institute.....Auburn, Ala.
WMAW Wahpeton Elec. Co.....Wahpeton, N. D.
WMAX K. & K. Radio Supply Co....Ann Harbor, Mich.
WMAY Kingshighway Presby. Church.....St. Loule, Mo.
WNAB Park City Daily News.....Bowling Green, Ky.
WNAC Shepard Stores.....Boston, Mass.
WNAD Oklahoma Radio Eng. Co.....Norman, Okla.
WNAF Enid Radio Distributing Co.....Enid, Okla.
WNAG Rathert Radio & Electric Co.....Cresco, Iowa
WNAH Manhattan Radio Supply Co....Menhattan, Kans.
WNAJ Benson Co. .....Chicago, Ill.
WNAL R. J. Rockwell.....Omaha, Nebr.
WNAP Wittenberg College .....Springfield, Ohio
WNAT Lennig Bros. Co.....Pbiisdelphia, Pa.
WOAA Dr. Walter Hardy.....Ardmore, Okla.
WOAE Midland College.....Fremont, Nebr.
WOAI Southern Equipment Co.....San Antonio, Tex.
WOAV Penna. National Guard.....Erie, Pa.
WPAA Anderson & Webster Electric Co.....Waco, Nebr.
WPAN Levy Bros. Dry Goods Co.....Houston, Tex.
WQAQ West Texas Radio Co.....Abilene, Tex.
WRAU Amarillo Daily News.....Amarillo, Tex.
WSAV Clifford W. Vick, Radio Construction Co., Houston, Tex.
WTAW Agricultural & Mechanical College of Texas, College Station, Tex.
WWAH General Supply Co.....Lincoln, Nebr.

*Class B. station broadcasting on 400 meters.

Canadian Broadcasting Stations

CFAC Radio Corporation of Calgary, Ltd., Calgary, Alberta
CFCA Star Publishing and Printing Co., Toronto, Ontario
CFCB Marconi Wireless Telegraph Co. of Canada, Ltd., Vancouver, B. C.
CFCD Canadian Westinghouse Co., Ltd., Winnipeg, Manitoba
CFCE Marconi Wireless Telegraph Co. of Canada Halifax, Nova Scotia
CFCF Marconi Wireless Telegraph Co. of Canada, Ltd., Montreal, Quebec
CFCH Abitibi Pnwer and Paper Co., Ltd., Iroquois Falls, Ontario
CFCI Motor Products Corporation, Walkerville, Ontario
CFCN W. W. Grant Radio Ltd.....Calgary, Alberta
CFCX The London Advertiser.....London, Ontario
CFPC International Radio Development Co., Fort Frances, Ontario
CFTC The Bell Telephone Co. of Canada, Toronto, Ontario
CFYC Victor Wentworth Odlom.....Vanrouver, B. C.
CFZC Canadian Westinghouse Co., Ltd...Montreal, Quebec
CHBC The Albertan Publishing Co., Calgary, Alberta
CHCA Radio Corporation of Vanrouver, Ltd., Vancouver, B. C.
CHCB Marconi Wireless Telegraph Co. of Canada, Ltd., Toronto, Ontario
CHCC Canadian Westinghouse Co., Ltd., Edmonton, Alberta
CHCF Radio Corporation of Winnipeg, Ltd., Winnipeg, Manitoba
CHCQ The Western Radio Co., Ltd., Calgary, Alberta
CHCS London Radio Shoppe.....London, Ontario
CHCZ The Globe Printing Co.....Toronto, Ontario
CHCX B. L. Silver.....Montreal, Quebec
CHIC Canadian Westinghouse Co., Ltd., Hamilton, Ontario
CHDC Canadian Westinghouse Co., Ltd., Vancouver, B. C.
CHVC Metropolitan Motors, Ltd.....Toronto, Ontario
CHXC J. R. Booth, Jr.....Ottawa, Ontario
CHYC Northern Electric Co.....Montreal, Quebec
CJBC Dupuis Freres .....Montreal, Quebec
CJCA The Edmonton Journal, Ltd., Edmonton, Alberta
CJCB James Gordon Bennett, Nelson, British Columbia
CJCD T. Eaton Co., Ltd.....Toronto, Ontario
CJCE Vancouver Sun Radiotelephones, Ltd., Vancouver, B. C.
CJCF News Record, Ltd. .....Kitchener, Ontario
CJCG Manitoba Free Press Co., Ltd., Winnipeg, Manitoba
CJCH The United Farmers of Ontario, Toronto, Ontario
CJCI McLean, Holt & Co., Ltd., St. John, New Brunswick
CJCN Simons Agnew & Co.....Toronto, Ontario
CJCS Eastern Telephone and Telegraph Co., Ltd. Halifax, Nova Scotia
CJCY Edmund Taylor .....Calgary, Alberta
CJGC London Free Press Printing Co., Ltd., London, Ontario
CJNC Tribune Newspaper Co., Ltd., Winnipeg, Manitoba
CJSC The Evening Telegram.....Toronto, Ontario
CKAC La Presse Publishing Co.....Montreal, Quebec
CKCB T. Eaton Co., Ltd.....Winnipeg, Manitoba
CKCD Vanrouver Daily Province.....Vancouver, B. C.
CKCE Canadian Independent Telephone Co., Ltd., Toronto, Ontario
CKCK Leader Publishing Co., Ltd., of Regine, Regina, Saskatchewan
CKCR Jones Electric Radio Co., St. John, New Brunswick
CKCS The Bell Telephone Co. of Canada, Montreal, Quebec
CKCZ Canadian Westinghouse Co., Ltd., Toronto, Ontario
CKKC Radio Equipment and Supply Co., Toronto, Ontario
CKDC The Wentworth Radio Supply Co., Hamilton, Ontario
CKQC Radio Supply Co. of London.....London, Ontario
CKZC Salton Radio Engineering Co., Winnipeg, Manitoba

WORLD WIDE WIRELESS

Pacific Operator Wins Praise

ONCE more a ship radio operator has lived up to the highest traditions of his profession. Operator W. H. Bell, of the S.S. *City of Honolulu,* which burned October 12 in the Pacific Ocean stuck at his key, in touch with vessels speeding to the rescue, and only left his post when it was no longer humanly possible to stay on the ship. He abandoned the vessel with the captain, chief officer and chief engineer, after all passengers and crew had been safely debarked in lifeboats four hours before. All were picked up uninjured by a freighter which responded to the wireless call for aid. It was Bell's first trip to sea. A. A. Isbell, general superintendent of the Pacific Division of the Radio Corporation of America, said:

"Although this was Bell's first trip in our service, I am extremely gratified to know that he has upheld the fine traditions of Radio Corporation men by staying at his post as long as it was humanly possible."

Immediately on hearing of Operator Bell's heroism, Mr. David Sarnoff, vice-president and general manager of the Radio Corporation of America, wired Mr. Isbell as follows:

"Please convey to radio operator W. P. Bell of the ill-fated steamer *City of Honolulu* the thanks of the Radio Corporation of America for his brave conduct during the emergency which resulted in the saving of life at sea and for upholding the traditions of the many heroic radio operators who have always thought of themselves last and who have even sacrificed their lives that others might be saved during such emergencies. The Radio Corporation of America is proud of Bell and I would ask you to extend to him my personal congratulations as well as to his assistant operators H. W. Hancock and N. C. Kumler who stood by during the trying period.—DAVID SARNOFF."

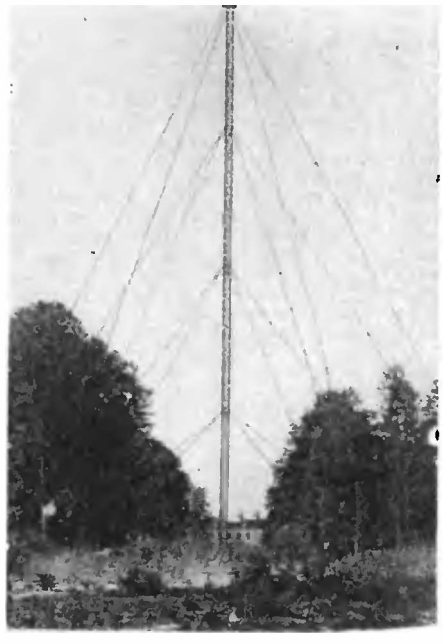
Under the heading "Another Great Sea Story," the New York "World" commented editorially on the burning of the *City of Honolulu* as follows:

"The burning of the steamship *City of Honolulu* in the Pacific Ocean had most of the elements of danger and daring which go to make up the perfect sea story.

"The ship with 217 persons aboard, passengers and crew, is in the open ocean—1,405 miles from Honolulu and 670 miles southwest of its home port—when the fire is discovered. Wireless calls for help are immediately sent broadcast and with more and more urgency as the spread of the flames heralds the doom of the vessel. The messages tell the story in graphic outline: 'Come at once.' 'Lowering boats. Leaving ship.' 'All left ship except Captain, Chief Officer and wireless operator.' And finally word of the abandonment of the burning craft: 'Captain and gang leaving ship; goodby to you all.'

"A complete picture in twoscore words of a sea disaster, brevity itself, yet enabling the reader of the day's news here in New York, 4,000 miles away, to visualize the leaping flames, to see the officers at their posts and the passengers and crew setting out in open boats to await rescue in mid-ocean, luckily on a calm sea. And happily that rescue is near at hand, potentially from several ships racing to the scene, actually from the freight steamer the *West Faralon,* first to arrive.

"Altogether a stirring tale of sea danger, best of all in its fortunate outcome. Once more mankind is moved to gratitude for the invention which almost with Divine power protects the mariner and the voyager at sea. And indeed has there been within memory a comparable performance of radio telegraphy in summoning assistance to a vessel in distress."



One of the towers supporting the great transmitting antenna at the new French Radio Central, located at St. Assise, near Paris

Trans-Ocean Station for Holland

IN the late war, Holland was entirely cut off from all direct cable communication with her colonial possessions and the outside world, and was entirely dependent on foreign cables; great efforts have therefore been made of late to provide the Netherlands with direct wireless service both to her colonies and to the United States. It is now learned that the Dutch Government is establishing a very powerful wireless sending and receiving station at Kootwyk, in the Province of Gelderland, covering an area of 750 acres. Kootwyk is some distance from the seat of government, but it was chosen on account of the country being more elevated than near the principal cities of the Netherlands.

Still another station for receiving will be established thirty miles southward. Five masts, 700 feet high, have been erected at Kootwyk, weighing 100 tons each. The station is expected to be ready for service at the end of the year.

Kootwyk Station will be equipped with a special duplex system to receive and send simultaneously to and from Java, 7,500 miles distant.

Diplomatic negotiations are now being carried on to make the new station available for American traffic after sunset, as the station cannot communicate with Java during the whole twenty-four hours owing to atmospheric conditions.

Austrian Concession to Marconi Firm

MARCONI'S Wireless Telegraph Co., London, has secured a concession from the Austrian Government whereby the company is given the sole right to erect and operate wireless stations for public traffic between Austria and all other countries. The concession is for a period of 30 years, and has been ratified by the Allied Reparations Commission. The many documents necessary for confirmation have been signed by all concerned, and it is expected that immediate preparations will commence for the erection and operation of the most modern high power transmitters and receivers in Austria, which will give practically instantaneous communication with the rest of Europe, with Asia, Africa and North America.

RCA Buys Entire Building at 64 Broad Street

IT was announced on October 9, by officials of the Radio Corporation of America that it had entered into a contract to purchase the White Oil Building at 64-68 Broad Street, New York City, from the White Oil Realty Company.

The announcement read: "During the last two years the Corporation has centralized at 64 Broad Street the handling of its transoceanic message traffic and it was the feeling of the officers of the company that the use of wireless for international communication had not only conclusively demonstrated its reliability, practicability and accuracy, but had also demonstrated that it was not only desirable but also necessary that the facilities for handling this kind of traffic should be permanently located."

The building at 64 Broad Street has come to be known in the radio world as the "heart of World Wide Wireless," as from here there are more circuits handled than in any other place or country in the world. The structure itself is ideally located for the purposes of the company, because it is in the center of the financial and commercial district of New York, in which city a large percentage of the traffic handled originates.

The building is also within two blocks of the principal cable and telegraph forwarding offices and is particularly near the office of the Postal Telegraph Company, with which the Radio Corporation has recently made a traffic arrangement whereby the Postal company collects and distributes trans-Atlantic radiograms from and to all points in the United States.

The new radio building is 10 stories high and contains 43,000 square feet. It has been known in the past as the White Oil Building but the name in all probability will be changed to "Radio House." It will also be remodeled at a later date to meet the needs of the Corporation. Eventually it will house the executive, sales and engineering departments of the Corporation, which are now located in the Woolworth Building.

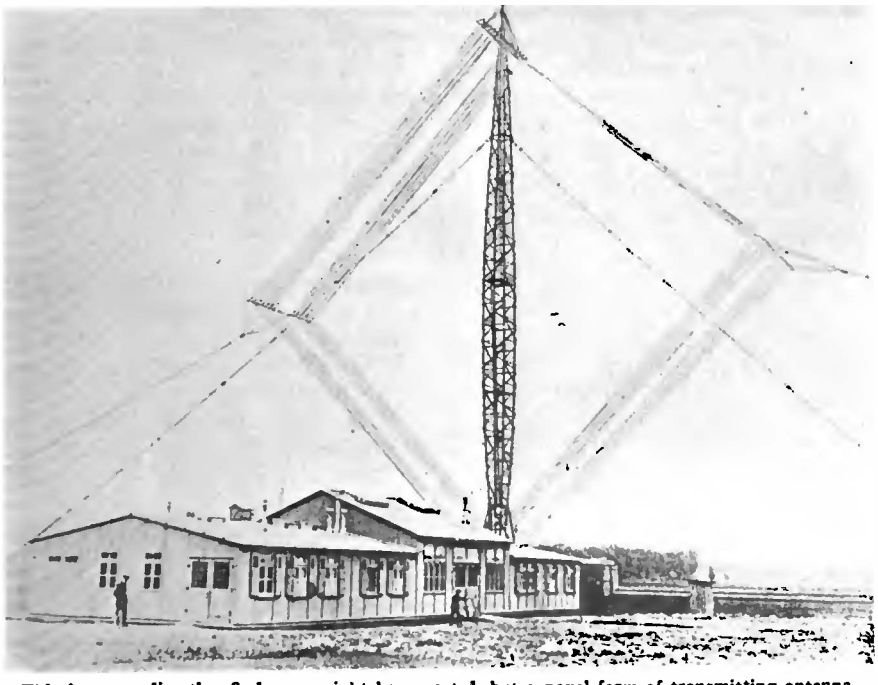
New Post Office Station

ADDITION of the sixteenth radio station for the air mail service of the Post Office Department has been authorized, and equipment is being assembled. Chicago has been chosen as the location of the new link in the trans-Continental wireless system.

This new station will be equipped with radio telephone in addition to radio telegraph in order that it may be available for experiments with night flying. The only other radio telephone station of the air mail service is at the Post Office Department in Washington.

The air mail station at Speedway Field has been using the Great Lakes naval station radio for its regular radio business. However, the naval station is about forty miles from the Speedway Field, and it was deemed advisable for the Post Office Department to have its own radio station on the grounds. The smokestack of the huge Speedway Hospital will be used as a support for the antenna of the new stations.

At the present time the new station will be used for regular business of the air mail.



This is not a direction finder, as might be expected, but a novel form of transmitting antenna at the new German wireless station at Oranienburgarstrasse. Signals from this antenna are so strong as to be audible not only in all parts of Europe but in North America and in Asia

Remarkable Ship-to-Shore Radio Communication

THE most remarkable records yet made in ship to shore radio telephony were hung up during the period from September 12 to 25, during the voyage of the S. S. *Matsonia* from Honolulu to San Francisco. The ship has one of the 1 kw. combination radio telephone and telegraph sets, made by the Radio Corporation of America. With it the operator was able to talk with the operator of the station at Apia, British Samoa. The last conversation took place at 8.30 a.m., when the *Matsonia* was 4,050 miles from Apia. The following day she docked in San Francisco.

During the entire voyage the vessel was in constant voice communication with the shore, speaking directly to either KPH, the Radio Corporation station at San Francisco, or with KHK, the Hawaiian station, whichever one was nearer. All the work was done on 550 meters.

The ship has made some extraordinary daylight transmission records. When the sun is above the horizon, as is well known, it is difficult to do distance work; however, the *Matsonia* one noon was able to converse with the Naval Radio station at Pearl Harbor, at 1,475 miles distance.

One of the outstanding night records was made when the ship was between Honolulu and Hilo, 2,100 miles away. Over this distance Chief Operator Slater talked with KPH, at 1 a.m. Honolulu time or 3:30 a.m. California time.

The great success of the ship-to-shore telephone in the Pacific has been responsible for much interest in it on the Pacific Coast, among both shippers and passengers, while amateurs who have picked up the conversations likewise have given the accomplishments much publicity. A steady growth in the number of ships using these combination transmitters is expected as the various steamer lines cater to the new public demand for the most advanced means of radio communication.

Army Tank Directed by Radio

ONE of the U. S. new Signal Corps radio transmitters designed for use on the Whippet tanks of the Army was tested out for the first time at the annual field day of the Army Ordnance Association at Aberdeen, Md., October 6. The standard sets, designed for the master tanks of each group include both telegraph and telephone apparatus. Under direction of the commanding officer in the rear the radio tank executed intricate orders immediately, charging and attacking enemy tanks under radio direction from back of the lines.

SCR79A Set Heard 2,700 Miles

IN testing out the radius of one of its standard radio telegraph sets designated as SCR79A, the Signal Corps has established a new record of transmission between 1,175 and 2,700 miles.

One of these sets was temporarily installed in the Headquarters of the Ninth Corps Area, San Francisco, with the call WYCH, and communication was undertaken with Army Transports on the Pacific. On one occasion the *Sherman* reported as hearing the signals from WYCH, while she was 700 miles west of Honolulu, a distance of approximately 2,700 miles from the transmitter. Other signals were exchanged between the Signal Corps station and the *Buford* over a distance of 1,550 miles, and with the *Sherman* again when she was 1,486 miles away. This record is considered very remarkable for a set designed for service under 100 miles, although it was made during a short period and under favorable conditions when interference was at a minimum.

Jap Ship Has Elaborate Radio Equipment

THE *Kamoi*, fuel ship of the Imperial Japanese Navy, which steamed out of New York on October 2, en route to Japan on her maiden voyage, has the most elaborate radio equipment of any ship afloat, according to radio engineers. The most recent inventions in the field of radio art have been included in the outfit most of which was furnished by the General Electric Company.

Included in the transmitting equipment are a one-kilowatt radio telephone and telegraph set which may be used for telegraphy on continuous or interrupted continuous wave; a twenty-kilowatt telegraph transmitter and a two-kilowatt 500-cycle quenched spark transmitter for telegraph only.

In the reception equipment are a long wave receiver with a range of from 1,000 to 30,000 meters and a short wave receiver ranging from 200 to 7,000 meters. In addition there is a superheterodyne receiver for long and short waves and a standard three-tube commercial ship receiver with a range of from 200 to 7,000 meters.

An interesting feature of the installation is a radio telephone exchange by means of which the ship's operator can transfer control of the radio telephone transmitter and receiver to any one of several stations, located in the commander's room, the commander's office, the senior officer's ward room, the bridge, etc. By means of the telephone exchange the commander or any other officer may communicate with any vessel in the fleet from any one of the stations on the *Kamoi*. The exchange board differs very little from the usual telephone exchange. A red light indicates that the receiver has been taken from a phone hook and the operator, by throwing a switch, puts the officer in immediate control of transmitter and receiver.

There is also a radio compass by means of which it is possible to find the direction of distant transmitting stations.

Captain Eddie Rickenbacher in his all-metal monoplane operates his G.E. radio receiving set, keeping in touch with the ground

The *Kamoi* is the show ship of the Japanese Navy. She was recently completed by the New York Ship Building Corporation and is the first vessel of any navy, other than the United States navy, to be electrically propelled. The electric drive equipment was designed and installed by the General Electric Company.

C.W. on the Pacific

CONTINUOUS wave transmitters are being installed on more and more vessels which regularly ply the Pacific. On all sides ship owners are bidding for C.W. sets, and it is considered in the near future every boat hailing from the West Coast will have a tube set as the main transmitter, with the old spark equipment as a spare.

The *Matsonia* and the *H. S. Alexander* using sets of the Radio Corporation of America, were the first to break the commercial ice on the Pacific. Their recent records of trans-Pacific trips indicate the degree to which commercial C.W. work is practicable. Other vessels are shortly to be equipped and before long tubes will generally have replaced the familiar chatter of the spark.

The usual type installed on coast boats for commercial work consists of a combined C.W. telegraph and radiophone equipment, rated at 200 watts and 1000 watts capacity. The sets use four 50-watt radiotron tubes, giving a combined output of 200 watts in the antenna circuit—an output that can be increased by a still higher percentage under emergency conditions. The sets are designed for intership and ship-to-shore communication both telephone and telegraph.

In the telephonic work four tubes are used—two for oscillators and two for modulators, with a speech amplifier attached. A change-over switch gives wave-length control. On these sets, rated at 200 watts, better distance records can be achieved than with the best two-kilowatt spark set ever designed, and as a result of this factor alone the C.W. outfits are gradually displacing all other types of equipment in Pacific Coast installations.

Call for Missing Operator

THE whereabouts of J. Ray Atkins, a radio operator, last heard from a year and a half ago on board the S. S. *Bellemina* on the New York to Argentine run, is sought by his mother, Mrs. J. R. Atkins, Box 253, Midlothian, Texas. In the hope that some of his brother operators may know where the missing young man is or that he may be located by means of radio itself through broadcasting, his story has been printed in the press and also broadcast by radio telephone.

Junius Ray Atkins served as a Sergeant 1st Class in Co. A, 111th Field Signal Battalion of the 36th Division, during the World War. He returned to this country on June 4, 1919, and was discharged at Camp Mills. On July 14, 1919, he secured a first grade radio operator's license, which expired in August, 1921, but was not renewed. Later, he was a ship wireless operator. He is 23 years old and a native of Midlothian, Texas, where his father is principal of the high school.

I.R.E. to Publish Standard Radio Terms

THE Standardization Committee of the Institute of Radio Engineers has been at work during the past year preparing for publication a Book of Standard Radio Terms. It is expected that this material will be ready for distribution to members of the Institute about November 15.

The book will contain technical definitions of nearly two hundred terms used in radio engineering and radio literature together with a complete list of standardized graphic symbols used in radio circuit diagrams.

The terms are listed alphabetically, which with liberal cross-indexing will make it possible for those interested to locate them quickly.

The Institute's Committee on Standardization is made up of: Donald McNicol, Chairman; E. F. W. Alexanderson, O. B. Blackwell, L. W. Chubb, J. H. Dellinger, Alfred N. Goldsmith, J. V. L. Hogan, H. W. Nichols, A. E. Reoch, L. E. Whittemore, Bowden Washington and M. B. Sleeper.

Tubes Used in Trans-Oceanic Service

Radio Corporation of America Gives 20 K.W. Pliotrons a Long Trans-Atlantic Test—Point Use for 1000 K.W. Tube —Six Tubes Maintain an Antenna Current of 350 Amperes

PREDICTIONS that the recent development of high-power vacuum tubes would make possible the use of tubes for trans-Atlantic commercial transmission came true on October 15, when a 16-hour test was conducted by the Radio Corporation of America at its Rocky Point, L. I., transmitting station. A bank of three 50 kw. Kenotrons and six 20 kw. Pliotrons successfully operated on two of the RCA circuits, to Great Britain and Germany, replacing for that period the alternators that customarily transmit across the sea. The test was entirely successful, as was anticipated from preliminary observations made in experimental work before the tubes were placed in actual commercial service.

Plans for the development of the new electron tube experimental set were completed in December, 1921, by representatives of the Research and Engineering Departments of the General Electric Company and the Radio Corporation, and the manufacturing of this highly delicate and specialized set was immediately started in Schenectady, N. Y. So fast did the work progress that in May of this year the temporary installation of the set was started at Radio Central, and when Senator Marconi visited the station in July, preliminary tests were in progress under the direction of W. R. G. Baker, of the General Electric Company, and C. W. Hansell of the Radio Corporation.

The set itself is for the time being composed of three 50-kilowatt, 15,000-volt, water cooled, metal vacuum tubes, known in the engineering world as Kenotrons, used as rectifiers, and six 15,000-volt, 20-kilowatt, water cooled, metal Pliotrons, used as high-frequency converters. For the experiment with the tube set one of the new mile-and-a-half long antennas suspended from six towers, 426 feet high, of the Rocky Point Station, was used, and the tube set succeeded in developing and sustaining in this antenna a current of the strength of 350 amperes.

So successful was the set in operation that the operators actually controlling the automatic sending keys at 64 Broad Street in New York City did not know that they were controlling a tube transmitter rather than an alternator until after the test was completed. An official of the corporation said:

"The operators on the English and the German circuits, if they noticed a change in the quality or the strength of the received signal did not comment on it, so we assume the signal was favorably comparable to the alternator signals. Of course, this is the first time in the history of wireless telegraphy that a high-powered tube transmitting set has operated for so long a period over as great a distance as that between New York and Germany."

Dr. Langmuir of the General Electric Co. says: "We will make larger tubes when larger tubes are needed"

The American water-cooled tube with its external plate is of great advantage because it makes it possible to develop tubes of larger capacity than where it is necessary to rely upon air as the only means of cooling. The building of these vacuum tubes with metal walls was only accomplished as the result of American research and inventive genius which showed the way to a successful method of welding glass and copper together.

While the set in its present stage is far from being a reliable commercial transmitter, the tests just concluded show that an alternative type of equipment to the Alexanderson alternator is on the way to aid America in building up its world wide wireless communication system. It also further substantiates Marconi's prediction that once reliable international telegraphy is established by using tubes, telephony must follow in its wake.

When Dr. E. F. W. Alexanderson, Chief Engineer of the Radio Corporation of America and inventor of the Alexanderson alternator was informed of the success of the experiment, he made the following comments over the telephone:

"Trans-Atlantic telegraphy has become a routine business, but the importance of this demonstration is the bridging of the ocean by a few powerful vacuum tube units. In this case only six tubes were used and we can safely predict that the same feat will some day be performed by a single tube. But what is the next? We have here seen a new physical principle reduced to practice on a large scale. Shall it fulfill the dreams that Edison's dynamo has not yet fulfilled to carry Niagara's power to New York? Ten years ago I became acquainted with the little device known as the Audion. Then it was a detector of signals and an amplifier, and the question why not amplify some more and then some more and use it for transmitting signals as well as for receiving? Dr. Langmuir of the Research Laboratory of the General Electric Company gave the complete answer to this question, although it has taken ten years to get to the point where we have today a trans-Atlantic tube transmitter, in these ten years the energy of the vacuum tube has been increased more than a million times. A few more years of the same rate of improvement would bring us beyond our wildest dreams, but all we need to say is that science and engineering have received a new tool. It marks a turning point like the steam engine and the dynamo. It will not only give us the trans-Atlantic telephone, but it will undoubtedly give us much more."

Dr. Langmuir, when reached at his summer home at Bolton's Landing on Lake George said, "I am greatly pleased but not surprised at the success of the tubes. It is a stepping stone in the progress of many years development. We will make larger tubes when larger tubes are needed and we will make them of greater efficiency for the principle on which this development has gone forward is a sound one."

The accomplishment of sending wireless messages across the ocean by means of the tubes presented a contrast of apparatus. The Alexanderson alternators almost fill the centre of the Rocky Point plant, whereas the tubes used can be packed in a small trunk.

This does not mean, the Radio Corporation officials said, that the alternators would be immediately superseded, because the tubes' superiority has not yet been sufficiently demonstrated to permit the scrapping of the larger machines, although the eventual adoption of the tubes is considered inevitable. Their value will be even

greater to the wireless telephone development, it is said, than to telegraph efficiency, as they were evolved by application of the same principle that has made the vacuum tube responsible for the success of radio telegraphy.

100 AND 1,000 K.W. TUBES DEVELOPED

Larger tubes than the 20 K.W. are being constructed. A 100 K.W. tube of nearly the same type as the present 20 K. W. tube is now being developed by W. C. White and H. J. Nolte and promises to be fully as successful as the present tube in addition to having the advantages of somewhat higher efficiency.

Another quite different type of tube involving the principle of magnetic control proposed by Dr. A. W. Hull and called by him the magnetron, has been constructed by J. H. Payne. This tube, consists essentially of a water-cooled cylindrical anode 30" long and 1¾" in diameter. In the axis of the anode is a tungsten filament 0.4" in diameter and 22" long. This filament is excited by current of 1,800 amperes at 10,000 cycles, the filament excitation requiring about 20 K.W. The magnetic field produced by this large heating current is sufficient to "cut off" the electron current from the cathode to the anode during a portion of each half cycle of the current passing through the cathode, this action taking the place of that of the grid in the three-electrode tube. The electron current to the cathode is thus interrupted 20,000 times per second. By the use of properly tuned circuits this can be used for the production of high frequency power radio, or any other purposes. This particular size will supply 1,000 K.W. of 20,000 cycle power at efficiency of 70 per cent. operating with an anode voltage of 20,000 volts D.C.

For radio purposes, efficiencies of 70 and 80 per cent. are eminently satisfactory but for other engineering purposes they are not as high as would be generally desired. Another line of development is therefore in progress, viz.: the production of tubes of higher efficiency as well as tubes of large output. There are two main causes of loss of power in vacuum tubes. The space charge effect and the filament excitation. By use of higher voltage and in other ways it is possible to reduce the space charge loss very materially.

The energy loss in heating the filament can be reduced to one-tenth or even less than one-twentieth of that necessary with a pure tungsten cathode by employing a "thoriated" tungsten filament under very special conditions, which have been the subject of study during the last few years.

The advantages of the thoriated filament is due to an absorbed film of metallic thorium on the surface of the film, this film consisting of a single layer of atoms. The thorium as fast as it evaporates off the surface, is supplied by diffusion from the interior of the filament. In utilizing this effect a particularly high degree of vacuum is desirable, or at least the presence of those gases must be avoided, which would oxidize, or otherwise combine with the very thin film of thorium. For this purpose the vapors of various reducing materials, such as magnesium, or alkali metals such as potassium substances containing carbon have been used. Very successful results have been obtained in adopting this thorium filament in power tubes. It is possible not only to cut the energy necessary for filament excitation down to a small fraction, of what it now is, but the life of a cathode can be increased enormously so that the practical applications of electron tubes of large power will certainly not be limited by an unduly short life.

These developments will come gradually for the practical construction of powerful tubes giving thoroughly satisfactory operation requires a great deal of development work. It would be rash, however, to predict the limitations of the ultimate use of vacuum tubes in the power field.

Sound Photographed for Broadcasting

A Device Developed for Reproduction of Sound Used Successfully for Broadcasting Music and Speech at WGY

THE Pallo Photo Phone, a device for recording sound upon a photographic film, so that the sound may be reproduced for radio broadcasting transmission over the ordinary telephone, or for "talking movies," was demonstrated for Thomas A. Edison on his recent visit to the plant of the General Electric Company, Schenectady, N. Y.

The details of this device, which is the invention of C. A. Hoxie, radio research engineer, were made public for the first time following the demonstration.

The record is made by causing the sound waves to produce vibrations on an exceedingly minute and very delicate mirror. A beam of light reflected by this morror strikes a photographic film which is kept in continuous motion. The film when developed shows a band of white with delicate markings on the edges which correspond to the sound which has been reproduced.

On account of the exceedingly small size of the mirror, its low inertia, etc., it is possible by this means to produce a sound record which includes the very delicate "overtones" which give quality to speech and musical sounds. This has not been so successfully accomplished by any other method of recording sound waves.

The reproduction of the sound from the film is accomplished by moving the film in front of an exceedingly delicate electrical device which produces an electromotive force which varies with the amount of light that falls upon it. In the past, attempts have been made to produce these results by means of selenium cells, but a selenium cell, though it responds to changes in the amount of light which it receives, does not respond with sufficient promptness to produce good results. There is a sluggishness in the response which seriously interferes with the quality of sound which is produced.

By an ingenious combination of vacuum tubes there has been produced an apparatus which responds to variation in the light falling on it with a speed which is so high that it can only be compared with the speed of light itself, or with the speed of propagation of wireless waves in space.

Therefore when this film is moved continuously in front of such a device the device produces an electric current which corresponds very accurately to the original sound wave. This electric current may be used to actuate a telephone or loud speaker. It was actually used recently to operate the radio transmitting station WGY. The well known voice of the WGY announcer, "KH," was recorded on a photographic film and sent out by WGY with such acccuracy that it was impossible to distinguish it from his voice as ordinarily directly transmitted from the station.

The inventor and the company decline to speculate on the future of the device. But as a motion picture and the voice of the actor or actors can be photographed on the same strip of film simultaneously there may possibly come of it the much sought after

(*Continued on page* 82)

What "Via RCA" Means to a Message

How Automatic Methods Are Used in Sending and Receiving by the Radio Corporation of America—Wonders of High Speed—Importance to the Business World

By Ward Seeley

SPEED! The word means different things to different people. To some it means an automobile darting around a racetrack. To others, an airplane soaring in the skies. To still others, the word brings to mind the fact that it is possible to transmit a message to Europe by radio and get an answer back within a few minutes.

An automobile has traveled at the rate of 156 miles an hour.

An airplane is capable of over four miles a minute.

Radio waves always travel at the rate of 186,000 miles a second. They are the speediest things there are.

When a radio operator presses a key in New York, the signal is received in Europe about 1/62nd of a second afterward. Anybody who has a Kodak knows what a 50th of a second is on the shutter—a wink that is barely visible. If a Kodak shutter controlled radio waves, they would reach Paris before the shutter in New York had closed.

Have you a split-second stop watch? It will divide the seconds into fifths. Take it out and practice starting and stopping the hand in a fifth of a second. You will find that it is quite a job to move your thumb over a fraction of an inch in that time—but in a fifth of a second radio waves travel 37,200 miles, equal to one and a half times around the earth.

These are not abstract scientific facts. They are practical realities, used constantly by the Radio Corporation of America, which turns them daily to the advantage of business houses, private individuals, anybody and everybody who needs quick communication across the Atlantic.

Because radio waves are so swift, it is natural that the methods of controlling them should be conducted at high speed. People tend to assume the qualities of that with which they deal. While things do not move at the rate of 186,000 miles a second in the various RCA offices, still the few visitors who have been privileged to observe the methods of transmitting and receiving have been amazed at the speed with which messages are handled.

It is not at all unusual, for instance, for a radiogram to come to the central control room at 64 Broad Street, New York City, over a private wire from any one of a number of bankers, brokers and others, and to be received in Paris in less than a minute. The telegraph operator at the end of the private wire may tick off the message at 10:15 a.m., it is copied on a radiogram blank by another telegraph operator at 64 Broad street, handed to a radio operator, and the latter, after having transmitted it to its destination, places a time stamp on the blank which may show that transmission was complete at 10:16. Inasmuch as the radio waves travel practically instantaneously across the Atlantic, completion of transmission means completion of reception.

On the other side of the sea, those who have direct wires into the Paris radio central are able to receive their messages with the same speed with which they were transmitted. In the case of such direct-wire arrangements on both sides of the Atlantic it is a daily occurrence to get messages from companies in New York City to firms in Paris in two or three minutes—faster than it is possible to telephone a message across the street in New York City.

This is the maximum service yet afforded by any communication means. It is so fast, in fact, as to exceed the capacity of the ordinary form of automatic time stamp, which records hours and minutes only. In order to give an accurate check on the time, a new form of clock is being developed, which will split the minutes, recording the actual time taken even if it be only one minute 12 seconds.

Of course, it is necessary for special arrangements to be made in order to realize speed such as this. The most important provision is a special wire from the office of the sender into Radio Central, in order to cut to the minimum the time consumed in delivering the message to the radio operator. At

The great receiving room at 64 Broad Street hums with activity night and day, handling traffic at high speeds. Each table controls the complete circuit of a transmitter and receiver that works with a foreign country—transmitting on one side and receiving on the other. As the signs indicate, tables are devoted to service with Norway, France, Germany (2) and England (2)

the time this is written, there are 17 such wires, 15 telegraph and two telephone, giving instant touch with banks, brokerage houses, newspapers and news associations. Inasmuch as many of the users of these wires also maintain private telegraph lines to their offices in other important cities, such as Philadelphia, Boston, Chicago and St. Louis, it can be said that it is possible for a man in, say, Chicago, to put a message on a desk in Paris in two or three minutes.

Similar arrangements are possible between the United States and Germany, Poland and Norway. In England, however, due to certain handicaps resulting from the necessity of using the public circuits of the British government telegraph lines, such speed is impossible. The jealously guarded British monopoly of telegraphs operates to slow up the delivery of messages there.

In general, this is no handicap, for the vast majority of users of radio service have not the slightest need of the maximum speed. In fact, they are content if messages are delivered over night. Speed of a minute or so is needed only by banks and brokers who deal in foreign exchange and in foreign stocks and bonds. Much "arbitrage" work is done by radio, the broker taking advantage of a momentary difference between the value of, say, francs in New York and dollars in Paris to shave off a tiny fraction. By using radio for his buying and selling orders, the arbitrage broker not only adds fractional profits to an aggregate considerable sum for himself, but also levels out the quotations to the same figures on each side of the Atlantic.

For the average business house the speed utilized by brokers is interesting solely because it indicates the calibre of the radio service that is available. By far the greater portion of the wireless traffic across the Atlantic is filed after 5 p.m., and the senders are perfectly content to know that their messages will be on the addressees' desks at the opening of the new business day in Europe. This results in intense operation of the RCA circuits during the night.

FILING "VIA RCA"—1. Many messages are brought to the receiving desk on the main floor by business men and their messengers. Here radiograms are received for foreign countries and ships at sea

FILING "VIA RCA"—2. Business houses wishing a little more speed file them by telephone, for which purpose a number of trunk lines are maintained and four expert typists (two not shown in the picture) take messages as dictated over the wire

Mechanical devices are used as far as is possible, in both transmission and reception, for the double purpose of utilizing the remarkable speed of wireless waves and assuring absolute accuracy.

Once a message is filed for transmission, but little human effort is necessary, and that is mostly clerical work that takes a minimum of time. Then comes the machine. The radiogram blank is handed to an operator, who pounds a typewriter keyboard. Each stroke of a key perforates a paper tape in such a way that when the tape is run through a special automatic transmitter, the appropriate dots and dashes of the International Morse code are formed. The perforations on this tape are not in the shape of dots and dashes, however, but consists of circular holes in two parallel rows, in various numbers and positions in relation to each other.

Beside the perforating machine is the device that does the actual transmitting, a small brass box with an electric motor mounted on it, and in front a little knurled wheel under which the perforated tape passes. Some levers back of a glass plate in the front of the box jiggle up and down and to and fro. The perforator clamps noisily at the tape, but the transmitter only whirrs gently as it controls the radio waves

FILING "VIA RCA"—3. For the utmost speed, banks, brokers, news associations and the Postal Telegraph-Cable Company maintain direct telegraph lines. These telegraph operators, located in the same room with the radio control tables, make it possible for firms to have messages delivered in Paris in two minutes and less

Close-up of the receiving side of one of the English circuits during high speed operation. The undulator signals are written on the tape by the recorder at the extreme right, and are read by the operators. At the time this was taken, 90 words a minute were being received

that leap off the antenna at the actual transmitting station, which may be 70 miles away, at Rocky Point, L. I., or at New Brunswick, N. J., or Tuckerton, N. J., or Marion, Mass. Between 64 Broad street and the distant stations there are direct wires, and the transmitter in New York City, controlling the current over these wires, thereby governs the great high frequency waves produced and sent into the air many miles away.

Messages sent from the other side to the United States go through a process that in many respects is the reverse of transmission. The radio impulses in the receiving antenna, far distant from New York City, are transferred to a telegraph wire leading directly into the central office, where, after going through amplifiers, they are sufficiently powerful to operate an automatic recorder. This draws a line on a moving paper tape.

As long as no signals are being received, the line is straight, at the bottom of the tape, but the instant a key is pressed on the other side of the ocean, the pen of the recorder moves to the top of the tape, and stays there until the transmitter key is opened again, when it drops back to the bottom.

That oscillating pen in the recorder is only 1/62nd of a second behind the transmitter 3,000 miles away.

Beside the recorder sits a radio operator at a typewriter, with ear phones over his ears. The tape runs across the front of the machine, the operator reading the dots and dashes as they appear on the tape and as he hears them through the headpieces. It isn't necessary to use the ears, but the operators prefer to listen, as well as look, in order to keep their ears in practice.

They look and listen, but don't stop.

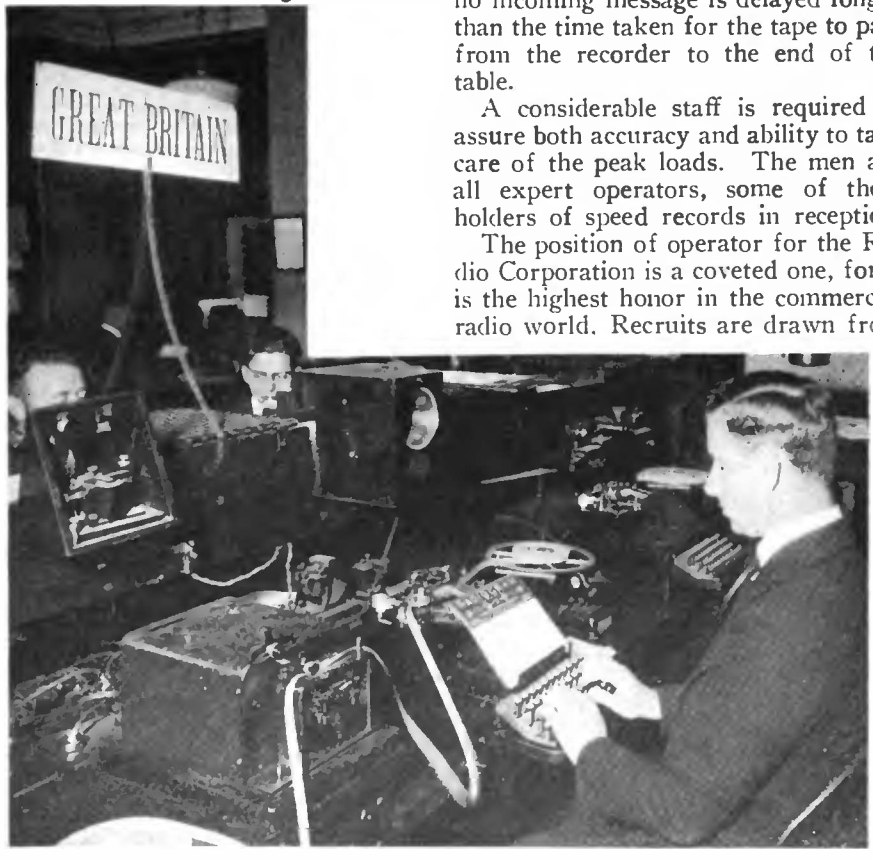
Each message is typewritten on a separate blank. As soon as it is complete, the operator jerks the blank out of the typewriter and places it on a flexible belt, which rolls over the table at which he works. This carries the paper swiftly to another belt traveling the length of the room, which deposits the message beside a distributing table, where it is passed by four different men, each doing quickly a single simple but necessary clerical operation. From this checking table it goes either direct to the telegraph wires, or, if it is to be delivered by messenger, to an addressing table, where the code address is translated into firm name and street address. It is not at all unusual for a message to be on the telegraph wires in New York City one minute after the transmitter on the other side of the Atlantic has finished sending it, or for it to be in the hand of a messenger running out of the door. The addressee in the latter case gets the actual blank on which the operator has transcribed the message only a few minutes before.

It is the use of these mechanical devices that makes it possible to send at the rate of 100 and more words a minute, a speed which no hand could reach and no ear recognize. The speed at which these machines are operated depends on atmospheric conditions and the amount of traffic to be handled. When conditions make it possible, several operators are required to keep up with the traffic coming through a single receiver, as the signals are received at a rate several times faster than it is possible to operate a typewriter.

Operation at really high speed is an astounding sight. Three and sometimes four operators sit in a row, reading the same tape as it flashes past. Each man marks the tape when he starts, copies as much as he can before it gets beyond reach, marks where he stops, jumps ahead and starts again. The man at his left starts where the first stops and goes as fast as he can until the tape beats him, and then he too drops it and jumps ahead, leaving operator number three to carry on. Occasionally four men work in line in order to keep up with the traffic, so that no incoming message is delayed longer than the time taken for the tape to pass from the recorder to the end of the table.

A considerable staff is required to assure both accuracy and ability to take care of the peak loads. The men are all expert operators, some of them holders of speed records in reception.

The position of operator for the Radio Corporation is a coveted one, for it is the highest honor in the commercial radio world. Recruits are drawn from



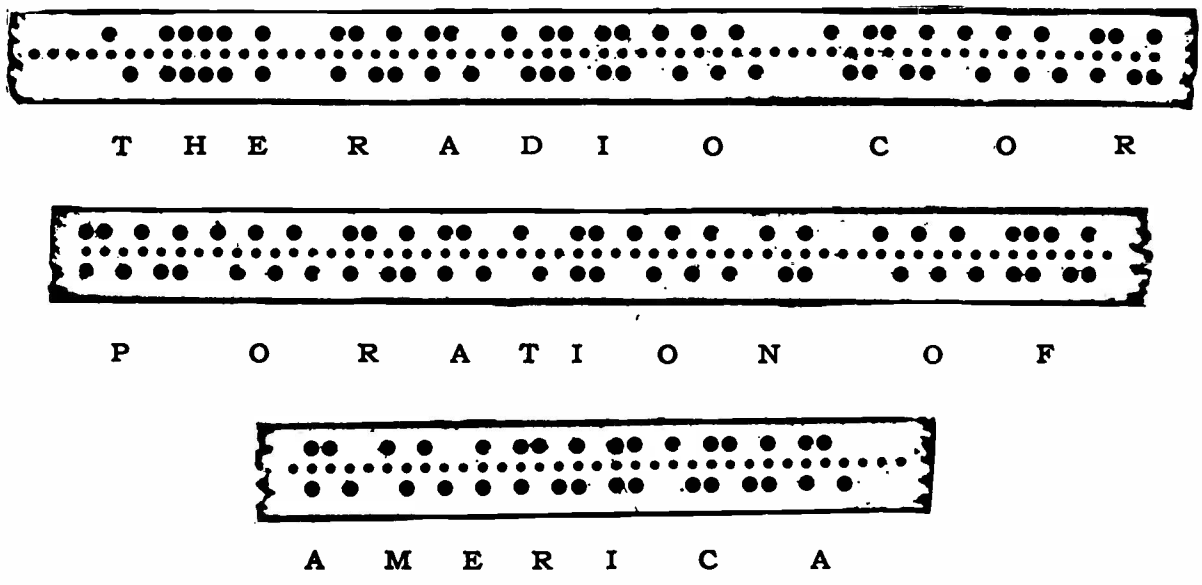
Close-up of transmitting side of English circuit, showing operator at Kleinschmidt perforator. The tape from this passes through the Wheatstone transmitter at the left. One perforator is capable of from 75 to 80 words a minute, and in case greater speed is required, a second operator uses the spare perforator seen at the right

the ranks of ship operators, and also from other departments of the Corporation, which has just opened a training school, where carefully selected men are given a complete course. An important part of the work of this school is instruction in receiving code on an ordinary telegraph sounder. The corporation's use of private telegraph wires makes it necessary that operators be able to receive both by telegraph and by buzzer. Those who know only the latter are handicapped, while anyone who can read a sounder can receive from a buzzer without study. The sounder is the more difficult, but absolutely necessary, and, moreover, excellent training for radio receiving, in which the dots and dashes are not clicks, but buzzes of varying length. The training school on the top floor at 64 Broad street is provided with all the apparatus used in actual transmission and reception, including perforator, transmitter and recorder, so that a man who has gone through it can take his place in the operating room downstairs without further preparation or explanation. Two days after school was opened, so many applications had been received to attend it that a waiting list had to be started.

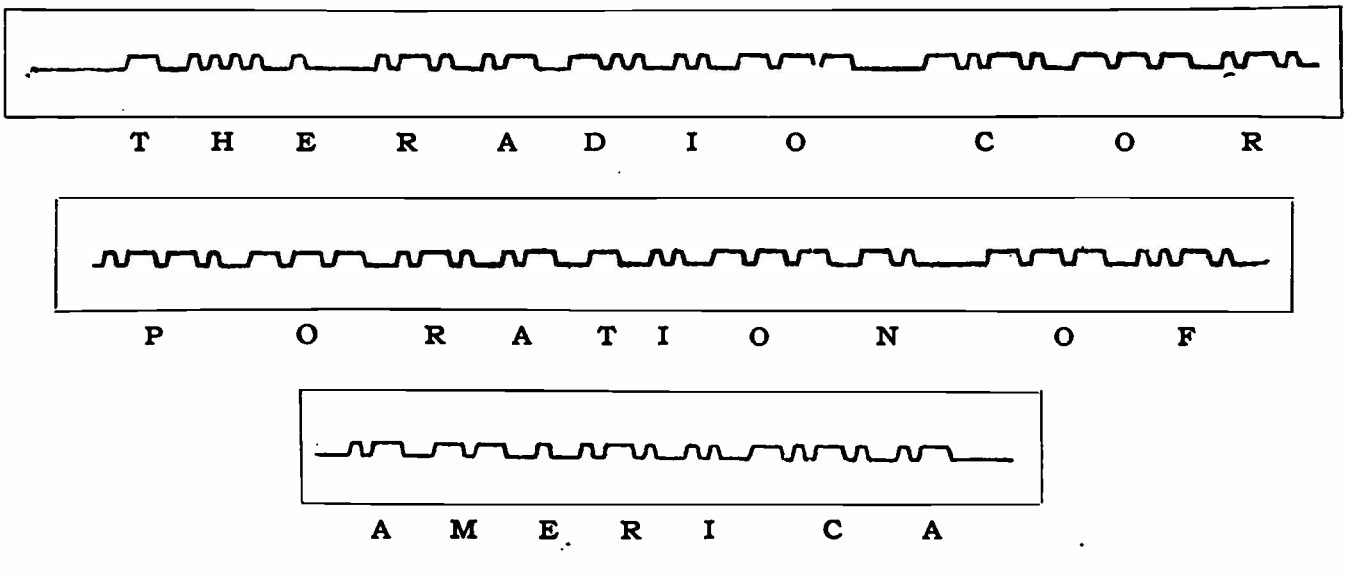
There is also a "training school" for the various machines, in which they are kept in perfect order. A fully equipped shop is maintained on the same floor with the operating room, where spare perforators, transmitters and recorders are kept. At the slightest sign of mechanical difficulty a perfect machine is substituted. The perforators are customarily overhauled three times daily, every eight hours, whether necessary or not, in order to keep them in perfect shape. The little steel fingers that punch the paper become dull quickly, and must be sharpened continually in order to produce perfect tape for the transmitter. The other machines do not need as much attention, having no parts that wear as quickly as do the steel punches of the perforator. Perfect machines, skilled operators trained in absolute accuracy, and the tremendous speed of radio waves all work together to place before American and European business houses the swiftest form of communication known, available by marking messages, "Via RCA."

Transmitting and Receiving Tapes Assure Accuracy

Wheatstone transmitter tape (perforated)—



Undulator receiving tape (inked)—



Radio in the Great Desert

Sand Storms Cause Heavy Static and at Times Make Installation and Operation Difficult — Vital Aspect of Communication Network in the Sahara

By Raoul Moha

RADIO telegraphy plays an exceedingly important part in the military and civil life of the French colonies, and nowhere more than in Northern Africa, where the difficulties of operation are no less than the importance of the service rendered.

Figure 3 shows the 2-kw. station at Colomb Béchar, the first to be established, in the beginning of 1917. This is a type S.F.R. with rotary spark gap, with power from a 1,000-cycle J.B. self-excited alternator, driven by a De Dion Bouton gasoline engine, two cylinders, six to seven horsepower. This alternator also may be driven by a single cylinder Aster motor, five to six horsepower, but in that case the output is slightly lower.

Figures 2, 4 and 5 show the 10-kw. set that replaced the original continuous wave transmitter, a 25-kw. high frequency alternator. The set has a synchronous spark gap, with two type A1-500 alternators made by the Société Alsacienne de Constructions Méchaniques, of Belfort. The alternators are coupled mechanically by pinned plates and electrically by a special automatic method. Drive is by a 4-cylinder Aster engine, 30-horsepower, type 47K. These alternators also may be driven by a direct current electric motor, 220 volts, 90 amperes, taking current from a storage battery, which latter is charged by a dynamo driven by a 50-horsepower Aster motor, type D-40, or by a Belleville 25-horsepower steam engine, as is the case at the station at Timbuctoo.

The station at Colomb Béchar takes care of heavy traffic with all the posts in the West Sahara radio net: Abadla, Taghit, Igli, Béni Abbès, Tabelbala, Timimoun, Adrar. It assures liaison with Bou-de-Nib (West Moroccan Net), when the telegraph line between these two towns is cut; with two stations of the East Sahara net, In-Salah and Ouargla; with Oran, whose radio post is nearby, at Ain-el-Turk, in similar case of interrupted wire telegraph service. It also gives daily service with Batna, which has a 4-kw. quenched spark, type CGR. And, when the weather permits, it works with Timbuctoo and Bamako.

Figure 1. Taghit, seen from a mountain, with enormous sand dunes in the background

Figure 7 shows the Aster engine, type D-40, 50-horsepower, four cylinders, which drives the dynamo producing the direct current for the spare 10-kw. arc set at Colomb Béchar.

It should be added that this station has been heard in France by numerous listeners, and, during the official tests in July, 1918, was copied in daylight by FL, the Eiffel Tower, and YN, at Lyons. This is considered remarkable, as it does not operate at full power, and normally puts only 7 to 8-kw. in the antenna. The station was erected by a special detachment of engineers, specialists in radio work, under Lt. Costabel of the 8th Engineers. At present it is operated by the 19th Engineer Battalion, the Algerian detachment of the 8th Engineers.

All the stations of the Sahara radio telegraph nets handle both official and private traffic. The greater part of these stations are provided with a spare vacuum tube continuous wave transmitter, type E3 bis, and those not already so supplied will receive arc C.W. sets in the near future. These will be used when necessary to circumvent interference by transmitters in West Morocco and Spain. Their small power, only 5 to 6-kw., and their new type, leads one to conclude that these spares are intended to be used in making tests and in emergencies rather than to assure a regular service.

Figure 1 shows a view of Taghit (West Sahara Net), where the station has two transmitters, one of 500 watts, type CGR, quenched spark, and the other a C.W. installation, type E3 bis.

Figure 1 will give the reader an excellent idea of the desolate country whose natural features cause many difficulties in the establishment and operation of radio stations in the Sahara. There are many high sand dunes, jagged mountain chains, and water is scarce. The presence of the

Figure 2. The antenna oscillatory transformers at the Colomb Bechar wireless station

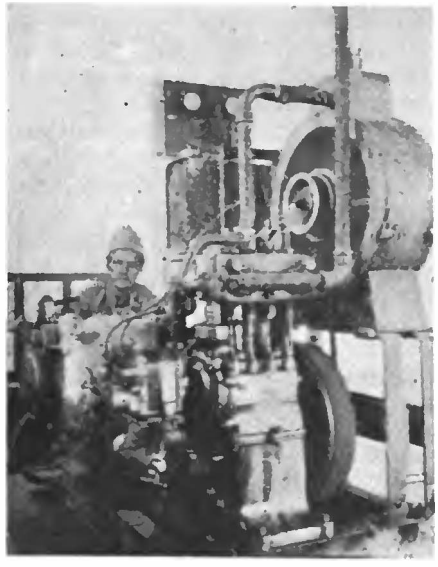


Figure 3. The power plant at Colomb Bechar is a 7 H.P. De Dion with a J.B. alternator

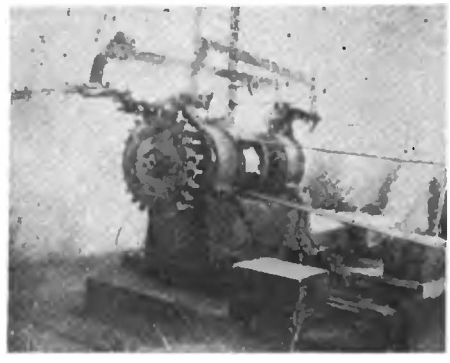
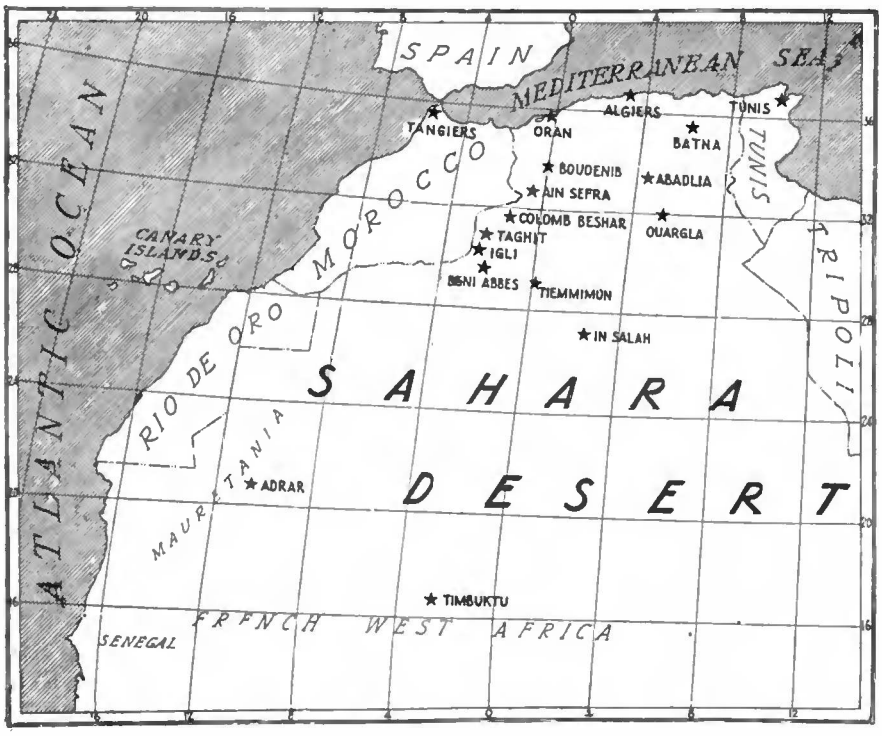


Figure 4. Belt-driven rotary spark gap of the Colomb Bechar spark transmitter



Map of the French colonies in Northern Africa, showing location of radio telegraph stations in the Sahara Desert and on its edges

sand dunes so close to the stations seems to be one of the causes of the static that interferes so greatly with reception, the atmospheric electricity apparently being generated by sandstorms. Measuring the electrical potential of the soil enables one to ascertain very exactly the amount of electricity generated by the friction between the sand grains when set in motion by the wind.

In addition to the mathematical proof, one also has visible evidence of this "sand" electricity, and sometimes

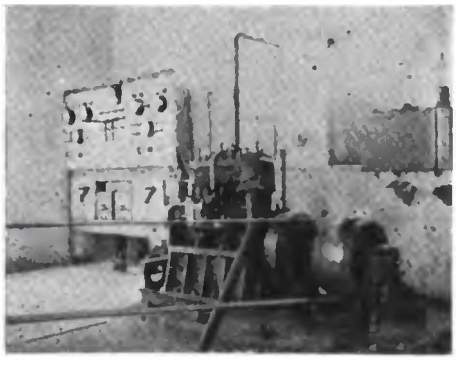


Figure 5. The Colomb Bechar power plant in January, 1919; 10 H.P. Aster motor with switchboard in background

also very painful physical proof, when the simoon blows. The antenna, that most efficient collector of electricity, becomes highly charged under high winds, and, unless one takes care to ground it and disconnect the receiving instruments, the latter are quickly put out of service by the repeated discharge of strong sparks. These jump between the plates of the condensers, from binding post to binding post, from knob to knob, and indeed across any and all points offering the slightest path for the current. The operator, if he stays at his post and is not insulated from the ground, will receive strong shocks. The effect of the static

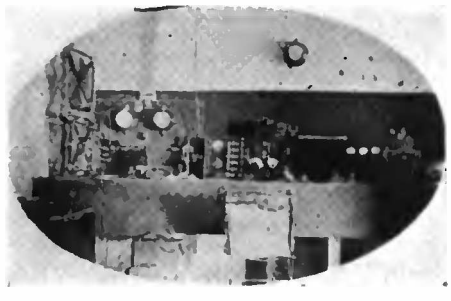


Figure 6. The Taghit E3 bis 500-watt continuous wave transmitter equipment

discharges from the antenna, if not physiologically dangerous or grave, is none the less very painful.

These atmospheric phenomena are to be seen more toward the end of the summer than at any other part of the year; apparently the sudden change of climate heightens them. One cannot say that there are more than two seasons in the Sahara, summer and winter, so quickly does the change take place. Static at this time causes the greatest inconvenience to radio communication, giving trouble in receiving because the discharges have the same tonality as the average medium or low pitched spark. For this reason it is a great advantage in the Sahara to transmit only by very high pitched spark, or, preferable to all, on continuous waves. During the static season high power must be used, and even then one is often obliged to suspend all service for long periods because of the difficulties just described.

Researches that will have the greatest importance in the establishment of radio stations in desert parts such as the Sahara should be undertaken. Such subjects as, the influence of the sun's rays and high heat on telegraphic transmission; the effect of the sand dunes, of metallic ore beds, of mountain chains, should be studied, as in these regions such natural objects seem to form screens that cut off radio signals.

The question of grounding, which is vital in all stations in all countries, presents great difficulties in the Sahara, there being a lack of all the common features of the average terrain that makes possible a good ground. There are no forests of whose moist earth one may avail oneself; such miserable habitations as there are contain not a particle of metal; there are no valleys to

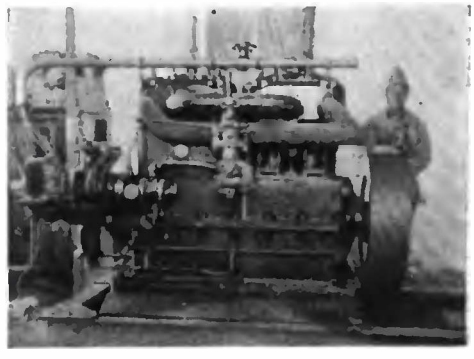


Figure 7. An Aster 50 H.P. motor is used for the 10 K.W. transmitter at Colomb Bechar

enable one to take advantage of the fact that, according to a certain theory, radio waves have a tendency to follow a valley; there are no prairies covered with grass, forming the best of all grounds in other countries.

Lacking all these, one is obliged to content oneself with burying the largest possible surface of woven wire or plates of zinc in such wells and springs as may be available, whether the station be located in an excavation, as at Taghit, or on an eminence, as at Béni Abbès, and Tabelbala. The station at Colomb Béchar has 450 square meters (535.5 square yards) of metal buried underneath the antenna, under the instruments, and beyond, making connection with no less than 14 wells.

Often the wells contain water saturated with magnesia, or have various chlorides in suspension, which erode the ground metal, and moreover, in case of transmission at high power produce harmful electrolytic effects.

In all cases when circumstances permit, careful studies are made of the best installation that can be made. Search is conducted for the most isolated spot practicable; the water supply is analyzed to determine its suitability

(*Continued on page* 82)

Ship Concerts Broadcast to Canadian Exposition

Marconi YC-3 Portable Phone Transmitter Installed on Lake Steamer Especially for the Occasion

By H. F. Shoemaker

VISITORS to the recent Canadian National Exhibition, August 26 to September 9, at Toronto, were much impressed by the radio exhibit that was made a feature of the Canadian National Railway's showing of a new all-steel train. The train, composed throughout of the most modern materials and equipment, was a center of admiring throngs, drawn as much by radio concerts as by the beauty of the cars themselves. A powerful receiving set was part of the equipment of one of the cars, and for the entertainment of nearby visitors had its loud-speaker horn turned out of a window.

As it was necessary to be able to receive radiophone concerts at all hours of the day in order to entertain visitors to the exhibition grounds an arrangement was made with the Marconi Wireless Telegraph Co. of Canada whereby one of their "YC-3" portable phone sets was installed on board the steamer *"Dalhousie City"* plying between Toronto and Port Dalhousie. This outfit was installed in the ship's radio cabin and a microphone lead of about 200 feet was run to the main saloon where all the concerts were put on. One operator was required in the saloon for announcing while another

Station CKUC aboard the steamer "Dalhousie City" was used to broadcast the daily concerts given in the saloon

sat in the radio cabin to see that a constant voltage was maintained. In rough weather the ship's screw was periodically lifted out of the water and then submerged, causing the ship's dynamo to fluctuate. Listening in was also done on a wavemeter placed near the aerial in order to keep tab on how each selection went out.

Some very excellent talent was obtained for these concerts, which were usually broadcasted while the ship was crossing the lake, and many letters of congratulation were received from listeners at distant points.

At the exhibition grounds results were equally good, the music being plainly heard a good 1,000 feet from the loud speaker. Besides the one horn shown in the photo, two others were connected in series and placed at different points on the grounds, so that a considerable area was covered. Programs were broadcast daily from 10 to 12 a.m., 2 to 4 p.m. and 8 to 10 p.m., Daylight Saving Time. The call was CKUC and the wave-length 440 meters.

As stated before the transmitter used was the well known Marconi YC-3 portable outfit which uses one 500-watt oscillator tube and a single rectifier tube for supplying D.C. to the plate. A motor generator—see in circuit diagram—was driven from the ship's dynamo and supplied 180-cycle current at about 75 volts. This was then led to the power transformer (2) where the voltage was raised to about 6,600. This at first appears unusually high, but it should be borne in mind that the Marconi tubes are very highly evacuated. The next step is to pass this current through the rectifier tube (3) where half of each cycle is cut off leaving a series of uni-directional impulses. This of course is useless for phone work, therefore to smooth this current out and merge each impulse partly into the other to form a continuous flow, it is now passed through a .125 mfd. condenser (4A), through an iron core choke (5) into a second condenser (4B). The current which is now practically continuous passes through another iron core choke (6) an air core choke (7) and a resonance coil (17) where it is finally delivered to the plate of the oscillator tube (9). The oscillatory circuit is then seen to consist of a condenser (8) an oscillator (9) aerial inductance (10) reaction coil (11) and the aerial and ground.

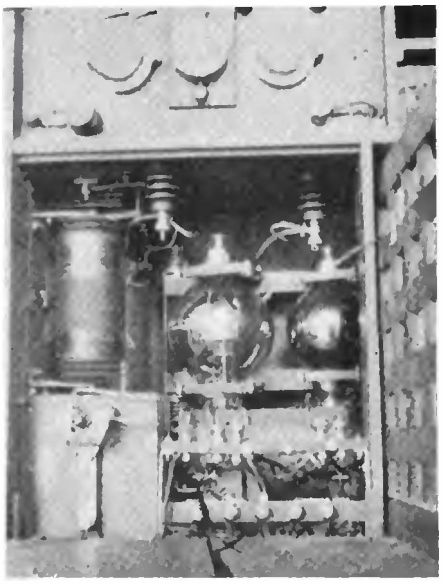
The Canadian National Railway's new all-steel train equipped with a radio set

Showing the loud-speaker horn erected outside the window of one of the coaches

In order to modulate the output it is now only necessary to interpose the modulation transformer (13) in the grid circuit. To the primary of this transformer is connected a microphone and a 6-volt battery in the usual manner.

It is interesting to note the method used for heating the filaments of the tubes. The A.C. of 75 volts delivered by the motor generator passes through two step-down transformers (15 and 16) which transform it to the proper voltage for lighting the filaments.

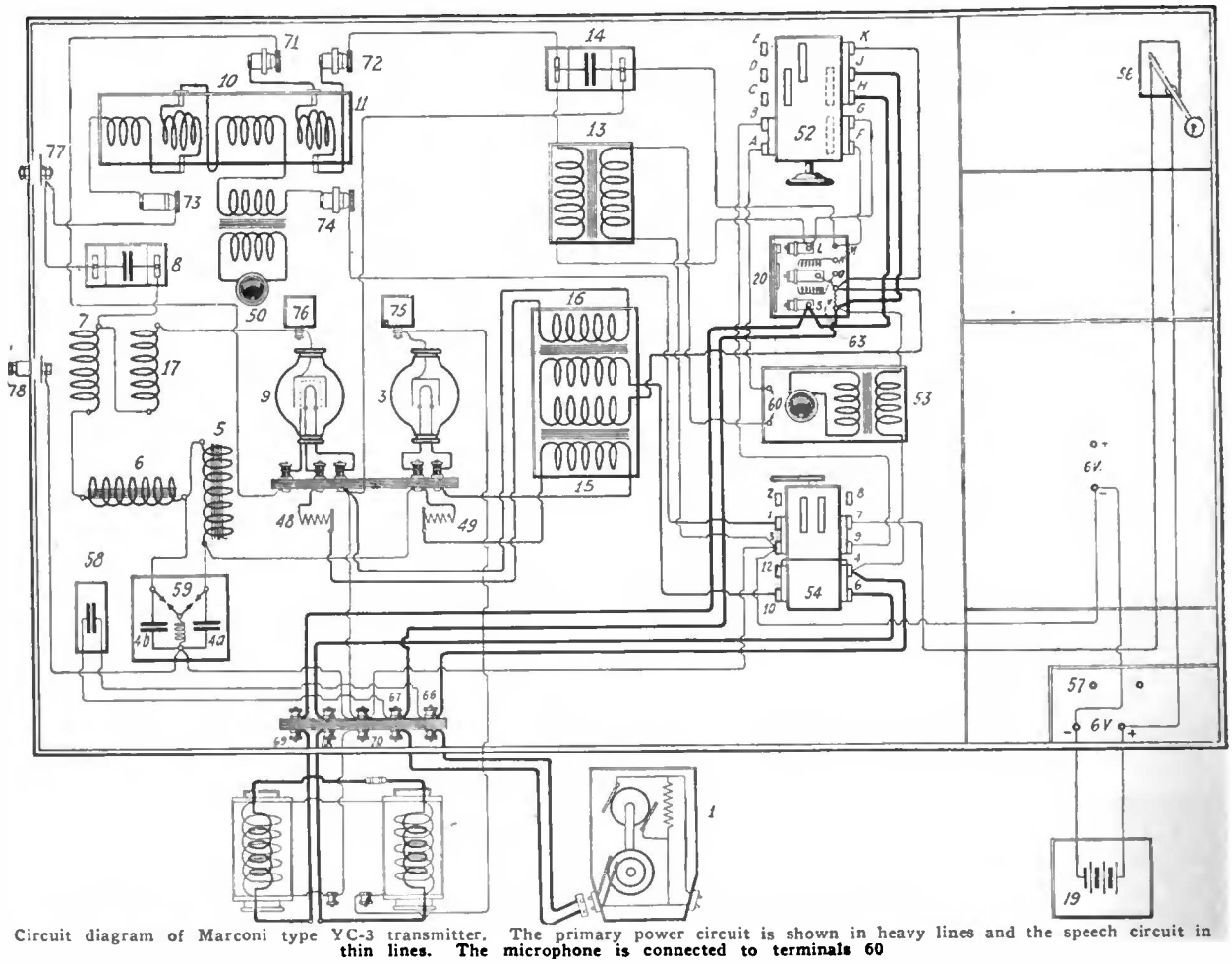
By means of a drum switch (52) it is possible to change from speech to C.W. telegraphy or buzzer modulated telegraphy ("Tonic Train" as the English call it). Since the same oscillatory circuit used for speech is used for C.W. telegraphy it is only necessary for the drum switch to connect the relay (20) and a key in the circuit. When the key is depressed the contacts of the relay are closed and the circuit continues to oscillate, but immediately the key is released the contacts open breaking the grid circuit and so stopping all oscillations. It is not possible, however, to merely break the grid circuit alone because during the time the tube is not oscillating the transformer builds up an extremely high potential in the smoothing out condensers, which gives the tube a higher voltage at the beginning of a dash than at the end of it. It is therefore, necessary for a second pair of contacts on the relay to break the power transformer's primary circuit, thereby cutting off the high voltage supply to the condensers. It will now be plain to the reader that as soon as the transformer (2) is cut off, the voltage of the generator will rise, causing an increased current to flow through the tube filaments which tends to shorten their lives. Therefore as a final precaution a third pair of contacts is placed on the relay (20) which, when the relay opens brings into the tube filament circuit a calibrated resistance which exactly compensates for the rise in voltage thereby keeping the filaments at a constant temperature.



Marconi portable transmitter, type YC-3 using one 500-watt oscillator and one rectifier to supply D.C. to the plate

In "Tonic Train" transmission exactly the same circuit as is used for speech is used for this type of telegraphy with the exception that the drum switch (52) cuts the microphone out of the modulation transformer primary circuits and introduces in its place a buzzer, battery and key. It is then apparent that the set is constantly emitting continuous waves, which, when the key is depressed, are modulated by the interruptions of the buzzer.

The drum switch (54) is used to change from transmitting to receiving. The receiving tuner employed the well known regenerative circuit which need not be described here. Two steps of radio and one of audio frequency amplification were used, the tubes being the Marconi "V24" and "Q" types.



Circuit diagram of Marconi type YC-3 transmitter. The primary power circuit is shown in heavy lines and the speech circuit in thin lines. The microphone is connected to terminals 60

This type of transmitter was in constant use during the war for intercommunication—its compactness and portability making it ideal for that purpose.

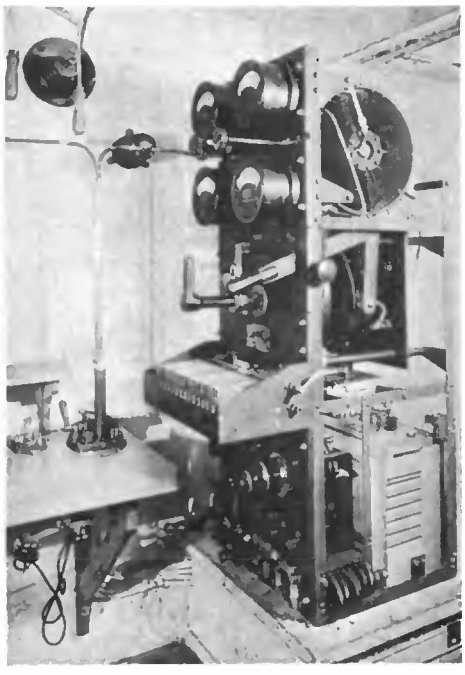
Radio in the "Dry" Navy

Boats of the Rum Chasing Fleet Are Equipped with Modern Spark and Telephone Transmitters—Orders and Reports Go by Wireless

A DULL gray ship rolls lazily off the coast. Lying low in the water, she seems to be little more than a hull, a sharp and wicked looking nose, and a slanting radio antenna. Once an "Eagle" boat, one of the sixty turned out at the Ford plant in Detroit, and in her early days a chaser of German submarines, now she is but a "rum chaser." Lo, how are the mighty fallen!

Not that the prey is unimportant. The chief violations of the American dry law are taking place along the coasts. Ships with large cargoes of liquor anchor off the shore and sell their contraband, a few cases at a time, to law-breakers in speedy motor boats. Stopping the big fellows, the rum runners whose cargoes often are worth $100,000 or more, is the only way to dry up the seaboard. That is why the "dry navy" was commissioned to cruise the salty sea about three miles from shore. For a while it watched the twelve-mile limit, and hailed any suspicious craft within it, but official Washington since has decided that three miles are enough.

So the little chasers stick close to shore. Take the one now known as the *Hahn*, for instance. She was originally No. 514. Other vessels of the fleet had numbers ranging from 13 up. There are varying numbers cruising about at all times, and their identity is never fully known. The dry forces like to be secretive. Anyhow, the *Hahn* is fairly well known, and is typical of them all. She is 110 feet long, has a displacement of 80 tons, and can do 18 knots when really interested in speed; enough to overtake most of the



The RCA type SE-1060, 1 K.W. spark transmitter used in regular service

rum runners. She has powerful gasoline engines, 2,500 gallons of fuel, a one-pounder, shooting solid shells, twelve rifles, and sixteen Colt automatics. Ready for business—especially when her radio apparatus is considered, for by it she communicates with the rest of the dry fleet and with the authorities ashore.

One of the secret agents on land picks up a tip that a ship will anchor four miles off Asbury Park on Tuesday night, and that all the local bootleggers are going out in boats to stock up with booze from the Bahamas. The news is reported to New York, turned over to a Navy transmitter, and probably within half an hour from the time the Volstead agent heard the news, it is being copied by the radio operator on the nearest ship of the Prohibition Navy. This is what happens Tuesday night:

The dry boat rolls along the three-mile line. Suddenly the lookout shouts: "Ship three points on the port bow!" A slight alteration of the chaser's course, and the gray enforcer of the law speaks through a megaphone to the anchored craft. This conversation is held:

Chaser: "Who are you?"

Smuggler: "Schooner *Blaah*, out of Nassau for Halifax."

C. "What is your cargo?"

S. "Wines and liquors."

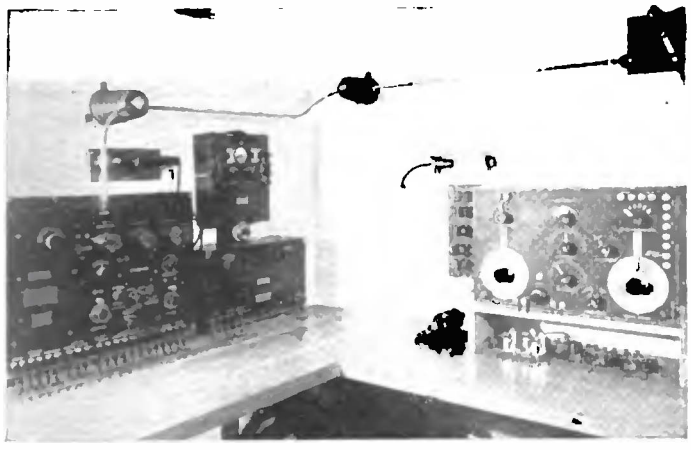
C. "Where do you think you are?"

S. "Four miles off the American coast, on the high seas."

C. "You've got another guess coming. You're half a mile inside American territorial waters. We'll send a custom officer aboard."

And in his little radio cabin, the operator sends back to headquarters the report: "Boarded schooner *Blaah*, Nassau for Halifax, with cargo of liquor, anchored in territorial waters. Proceeding to New York with her." Another prize has been captured.

The radio apparatus used is complete in every particular, including both spark and continuous wave transmitters and receivers, installed by Henry P. Kasner, of the Radio Corporation of America. The main transmitter is the RCA type SE1060, a 1-kw.



The 5-watt Western Electric C.W. transmitter and RCA, type IP-500 receiver

One of the original "Eagle" sub-chasers now used by the "dry" navy to discourage the invasion of the "wet" fleet

quenched spark set, one of the standard ship transmitters now to be found in vessels plowing the seven seas. It takes 110-volt direct current from the ship's mains to drive a motor generator set, whose A.C. output goes through a transformer to step up the voltage to the pressure necessary for the spark gap. The efficiency of the set is such that it will deliver, under normal conditions, 8 to 8.5 amperes to an antenna of 8 ohms resistance, when working at 300, 600 or 952 meters. All the apparatus, with the exception of the motor-generator, is contained on a single panel mounted in a sturdy frame.

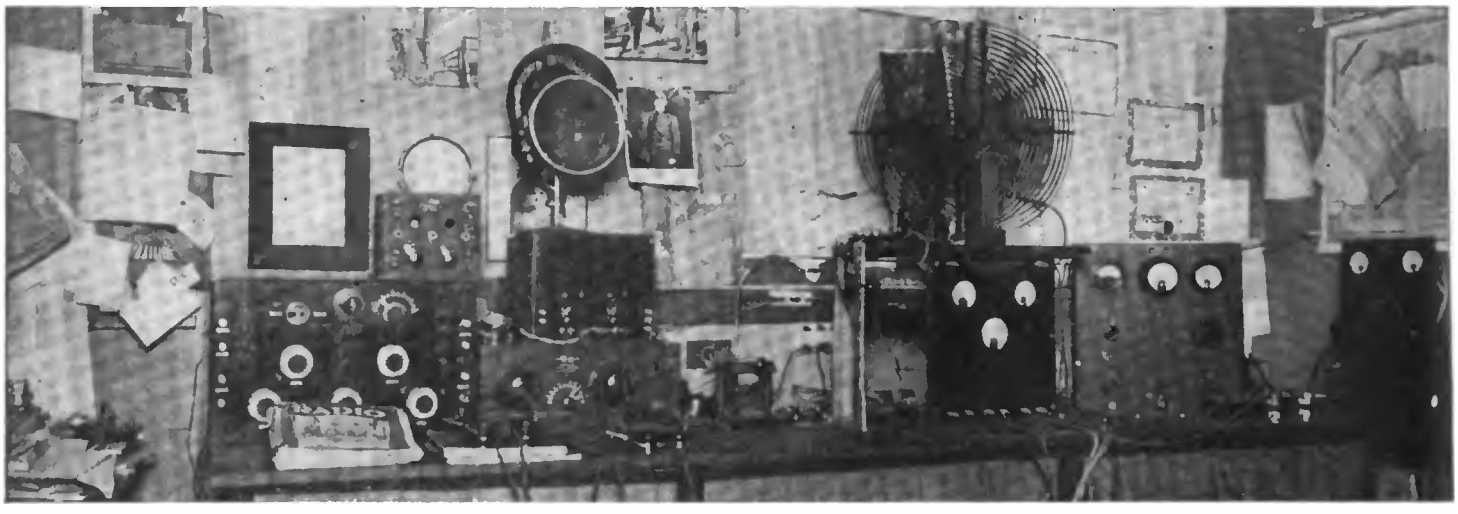
The C.W. transmitter used on these boats is a 5-watt Western Electric set, of the type in use by numbers of wireless amateurs on land. While the motor generator for the spark set has to be placed down in the bowels of the ship, the same instruments for the phone transmitter are placed right in the operating room, under the table at the right of the transmitter. This set, of course, has a limited range, and is used mostly for communication between the vessels of the fleet when near each other at sea. However, so excellent is the performance of this set that inter-fleet conversation has been heard on shore at considerable distances.

The next time a bootlegger lets it be known that he has some Three Star red eye but will have to charge $12 or worse, chalk it up to the credit of the radio-equipped dry navy.

Unusual "DX" During Hot Weather

By Major Lawrence Mott (6XAD)

IT has always been supposed that summer heat precluded any possibility of satisfactory long-distance work—either transmission or reception. In order to test this theory thoroughly, certain investigations were made at my station—6XAD—on two consecutive nights, the hottest that were experienced on Catalina Island, off the coast of Southern California, during the summer.



The transmitting and receiving apparatus at 6XAD, which has been used in the exceptional DX work accomplished by Major Mott

Extraordinary results were obtained with the use of a special Western Electric tube, used as detector only! At no time were any stages of amplification employed.

Here is the list, which speaks for itself:

On the night of September 13-14, between the hours of 6.57 P. M. and 12.34 A. M., the folowing stations were clearly heard at 6XAD:—9 FV; 7MF; 7AFW working 5CY; 5PX working 9DTE, 9CNS; 6BKO worked 6XAD; 6ALU worked 6XAD; 6UP worked 6XAD; 7IY working 7LU; 9CNS working 5EK; 7LU worked 6XAD; 9PS-CQ; 9AON working 7LU: 9DUG-CQ; 9BZI working 8BDA; 8AIO-CQ; 9ANQ-CQ; 8AQF working 8AGY; 9PS working 6KA; 8AIO-CQ; 8BZI-CQ; 9DPL working 2FP; 9AIO worked 6XAD; 8AQF-CQ; 9FK working 6ABX; 9PS-CQ; 9DPI working 9ANZ; 8AIO working 5ZA; 9DPL working 9AON. 6XAD on that night handled traffic with 6BKO and 7LU.

On the following night, Sept. 14: 9AYS-CQ; 7TY-CQ; 8AQF worked 6XAD from 10.16 P. M. to 10.46 P. M., and is in Marietta, Ohio!! He was QSA, and reported 6XAD the same. 9APS-CQ; 9AYS working 5ES; 9PS working 5ZA; 9AYI working 9BDS; 9YAJ-CQ; 5BE-CQ; 8AIM working 9AIG.

At 12.17 A. M., Sept. 15, 6XAD effectively worked 4BF, who is located at St. Petersburgh, Florida. Three messages were successfully handled—4BF coming in very QSA, on detector only!! 8IU-CQ, 9APS working 8WR. 5XD-CQ, 9AGO working 9AYS, 5UO worked 6XAD, reporting me as "vy-vy-vy QSA." This station is at Wichita Falls, Texas. 9APW working 3OT.

The complete list is considerably longer. I give this much of it in order to prove that DX results can be obtained in the extreme heat of summer. Doubtless the owners of the stations that I have logged will be pleased at the efficiency of their transmission! My compliments to them all! I hope to work them during the coming winter!!

May I call attention to the fact that 6XAD will be officially open after November 1—the same nights and hours as last year—Tuesday, Thursday, Sunday, from 10.30 P. M. until 3 A. M., or later, if tests from the East are desired.

The most remarkable result of all those given above was undoubtedly that of so effectively working 4BF, with whom communication was carried on almost as though he were in the 6th District. I was using my new transmitter, employing two 50-watt, Western Electric tubes — I.C.W. throughout, on 225 meters.

It is my intent, shortly, to install still another transmitter, using two of the British 1000-watt tubes, and also employing I.C.W. This new set ought to be in operation by November. I shall be glad to have reports on it.

It is to be hoped that the C.W. and I.C.W. men will "make good" during the coming radio season, and it gives me much pleasure to state that if 6XAD can be of any use, for DX tests and so forth, I shall be happy to render such assistance as I can.

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

The Receiver Radiation Problem and Some Solutions

By Abraham Ringel

(First Prize, $10.00)

IT is well known to all radio fans that regenerative receivers are capable of producing oscillations, identical to those produced by a transmitting station. Of course, the power in the former case is only a very small fraction of a watt, whereas, in the latter case, the energy may be many kilowatts. The effect of the oscillating regenerative receiver on another receiver, say two hundred feet distant, would, however, be far greater than that of a one-kilowatt transmitter two hundred miles away.

But the regenerative receiver, which has been carried beyond the oscillating point, has become a nuisance even in the reception of nearby stations. This is especially the case in congested radio districts such as New York, Boston, Chicago, San Francisco and other large centers of population; where oftentimes, receiving antennas are only five or ten feet apart—on the roof of the same apartment house. One oscillating receiver is then likely to interfere with the enjoyment of hundreds of listeners within a quarter-mile radius. Unearthly shrieks and wails will then be intermingled with some classic musical selection, completely spoiling the effect produced by the music; and the listeners would feel impelled to lay violent hands on the one causing the disturbance.

Whenever an oscillating receiver radiates energy at the same time as a radiophone station is operating, a beat note of audible frequency is produced. This beat note is due to the difference in frequencies between the broadcast transmitter and the oscillations generated by the local receiver. This phenomenon is of exactly the same nature as beats produced by an organ; if two notes, of almost the same pitch are sounded, a hideous racket results from this combination. First the two combine and re-enforce each other producing a loud sound—then their phases are in such relation that they oppose, and practically no sound results. Thus a terrific drumming noise is caused. A similar phenomenon may be observed by sounding two adjacent notes on a piano. At times the energy from the two different notes add up to give a sound as loud as both combined—at other times, they oppose and silence results. These beats occur at a definite frequency, which is determined by the difference between the pitches of the two notes. The heterodyne receiver, which is used so extensively for continuous wave reception, works on the same principle. Here the signal to be received has a frequency of, let us say, 20,000 cycles (about 15,000 meters wave length). A local oscillator is applied in which the frequency may be varied. If the local frequency is set at 20,000 cycles too, no sound is produced because there are zero beats. If set at 19,000 or 21,000 cycles, beats of 1000 cycles are caused which gives an audible note. The note may be varied at will by means of the local oscillator.

In the case of broadcast reception, most transmitters work at a wave length of 360 meters, which is a frequency of 833,000 cycles per second. When this radiophone station is received by an oscillating receiver, the following phenomena are observed: as you tune to the station, on approaching resonance, a very high pitched whistling note is heard, which decreases in pitch until at the resonant position, silence is heard; on continuing tuning, the note again increases in frequency until it becomes inaudible (above 15,000 or 20,000 cycles). The explanation of this is very simple. When no note at all is obtained, the receiver is generating oscillations of exactly the same frequency as those being received, and the resulting beat note is of zero frequency. Detuning to either side of this point changes the frequency of these oscillations to any desired value; let us assume to 835,000 cycles per second. The beat note will then have a frequency of 2,000 cycles per second. On detuning several degrees, the local oscillations may be made to have a frequency of 850,000 cycles, which, when combined with the 833,000 cycle signal being received, would give a beat note of 17,000 cycles, which is practically inaudible.

Unfortunately, the operator of the receiver in oscillation is not the only one who is affected thereby. The local oscillations, feeble as they may be, are radiated from the antenna and combining with the carrier wave frequnecy of the radiophone station, produce similar beats in all other receivers in the neighborhood. Those who are situated nearby to the offender are the more favored in this respect; the squealing and whistling being several times louder than the desired concert. Those at a greater distance do not suffer to the same extent, but even then, the interfering noises cause a great deal of annoyance. The writer has found from experience that no interference is noticed when the disturbing noise is less than .001 as loud as the music desired.

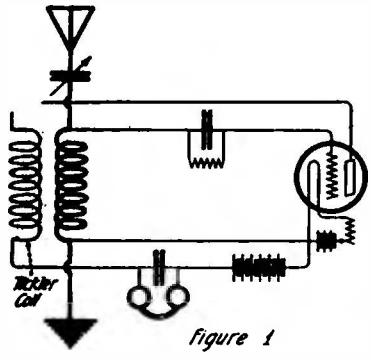


Figure 1

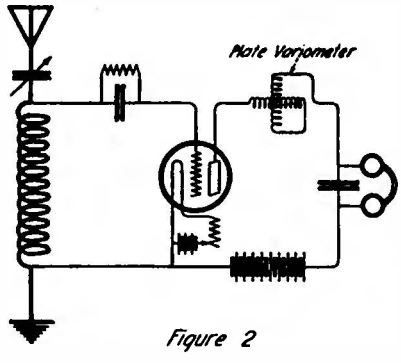


Figure 2

Single-circuit regenerative tuners

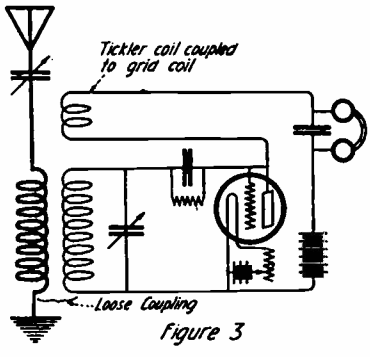


Figure 3

Two-circuit regenerative tuner

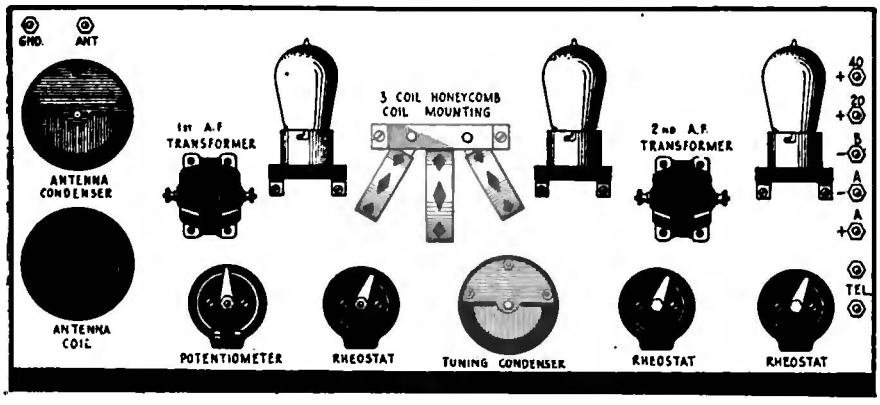
Some Preliminary Remedies

Some drastic action will have to be taken to eliminate oscillating receivers from congested sections. Those living in the country, with the nearest house one quarter to a half mile away, need not worry about this problem at all. Suggestions have been made in some sources to stop the sale of regenerative receivers—or else confine their sale only to country districts. But it would be practically impossible to enforce such regulations effectively. Besides, it would serve as

a punishment not only to the few offenders, but also to the vastly greater number of owners of regenerative receivers, who do not oscillate into the antenna—in fact who do not bring their receivers to the oscillating point at all. The general basis of our laws is summed up in the expression, "Rather let a hundred guilty escape, than have one innocent man punished." Yet, many prominent radio men were proposing to make a hundred innocent men suffer in order to punish a single offender.

they should be educated by any or all of the various schemes mentioned.

In order to prevent the increase of such receivers, the writer would like to suggest a few technical remedies, which will prevent oscillating directly into the antenna. The worst offender in this respect is the man who owns a single circuit tuner, similar to those illustrated in figures 1 and 2. Here, in case of oscillation, quite considerable high frequency current flows in the antenna. The least offender is the man with a two circuit



Layout of panel for the "reflex" receiver

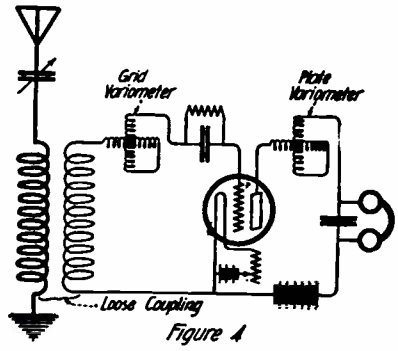
The regenerative receiver cannot, and never will be stopped. It is up to the individual owners to curb oscillations in their receivers—and this they are certain to do when they are educated to the importance of the interference thus created. Newspapers and radio magazines, such as THE WIRELESS AGE, wield a powerful influence—and should take every opportunity to educate the public in the proper use of regenerative receivers. Whenever they publish regenerative circuits, they should explicitly mention the great harm being done, when the receiver is made to oscillate. Manufacturers selling such receivers would do well also to mention this matter in the instruction books or leaflets accompanying their sets; or they will be likely to find most of the broadcast business ruined by their negligence in this respect. In cases where expensive sets are installed by dealers, they should fix the regenerative adjustment so that it is impossible for the receiver to oscillate. The seriousness of the situation should be spread by word of mouth. Lectures and those demonstrating apparatus as well as the readers of this article, tell your listeners and friends. Better still have the operators at the broadcast stations tell their invisible audience of the importance of solving this problem—and actually demonstrate how a fine concert can be broken up by squeals from a regenerative receiver. The writer is convinced that most men who habitually make their receivers oscillate before tuning to a station, do so in ignorance of the effects of such action, and

regenerative tuner as shown in figures 3 and 4. When the coupling is quite loose between primary and secondary, very little of the oscillating energy in the secondary or grid circuit gets out into the antenna. Besides, the antenna circuit may be slightly detuned, which would cause even less energy to radiate. In some observations made by the writer, he found that a single circuit receiver as illustrated would give an oscillating current of the order of 5 milliamperes in the antenna, whereas a two circuit receiver would give about one twentieth the current —approximately 0.2 milliamperes—and the resulting squeals produced in another receiver, located two hundred feet away were of relatively the same intensity. The squeal produced by the two circuit tuner was about one-twentieth as loud.

Non-regenerative receivers, especially those using radio frequency amplification, cannot produce oscillations in the antenna and are therefore ideal for broadcast work. The main difficulty is this: a regenerative receiver will give a signal about 100 times as great as a non-regenerative receiver and it requires at least two stages of radio-frequency amplification in order to equal regeneration on the average antenna. No radio amateur would feel willing to go to the additional expense of two more tubes and two radio frequency transformers to go with them.

The writer wishes to present a number of circuits, which make use of radio frequency amplification, to enable the amateur to use

regeneration, and in other ways provide for a maximum use of the tubes. These circuits, although using the same number of tubes as the ordinary regenerative circuit, will give signals fully as loud on the local stations, and in addition enable you to read out and bring in the distant stations, which have hitherto eluded you. For purposes of comparison later on, the writer herewith presents a few ordinary, non-regenerative, and hence, non radiating receivers. In these circuits, there is no tickler coupling or plate



Two-circuit regenerative tuner

circuit tuning, which causes regeneration. Figure 5 shows a single circuit receiver, with the detector directly connected to the terminals of the antenna coil. Figure 6 shows a circuit in which the detector circuit is coupled to the antenna circuit. Figure 7, is essentially the same as figure 5, with one stage of radio frequency amplification.

NON-RADIATING REGENERATIVE RECEIVERS

As explained previously, receivers which employ radio frequency amplification, do not oscillate into the antenna. If radio frequency alone were used, it would require at least two stages in order to equal regeneration in effectiveness, when used with the average receiving antenna. The writer makes use of a combination of radio frequency amplification and regeneration. This system is illustrated in figures 8 and 9. For convenience, a single circuit tuner is used to apply the signal received from the antenna to the grid and filament of the first tube.

In figure 8 this tube acts as a radio frequency amplifier; amplification being obtained by tuning the grid circuit of the detector tube, which follows it. Regeneration is accomplished in the detector tube by

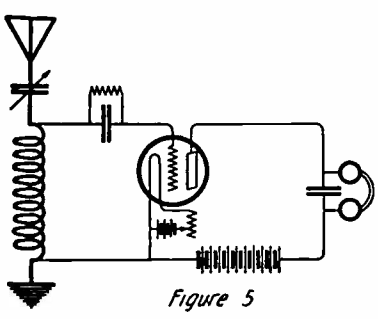


Figure 5

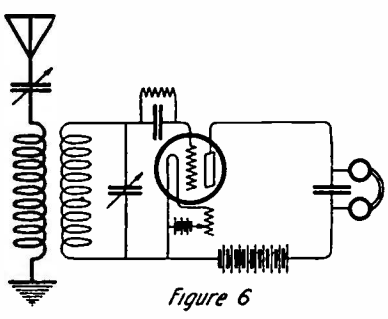


Figure 6

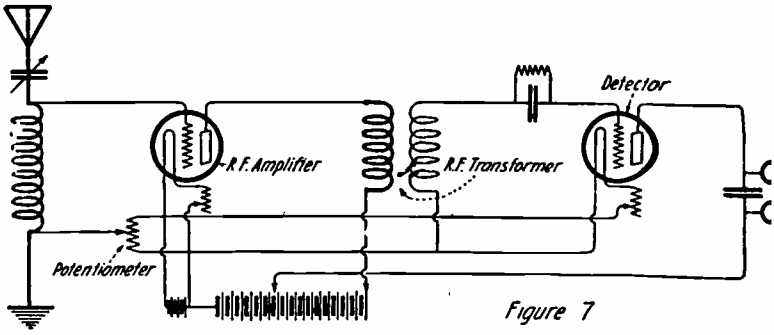


Figure 7

Various types of non-regenerative receiving circuits

means of a tickler coil coupled back to the grid coil of the special coupler, which is used as the radio frequency transformer.

The operation of a set of this sort is somewhat as follows: the antenna circuit is first tuned to the desired station, the potentiometer on the radio frequency tube adjusted for loudest signal; the condenser

in the grid circuit of the detector tube is then varied until loudest signal is obtained, with the tickler coupling as loose as possible. The tickler coupling is now increased as much as desired—retuning the circuits slightly to provide for the detuning, which is caused by the tickler coupling. In order to obtain good selectivity and discriminate against stations which are only two or three meters off the desired wave length, the coupling between the plate of the radio frequency tube and grid of the detector tube may be loosened, and the circuits returned until the undesired signal is eliminated.

Specifications for constructing the various coils are given herewith. The antenna coil may be a honeycomb or duolateral coil of about 60 turns. The experimenter could very easily make a coil suitable for use at broadcast wave-lengths by winding approximately 75 turns of No. 26 or No. 28 double silk covered copper wire on a three inch (diameter) tube. Any other size wire slightly smaller or larger which is available may be used. Enamelled wire or cotton covered wire are equally good.

A three-coil honeycomb mounting, which can be bought at all radio supply shops, may be used to good advantage for the radio frequency transformer and tickler coil. The coil at the left should be used in the plate circuit; the center coil in the grid circuit, and the coil at the right as the tickler. For the plate coil, one of about 50 or 60 turns is desirable. For the grid coil, one of about 75 turns will do, and another of 40 turns will serve as the tickler.

All the other apparatus may be of any standard make. Potentiometers and rheostats are standard articles, any make being suitable. In the matter of selecting tubes, the first tube should be a hard amplifier tube such as the U. V. 201. The second tube may be either a U. V. 200 or a U. V. 201. The writer generally prefers the latter, because they are not as troublesome and do not require as close adjustment of filament and plate voltage.

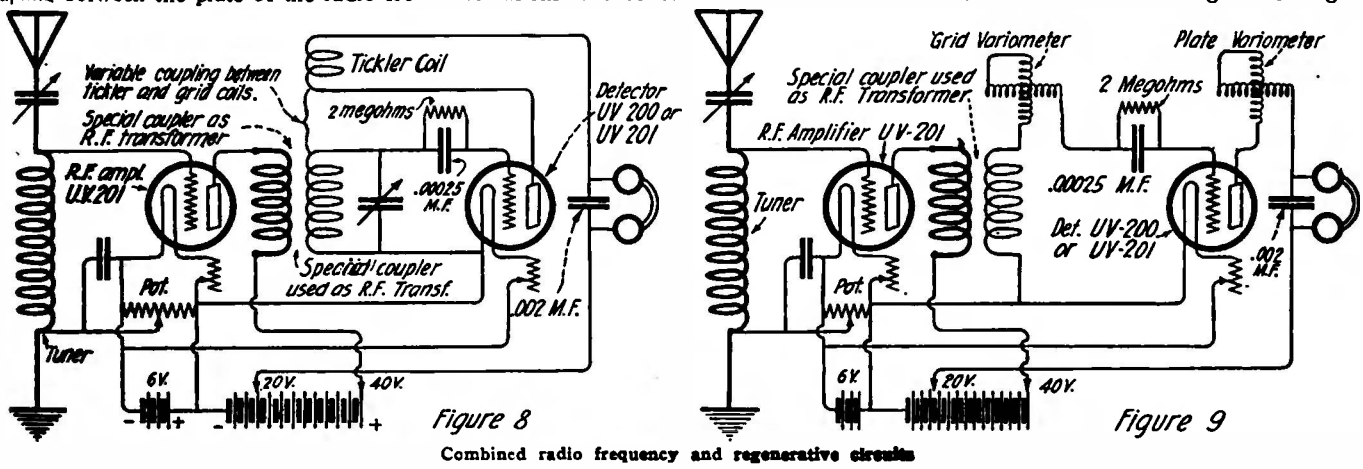
If the tickler coupling in this arrangement is carried beyond the oscillating point, such oscillations will be confined to the detector tube; practically none going into the antenna, since they are stopped by the radio frequency amplifier tube, which acts as a one-way valve only.

The tuning adjustments of a set such as this are not much more complicated than an ordinary receiver, and the experimenter should not experience any great difficulty in operating it.

Figure 9 shows a receiver similar to that of figure 8, with the exception that regeneration in the second tube is effected by tuning the grid and plate circuits with variometers. The antenna, grid and plate coils may be of the same size as those used before. Then again spider-web coils may be used here. For the antenna coil, one containing 80 turns of No. 28 or 30 double silk covered wire on a core 1⅛ inches inside diameter and 2¾ inches outside diameter is suitable. A similar size coil of 70 turns will do for the plate coil and one of 75 or 80 turns for the grid coil. The last two coils may be coupled by spacing them one inch apart. In this connection, it is important to turn the antenna coil at right angles to the other two, so that there will be no coupling back from the regenerative circuit to the antenna.

The addition of another tube is always regarded with disfavor by the average amateur, since the drain on his storage battery would be such as to cause it to run down within a few days. The author herewith presents a circuit in figure 10, in which the tube which is added is made to do a two-fold duty. It behaves both as a radio-frequency amplifier and an audio-frequency amplifier. Such a circuit is generally called a "Reflex" amplifier. With a combination of two tubes, we can have the following: One stage of radio-frequency amplification, regeneration, detection, and one stage of audio-frequency amplification. The phones in such a circuit are placed in the plate of the first tube, shunted by a suitable blocking condenser of .002 microfarad capacity. With a three-tube set up, in addition to the usual regenerative detector, and two stages of audio-frequency amplification, we can have a single stage of radio-frequency amplification ahead of the detector tube—this tube being the "reflex" tube. This circuit is illustrated in figure 10.

It is a non-radiating circuit, because the radio-frequency stage precedes the regenerative tube. The course of a signal coming from the antenna is somewhat as follows: Signal is applied between grid and filament of the first tube, and amplified in the plate circuit; from the plate it is coupled to the grid of the detector tube, regenerated and still further amplified by the regenerative action. Thus far we have been dealing with radio frequency. The signal is now rectified by the detector action of the second tube and the resulting audio-frequency in the plate circuit is fed back by means of a U. V. 712 audio-frequency amplifying transformer to the grid of the first tube. The audio-frequency is amplified in the plate circuit and



Combined radio frequency and regenerative circuits

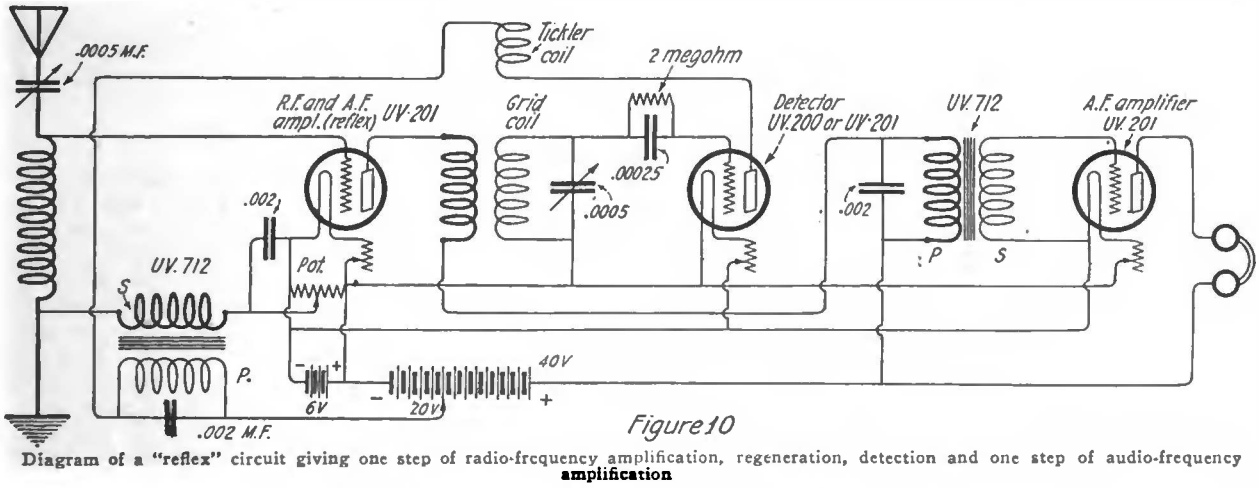


Diagram of a "reflex" circuit giving one step of radio-frequency amplification, regeneration, detection and one step of audio-frequency amplification

coupled to the grid of the third tube by means of another U. V. 712 transformer. The telephones, or loud-speaker, are placed in the plate circuit of this tube. The primary windings of both of the audio-frequency transformers are shunted by blocking condensers of .002 microfarad capacity in order to provide a by-pass for the radio frequency currents. It is not necessairy to do this in use of a vernier condenser connected across capacity of these coils is sufficiently large to provide an ample by-pass for radio frequency.

The coils used in the antenna and regenerative circuits may be the same as those described above. Three coil honeycomb mountings are ideal for use in the regenerative circuit. Both the variable condensers should have a maximum capacity of .0005 microfarad. The writer recommends the use of a vernier condenser connected across the tuning condenser of the second tube. With loose coupling, this will prove invaluable in tuning out undesired stations.

For those who prefer it, the author wishes to state that variometers may be used for regeneration in the second tube. A variometer should be inserted in the grid circuit, omitting the condenser shown, and another variometer added in the plate circuit, as shown in figure 9.

The apparatus may all be laid out on a horizontal board, or mounted in panel form. Personally, the writer prefers to have it on a board to facilitate the necessary changes and improvements that suggest themselves in order to secure the most enjoyment and enlightenment from a given set up. Here it is worth mentioning that the audio-frequency amplifier will have a strong tendency to squeal and howl unless certain precautions are taken. The transformers should be so arranged that the leads running to grid and plate are as short as possible. It is in general preferable to have a long plate lead rather than a long grid lead—in a case where the leads are over eight inches long. Note that a by-pass condenser of at least .002 microfarad capacity should shunt the potentiometer.

Figure 11 shows the general layout of the apparatus on a horizontal board. The experimenter may mount it on a combination horizontal-vertical panel, with the controls on the front.

In conclusion, the author wishes to urge upon all amateurs who use regenerative receivers to avoid oscillations because of the interference it creates. Only those living in thickly populated districts need heed this warning. Those who wish to revise and improve their sets may make them non-radiating as shown in this article, without losing the advantage gained through using regeneration and without the expense of additional tubes, for the tubes are here used to their utmost. But no amount of technical papers will have the desired effect unless the influential radio magazines such as THE WIRELESS AGE will continue to keep up a persistent campaign of education and enlightenment.

A Solution to the Re-Radiation Problem

By S. M. Hill

(Second Prize, $5.00)

THE problem of re-radiation from receiving sets is not new, but is one on which there has been very little information published. I had not previously regarded the condition at all, but on reading the article in THE WIRELESS AGE, I was tempted to try it out. Re-radiation is not a condition due alone to regenerative receivers, as the author of the previous article seemed to imply—but occurs on all types of antenna circuits with crystal receivers and

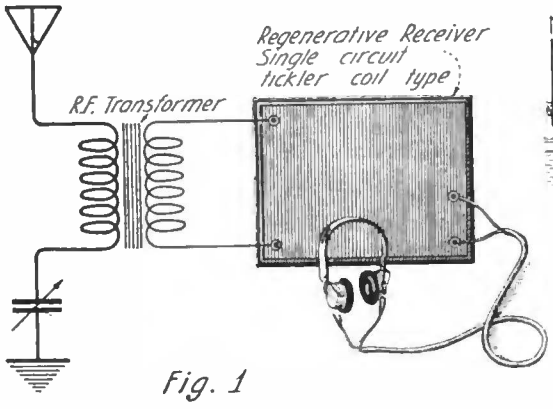


Fig. 1

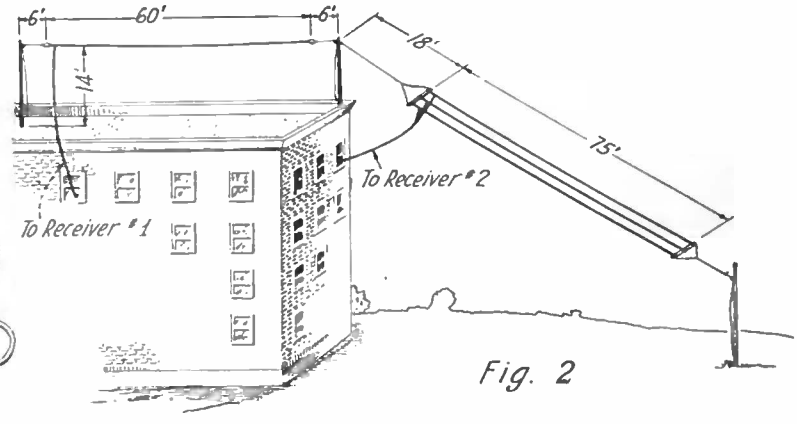


Fig. 2

Radio-frequency regenerative set used and antenna conditions during the test

with non-regenerative receivers. With V. T. detectors the ideal condition is probably realized when the re-radiated energy is just equal to the absorbed energy, in order that the greatest signal strength may be obtained as brought out by Dr. Eccles in his book.

This statement is difficult to prove, since it is almost impossible to adjust a receiver to fulfill such a condition. The three factors —total received energy, energy absorbed in receiver, and the re-radiated energy—cannot be measured or even computed with satisfaction.

So in the following, statements are made based on practical results only. Also all observations were made without fully knowing whether some third party was "butting in" with his receiver and affecting our results as there are several antennas in my immediate vicinity. The results are as follows: The least interference was obtained when a single step of radio frequency amplification was used between the regenerative set and the antenna. When this circuit was oscillating vigorously very little interference was encountered at the other receiver. The amount of interference was compared as follows: the receiver that was adjusted to the oscillating state (which I will label Rec. No. 1), was so tuned that it would heterodyne a certain C. W. station working at the time. The other receiver (No. 2), was tuned to the same wave length but was not oscillating so the C. W. station was inaudible when receiver No. 1 was not working. When No 1 was switched on the effect of a separate heterodyne was established and made the signals audible. This was compared with the effect of the redesigned regenerative receiver with the R.F. amplifier set included. It was noticed that part of the howling in one receiver that has been noticed for the past six months, and attributed to local conditions in the receiver, was in reality due to the other receiver—so our experiments have helped us in one way at least. This was true when the regenerative circuit was adjusted for maximum signal strength. With moderate feed back adjustments the effect was hardly noticed.

The average operator rarely knows however when his receiver is adjusted for maximum regeneration for the wave he is using, so he often gets his set howling unintentionally even if he tries to keep regeneration as low as is consistent with the signal strength desired.

The question remains of the adaptability of the ordinary R. F. transformer for this use. The type that gave us the maximum results had a 1-1 ratio, with a powdered iron core. The primary and secondary windings had an inductance of about 1.2 millihenries, which with a series condenser about .0003 mf. and the antenna of about .0002 mf. gave us a range up to about 800 meters, was hardly low enough to get good reception on 200 meters. The adjustment of the antenna circuit was far from critical. It may be remarked here that a radio frequency amplifier has regenerative properties characteristic of the tuned plate circuit, so one might expect to get as much re-radiation as before. Nevertheless our results showed much less, a condition probably due to the fact, that the actual amount of feed back around each tube was small. That is, the circuit containing two tubes regenerates slightly instead of one tube with maximum regeneration.

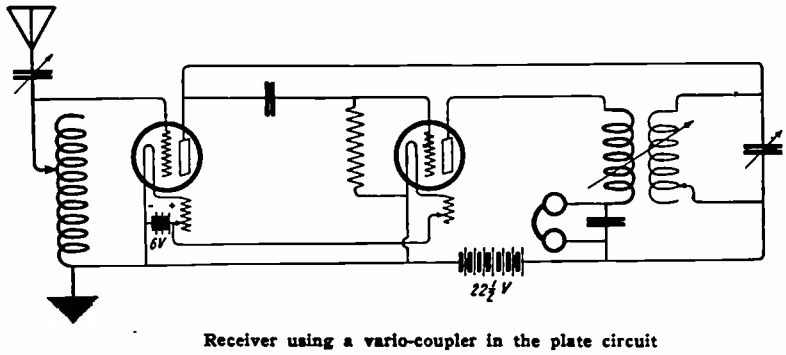
The Anti-Radiation Circuit

By G. P. King

(Third Prize $3.00)

THOSE amateurs who use the well-known "tuned plate circuit" method of radio frequency amplification have it in their power to adopt an extremely simple device to prevent radiation from their sets when oscillating. The device, though not new, is by no means so widely known as it deserves to be. It consists in putting the feed-back into the tuned plate circuit instead of the aerial circuit. In the case of a well-arranged set, i.e., one in which the various circuits are well separated so that energy is not transferred inductively from the plate to aerial, this type of regeneration results in complee freedom from radiation, when the set is oscillating for the reception of C. W. or searching for carrier-waves. This prevents interference with nearby receivers.

The arrangement of a typical circuit employing this device is shown in the figure 1. Two points which should be noted are, firstly, that the vario-coupler in the plate circuit only needs about half the number of turns which would be required if it were in the aerial circuit, and secondly, that since the damping of the aerial circuit no longer can be reduced with regeneration it must be kept as low as possible by using low-resistance wire, Litz preferably, and the very best of insulation throughout.



Receiver using a vario-coupler in the plate circuit

Regeneration on a Two-Slide Coil

By A. G. Shirt

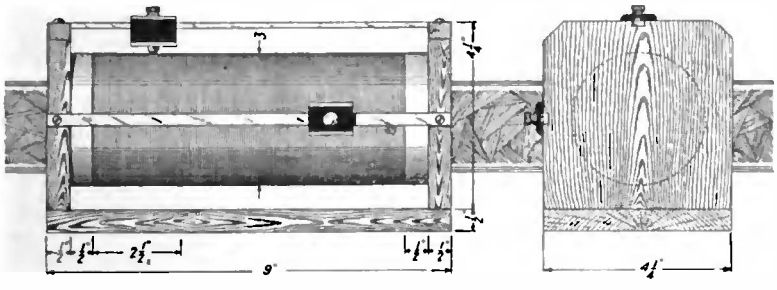
MANY a radio novice starts by looking for a practical and at the same time moderately priced set. What kind of a set—regenerative? Well no, not just at present. Maybe later, when he gets a bit more money and can afford batteries, he'll indulge in a vacuum tube outfit, but until then he's going to plug along on a crystal outfit. A sensible and laudable plan, a scheme which most of us followed. There is a blessed and powerful urge which keeps us going in the radio game after we are once started, and the number of amateurs who heard their first signals over crystal detector may be arrived at approximately by taking an up-to-date call book and counting the number of names. Such being the case, it is the duty of men who are in a position to advise, to offer the newcomer in the science something that has stood the test of experience and the pocketbook.

Since it is as sure as death and taxes that the first crystal set will later be discarded in favor of a tube outfit, why not a deliberate building of the first so that the second may be half built when the time comes for the change? This is practicing economy as well as forethought. Experience has demonstrated that an ordinary two-slide tuner, the plans of which have been so often submitted that they are no longer original, is as efficient a tuner for regeneraive work as it is for crystal! Only one additional tap—and that is indicated in the instructions which follow—must be made!

This is surprising news even to a great many experienced amateurs, the bane of whose existence has been the high cost of variometers, variocouplers, and variable condensers. Those instruments are not absolutely necessary for a good regenerative set, where nothing need be sacrificed for efficiency, but where the money involved is given careful consideration. The amateur building this tuner, and operating it as suggested will find himself in the proud possession of a neat and capable receiver, which will do single and regenerative circuit work with equal satisfaction and success.

The range, of course, depends upon the sensitivity of the particular crystal used, but on the average radio concerts can be picked up from broadcasting stations fifteen miles away or even more, while the ordinary commercial station may be heard from distances of two hundred miles or more. This is disappointing, isn't it—the first disappointing feature. But it is true of all crystal sets, especially the ones constructed at home. In this matter of ranges, it is well to be honest and conservative. Then a fellow knows just what he is getting and doesn't set high, but disappointed, hopes on doing spectacular DX work right off the bat.

Outside of the phones, the set ought to cost about $1.75. In buying your headphones, remember that they are the instruments that are to stay with you, and get a pair of real value; it pays in the end. A reputable make and about two thousand ohms resistance are the things to look for.



Constructional details of the two-slide tuner

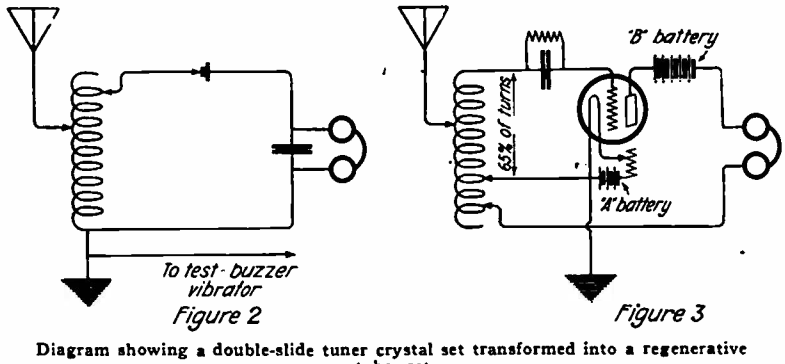


Diagram showing a double-slide tuner crystal set transformed into a regenerative tube set

As for the tuner, that can be easily and profitably made at home. Don't follow the dimensions to the fraction if you find a smaller or larger instrument better suited to your needs—but do comply with the general instructions. As shown on the drawing, with a cardboard tube three inches in diameter and wound with seven inches of wire, the tuner will have a wave length selection of about eight hundred meters. That is to say, if the natural wave length of your aerial is 150 meters—most small aerials are not over that—you will be able to tune in everything up to 950 meters. This selectivity includes amateur, commercial, broadcasting, compass-station, and navy wave lengths, so there should always be something coming in, especially if the receiver is near the coast.

After coating the cardboard tube—or the wooden cylinder—with a few applications of shellac, which serves to shrink and harden the tube, wind it with No. 22 enamelled covered copper wire. Seven inches of wire means a tube eight inches long, so that one-half inch may be left clear at each end. Cotton or silk covered wire may be used, but it is so much easier to scrape clean the contact path for the sliders with enamelled wire that its use is urged, although not imperatively. Two and one-half inches from the left hand end, scrape the wire clean and make a tap. Solder it well, and bring it inside the tube. Then go on with the winding.

This tap is the only one that must be made, and is the secret of the tuner's use in a regenerative circuit. In case a larger or a smaller sized tube is used, place the tap so that sixty-five per cent. of the wire is to its right. This is the proportion that has been found best by experience.

There's the tuner! The rest of it is like any other two-slide coil.

But after using the crystal set for a while, there gathers on the brow of the earnest radio bug a mighty frown. He gets tired of fooling around with a detector that won't stay set, and has had enough of a buzzer that always sticks. He hasn't received a totally complete concert yet, and a whole message is a thing unknown. Something always happens to spoil things—and besides, the best music and the most interesting press comes from stations that are no more than audible. Moreover, he has a bit of money now, enough for a tube and socket, and a battery or two, and when all this happens to a radio ham, he is ready for a regenerative set. Does he open the window and chuck out everything but his headphones, and then lay out a fabulous sum for entirely new equipment? Not if he's working with the tuner I have described. He brings out the regenerative tap, buys his vacumn tube where and how he may, gets a socket to put it in, collects the energy to light the outfit up, makes or buys a grid leak condenser, secures a rheostat, and he's finished. On the same base he formerly used for a crystal set and with the old two-slide tuner, he has an efficient tube regenerative set.

Now concerts can be heard distinctly for two hundred miles, and spark stations five hundred miles—both distances being extremely conservative.

The hook-up for the regenerative work is given, and it has proven a good reliable circuit. No buzzer is necessary to adjust the set. Put it into operation by closing the filament switch, and adjusting the rheostat until the filament burns brightly and an audible plucking sound is heard in the phones when the grid is touched with the finger. If the plate battery is tapped so that from 18 to 22½ volts there are 1½ volt steps, it will aid in getting more critical adjustments and in some cases, louder signals. Some amateurs rig up both sets together, so that a throw of the switch changes the circuit from the original crystal detector outfit to the new regenerative. This is an obvious way of saving the batteries, and prolonging the life of the tube, for it often happens that a tube is employed for what a crystal might easily and clearly bring in.

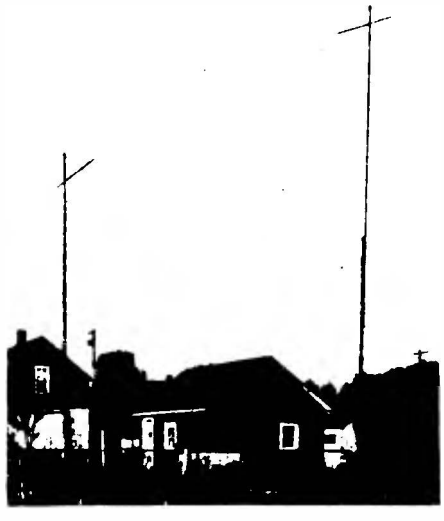
It requires a little time to become properly acquainted with a regenerative hook-up, but once you do, the days of the crystal set will be gone forever! The expense is cut down considerably by the use of this useful two-slide tuner.

New C. W. Transmitter at 2EL

Old Timer Junks Spark Set and Marvels at Increase in Range—Counterpoise Proves Its Value—100-Watt Set Works St. Louis by Voice

WAY back in the early days of amateur radio, years before the war, Harry H. Carman of 217 Bedell Street, Freeport, L. I., started to build an amateur wireless station and although he has been working more or less continuously on it since then the station was only recently completed. It must not be assumed that it has taken him ten years to get energy into the air, for that is most certainly not the case. In fact, the air in the vicinity of Freeport, L. I., has been overloaded with energy for years since he started operating 2 EL. The trouble has been that he has employed spark transmitters of heavy calibre which overloaded not only the wave length he was working on, but a large number of wave lengths both sides of it as well.

Like many other amateurs Mr. Carman assumed that the more power he used the greater would be the effect at a distance, but in doing so he overlooked the fact that an antenna ammeter is very often not a true indication of what is being actually accomplished. It is true that in times past he has frequently been able to push the hand of a 5-ampere ammeter clear off the scale, which has caused the aforesaid Mr. Carman to smile with satisfaction at the visitor. Whenever any of the amateurs of the surrounding territory happened to be on hand during the smiling process, their faces took on a different aspect and the general opinion was, "Yes, that would be fine if it could be tuned so that it would not put everybody else in this part



The antenna system at 2EL

of the country out of business." As one amateur expressed it, whenever 2 EL closed his key, "It sounded like the whole power house had broken loose and gone on a rampage."

However, Mr. Carman has at last come to the conclusion that there is something in continuous wave operation in view of the fact that his C. W. signals recently have been heard where they never were heard before with his stone crusher, with only one-half the power that his sparks used to consume. In other words, another one of the ancient and honorable school of old shellbacks, the hard-boiled spark devotees, has become as strong for C. W. as he formerly was for the spark method.

The change at 2 EL has been complete and absolute. His highly prized, and almost adored, 1 kw. stone crusher outfit is now in a more or less neat pile at one end of the station with a large sign hung above it: "For Sale—Cheap."

The first excursion into the realms of C. W. transmission was made by means of a 5-watt tube, hooked onto a make-shift, high-voltage transformer. Later on, the size of the outfit was increased to the extent of two 50-watt Radiotrons UV-203 in a self-rectification circuit. When stations one thousand miles away began to respond to this outfit, characterized by Mr. Carman as a "mess of junk," this hard-boiled spark devotee began to think seriously that there must be something in this C. W. transmission after all. The success attained with the self-rectification set was sufficient to put Mr. Carman in the state of mind where he was willing to listen to advice on the subject of C. W. operation, a point never before possible during his long career in amateur radio. Then one bright morning he forgot home, business, pleasure and everything in a wild desire for a real C. W. transmitter. This has now been built and the records so far made with

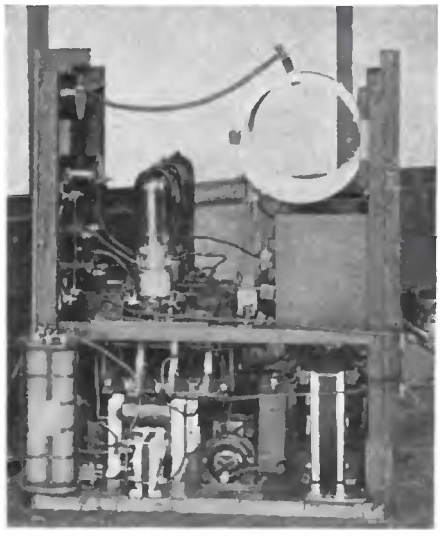
the 100-watt set, with D. C. plate supply have more than justified the trouble and the expense involved in procuring the necessary odd parts and assembling them into a dependable long-distance amateur transmitter, using the Colpitts oscillator circuit, with Heising modulation.

This present set, which is really about number 57 of the total number which Mr. Carman has put together during his career in amateur radio, consists of three 50-watt tubes, one as an oscillator, one as a modulator, and one as a speech amplifier. The set can be used three ways, that is, for voice, interrupted continuous waves, or straight C. W. When used for voice with one tube as an oscillator, one as a modulator, one as a speech amplifier, the antenna current is in the neighborhood of 3.5 amperes, and when used for straight C. W. the antenna current is in the neighborhood of 4.5 amperes, using two tubes as oscillators.

An A. C. - D. C. motor-generator, made by the Wireless Specialty Apparatus Company, is used for the plate supply, the normal voltage being approximately 1,000 volts. Field control is provided so that this can be reduced or slightly increased, if necessary. The filaments of the tubes are lighted with a Thordarson lighting transformer, shunted on the secondary side with condensers, the central point of the two condensers being connected with the neutral or central tap of the transformer where the filament return is made. No indication whatever of a 60-cycle hum is apparent in the set when used for voice communication.

A filter system composed of two filter reactors, type UP-1654, in connection with a 5 mfd. filter condenser, is used across the high voltage and all motor-generator noises completely taken out of the system. A chopper, type RX-1638, mounted on a high speed Universal motor, is inserted in the grid-leak line and the note of the chopper can be regulated at will by means of a variable resistance which governs the speed of the motor.

The plate blocking condenser and also the brid blocking condenser are Murdock sections of .002 mfd. capacity; the feed-back condenser between the negative lead of the generator and the lower point of the oscillation transformer is a Murdock .0017 section. The constant current plate reactor is of Acme manufacture of 1½ henries, and the grid reactor of the modulator tube, and plate reactor of the speech amplifier tube are also of Acme manufacture of an inductance of 1 henry.



Close-up view of the set showing the three tubes and various other parts

The biasing batterles used on the grid of the speech amplifier and also on the grid of the modulator tube are of 22 and 44 volts. A General Radio modulation transformer is used in connection with a Western Electric Company microphone, type 284-W, for speech. The oscillation transformer is type UL-1008, and in this case, as in others where the type number is referred to, the parts are so listed in the catalogue of the Radio Corporation of America.

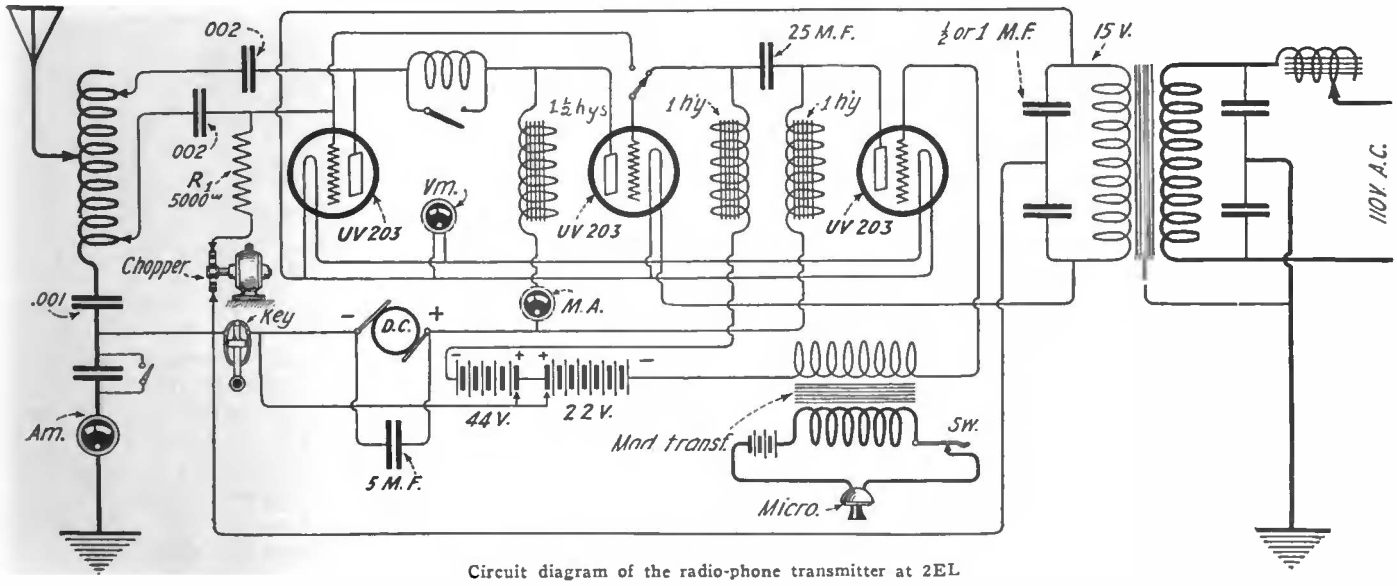
All the indicating meters of the set, seven in all, are the product of the Jewell Electrical Instrument Company, and are mounted on a bakelite panel 2x4 feet. The Jewell meters are an antenna ammeter, filament volt meter, grid milllammeter, two plate milliammeters, and one volt meter with multiple for the high voltage supply and one for the line voltage. While this may seem an unusual number of meters to employ it is nevertheless very desirable to have indicating instruments In all circuits of a transmitter of this kind so that guesswork is entirely eliminated. The various circuits once properly adjusted, these meters can be short circuited or taken out of the circuit entirely if desired. The many great advantages when first "tuning up" a C. W. transmitter being gained by having indicating instruments in all circuits are so obvious that the small expense entailed by permanent installation of the meters is more than worth while. As above outlined, it is better to know than to guess, as a guess may often be wrong, resulting in damage to the tubes or other parts of the transmitter.

The antenna at 2 EL station runs at a vertical angle of 45° directly above the station to a height of 88 feet. The antenna is of four wires on 15-foot spreaders. The ground system consists of a network of wires eight feet above ground in a circle around the station, and the use of a counterpoise in place of the aerial ground system formerly used has undoubtedly been responsible for a great deal of the success attained by this station. The location, which is on the edge of the town of Freeport, close to a salt water creek and salt water marshes, would seem to indicate that it was an ideal spot for a ground if there ever was one, and Mr. Carman's faith in this point of radio communication has been so strong that he has heretofore been a constant buyer of hot water boilers, old pipe, kitchen stoves, kitchen sinks, and everything else in the way of metal junk that anybody on Long Island had to sell. In fact, the former ground system of 2 EL station was a marvelous and wonderful collection of junk of all sizes, kinds and description. The cable which lead to this mass of junk was larger than Mr. Carman's arm and he's a husky fellow at that.

Anybody who has changed from ground to counterpoise can readily imagine what happened to Mr. Carman's feelings and his pride in the wonderful ground system when it was finally disconnected and a few wires strung from his ground connection to the fence. The first counterpoise consisted of a few small wires, composed principally of old bell-wire, with twisted but not soldered connections. It resulted in an immediate increase of 1 ampere in antenna current.

Rebuilding the counterpoise and adding several more wires to it has resulted in a greater antenna current than Mr. Carman ever hoped for by means of the old ground and he has rather reluctantly, it is believed, finally come to the conclusion that a counterpoise is far superior to an earthed ground.

"Listen, old man," he said to a visitor, "it takes a long time for me to get anything into



Circuit diagram of the radio-phone transmitter at 2EL

my head, and when some of the other hams told me what a counterpoise was good for I just let it pass, until one day one of 'em got mad about it and I thought maybe there was something doing. So I hooked up some old bell wire, and Oh Boy, you should have seen the ammeter!"

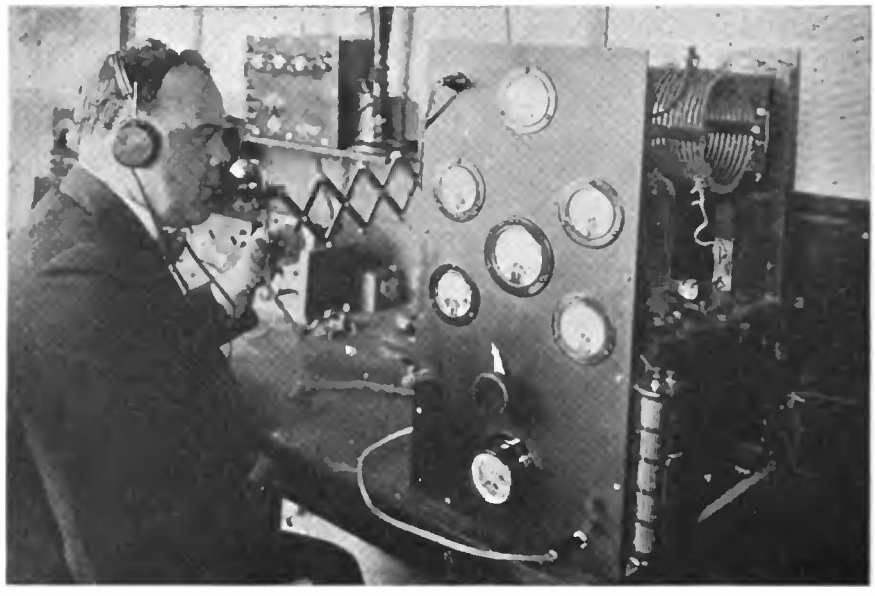
Having sold himself on the counterpoise, Mr. Carman proceeded to make a good one. A pear tree happening to be in the way of some of the wires, out came an axe and down went the tree. Amps beat pears!

In the first three weeks of operation of the new C. W. transmitter with the counterpoise, 2 EL was heard as far south as Porto Rico, was reported by a station in the Fifth District, heard in South Dakota, and in Northern Ontario. F. Feuerborn, 9 CTR, at St. Louis, Mo., wrote: "Your sigs. worked here Sept. 29th A. M. Your voice was very QSA on detector and home made regenerator. Your fone is FB. First distance amateur fone I have heard that had real good modulation. Could understand every word you said very clearly when there was no local interference."

Louis Rexach, 401, at San Juan, Porto Rico, reported C. W. signals from 2 EL: "Some distance, O. M., would like to work you. Congratulations."

M. J. Caveney, Canadian 3 GG, located in about latitude 48 north, longtitude 81 west in the Porcupine gold mining area, reported 2 EL QSA on Sept. 29 at 5:24 a. m., and asked "When do you sleep?"

The signals from 2 EL have been copied by many amateurs to the south, including 4 NU, Orlando, Fla.; 4 BF, St. Petersburg, Fla.; 4 JI, Winter Park, Fla.; 4 DL, West Palm Beach, Fla.; 4 FT, Wilmington, N. C.



Harry H. Carman, owner and operator of station 2EL

Many of these reported reading 2 EL on detector alone. Other stations reading 2 EL during the first three weeks were: 9 DZY, Maplewood, Mo.; 8 CZN, East Cleveland, O.; 9 OX, Louisville, Ky.; 9 OF, Waukegan, Ill. During the first week alone 52 new cards came in.

In addition to DX work, the new C. W. transmitter is of course marked by purity of wave, resulting in minimum interference with other transmitters or receivers. In fact, so fine is the tuning of the transmitter that Mr. Carman is not at all disturbed by the recent decision of the Freeport Radio Club to stop transmission between the hours of 7 and 10:30 p. m.

"Let 'em stop," he proclaimed. "I'll turn in my resignation if they want it. I'm not interfering with anybody on the broadcast wave lengths and I'm going to keep going. If the club wants to do something, let 'em pass a resolution that nobody is going to use anything but C. W. transmitters.

And just three short months ago this same amateur refused to believe what he is now so emphatically telling the wide world.

Telephone Receivers Used in Radio

By Bernard Steinmetz

A LARGE number of subjects are now being given property attention in radio periodicals, and almost every conceivable instrument is being discussed. There is, however, a notable absence of any information on the telephone receiver; i. e., the headset itself. This would seem to imply that there is no need to discuss this instrument as most amateurs understand it thoroughly. That this is far from being the case is immediately evident to one who constantly hears amateurs speak about it. The other day I was speaking to an amateur who had recently bought one of the simple crystal receivers now on the market, and he told me he heard WJZ pretty well on it. "But you know what," he continued, "for the fun of it I tried a 3,000-ohm telephone instead of the 2,000-ohm that comes with the set, and would you believe it the signals came in much louder." He was under the impression that the lower the telephone resistance the louder the signal should be, for more current could then flow through it. On the other hand there are any number of amateurs who seem to think that all telephone receivers must have a very high resistance. It seems clear that behind these two widely differing opinions there is a lack of fundamental knowledge regarding the telephone receiver. It will therefore be the object of this article to make clear the fundamental principles of the telephone receiver, and thereby clear up any misconceptions which may be prevalent among the amateur and experimental fraternity.

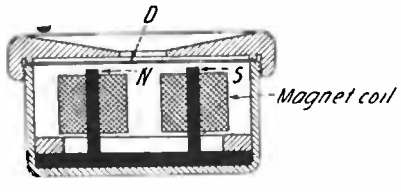


Fig. 1

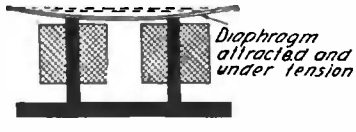


Fig. 2

Diagrams of the standard telephone receiver

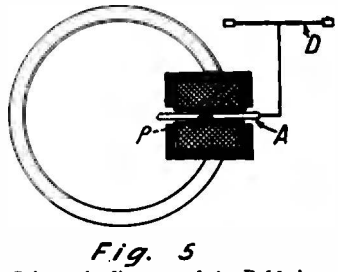


Fig. 5

Schematic diagram of the Baldwin receiver

A simple working drawing of the so-called watch-case telephone as used on radio sets is shown in figure 1. It consists essentially of a small permanent steel magnet having two pole pieces N and S, on which are wound

(*Continued on Page* 83)

NEW APPLIANCES AND DEVICES

New Storage B Battery

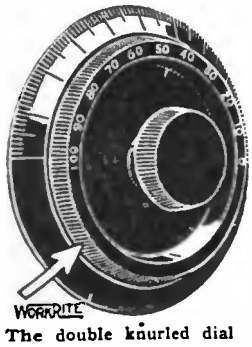
THE Westinghouse Union Battery Co., Swissvale, Pa., is offering a new B battery of the storage type, in which all the elements are containcd in a single glass jar, instead of being placed in eleven separate containers. This makes it much easier to

The new storage B battery

keep the electrolyte at the proper height, and the battery is more convenient to handle. The battery gives 22 volts, and is rated at 1.2 ampere hours, so should give long service without needing re-charging. When a new charge becomes necessary, it is easily given by means of a chemical rectifier, at a rate of from .1 to .2 ampere. The battery weighs five pounds, is 2½ inches wide, 4¼ inches high and 9¼ inches long. It lists at $8.80. In addition to this small battery, the company also makes other types especially suited for radio use, including two other types of B batteries and ten models of A batteries, ranging from 27 to 162 ampere hour capacity, and in four, six and eight volts.

Dial With Two Knurlings

WHEN endeavoring to get a fine adjustment in tuning most people abandon the center knob on the dial and place their fingers at the edge, where the improved leverage gives better control. However, the average dial presents outside of the knob no



The double knurled dial

surface for the fingers to grasp, except for the slight indentations of the engraved scale, and the smooth surface thus sometimes allows the fingers to slip during a delicate adjustment. To obviate this slipping the Workrite Mfg. Co., Cleveland, O., has added a second knurling to its Workrite dial, near the edge. The dial thus offers the fingers a grip not only on the knob, but just inside the engraving as well. Rough and fine adjustments are made with ease. The dial is handsome in appearance, being highly polished, and is 3½ inches in diameter and may be had for either a 3/16 inch or ¼ inch shaft.

"Maderaware" Die-Cast Woodhorns

THE American Art Maché Company, Chicago, has adopted the term "Clearspeakers" for their "Maderaware" horns, to typify the clear voice-like messages that they deliver. The violin-like resonance of "Maderaware" wood is ascribed to the fact that the die casting process compresses the wood-fiber to a density of 200 per cent. greater than that of seasoned hardwood, and that this density is uniform throughout the structure.

Maderaware horns

It also has the effect of amplifying the sounds by adding to the electric vibrations the vibrance of the wood itself. Yet, however loud the message, it is stated to be uniformly clear, pure, musical and free from metallic discord.

Fada Tells Some Facts

FRANK A. D. ANDREA, New York City, whose trademark "Fada" appears on a constantly increasing number of radio sets and parts, has issued as Catalogue E the "Fada Handbook of Radio Facts." This is a well-printed and thoroughly illustrated booklet of 48 pages, and is remarkable in that exactly half of the space is given over to radio theories and facts, explained in a popular way, much after the manner of the elementary textbook. The last half of the booklet lists the various Fada products. A useful book.

Cisin Joins Dictograph

H. G. CISIN, author and electrical expert, has joined the staff of the Dictograph Products Corp., New York City. He has been placed in charge of sales promotion, advertising and publicity. As a radio enthusiast and expert he will give much of his time to the radio division of the Dictograph business.

Alden-Napier Sockets and Dial

AMATEURS and assemblers of radio apparatus are showing interest in the sockets and dials made by the Alden-Napier Co., Springfield, Mass. One socket, known as the "Small Space," is notable for its compactness, the binding posts hugging the soc-

Alden-Napier dial

ket very closely. Inasmuch as compactness frequently is desirable in sets using a number of tubes, this socket is attracting favorable comment.

Another Alden-Napier product is the "De-Luxe" socket, in which no attempt has been made to economize space. The terminals are conventional binding posts, slanted outward at an angle to make them easy of access. The special feature of the socket, however, is a patent clip for the prongs on the tube, by which a positive contact is given under all conditions. As the tube is slipped in place the clip exerts a wiping pressure against both the bottom and sides of the legs. The operator using these sockets can be sure that if an open circuit occurs it will not be in his contacts with the legs of the bulb. Instead of turning the tube in inserting it, it is pushed straight downward. Genuine moulded Condensite is the material used for insulation. As there is ample spacing between the contact strips and the bottom of the socket,

Alden-Napier socket

it can be used for 5-watt transmitter tubes, as well as detectors and amplifiers.

Another Condensite part made by the company is a dial, three inches in diameter, which, owing to the size and design of its knob, can be used without the fingers concealing the graduations on the edge. This is an appreciated advantage in a dial of such a size. The dial uses the minimum of material consistent with durability, in order to reduce absorption losses.

How to Select Between 360 and 400 Meters

Hints on Avoiding Interference When Two Broadcasting Waves Are 40 Meters Apart

By C. W. Horn
Superintendent of Radio Operations
Westinghouse Electric & Mfg. Co.

THE Department of Commerce, in order to assist radio broadcasting, has specified two wave lengths on which broadcasting may be conducted. These wave lengths are 360 meters, the one in general use up to this time, and 400 meters, just recently allotted. While these wave lengths are 40 meters apart, there will undoubtedly be considerable confusion on the part of those owning radio receivers who are situated very closely to one of the stations. For the purpose of assisting those who are so unfortunately located that two such stations are picked up by their receivers simultaneously, I will describe a number of methods which, if applied, should greatly assist those desiring to get either one of the two waves without being too greatly interfered with by the other. There is one case, however, which will be very difficult to assist, that is where the receiver is exceptionally close to a broadcasting station; by close is meant within a few thousand yards.

The assignment of two wave lengths so closely together will have the effect of stimulating construction of radio apparatus which will be capable of tuning more sharply, and it is the old case of "necessity is the mother of invention."

Therefore, while the few who may be inconvenienced by their nearness to a station may complain, the results in the long run—and not so very long at that—will be beneficial to them. The condition that has been created is stimulating the construction of apparatus that tunes more finely, and also is having an influence on the government, which may result in the assignment of more wave lengths for broadcasting purposes, giving the public still more choice in programs.

One of the greatest misunderstandings that the writer has found in connection with the installation of radio receiving apparatus is that it is believed that the more wire and the larger the antenna, the more will be received. Exceptionally large antennae make it more difficult to tune sharply, and for this reason it is advocated that very short single wire antennae, approximately 75 feet long measuring from the apparatus to the far end, be utilized, such single wire antennae to be stretched away from all metallic objects and run straight and clear of all obstructions.

Secondly, do not run the antenna or lead-in over metal roofs, along water spouts or drains, or parallel to telephone and power wires.

Mr. Frank Conrad, Assistant Chief Engineer of the Westinghouse Electric & Manufacturing Company, has made measurements and drawn resonance curves which show that a short low antenna tunes much more sharply than a large and long antenna. This holds true both for coupled and single circuit tuners.

Another method to pursue in overcoming interference, especially where vacuum tube receivers are used and where the receiver is located close to a broadcasting station, is to make use of the well-known directional properties of the loop antenna. A very simple loop can be constructed very easily by winding a half a dozen turns of wire, spaced about one inch apart, on some framework which can be rotated. It will then be easy to tune out a station which has a difference of 40 meters in wave length, especially as a loop antenna forms a closed circuit which can be more sharply tuned than an open antenna. The two ends of the loop should be connected across the antenna and ground terminals of the receiver, and no other ground or antenna used.

Those who are more fortunately located, that is at a little distance from a broadcasting station, can without any difficulty, tune in either one of the wave lengths mentioned. They should, however, bear in mind that a single wire antenna, not too long and kept free from obstructions, and not running near grounded metallic objects, will tune sharper. Where the amateur has a transmitting apparatus it is, of course, desirable to have a fairly large antenna, with more than one wire, and if such is the case he should use a separate wire for receiving.

The ideal condition will be when stations can operate independently on either of the two wave lengths without interfering with each other, and because the receiving apparatus is an important factor these suggestions have been written in order to give the owners of receiving apparatus information necessary to increase the efficiency of their apparatus.

PRIZE CONTEST ANNOUNCEMENT

The subject for the new prize contest of our year-round series is:

SUPER-REGENERATIVE RECEIVER

CLOSING DATE : : : DEC. 15, 1922

Contestants are requested to submit articles at the earliest practical date. Prize winning articles will appear in the February, 1923, issue.

All manuscript should be addressed to the CONTEST EDITOR OF THE WIRELESS AGE.

MANY of our readers have hesitated to experiment with the Armstrong Super-Regenerative Circuit, because of it being somewhat complicated in its operation. It is being successfully used, however, by a large number of amateurs, who are obtaining excellent results. Are you one of them? If you are, the readers of THE WIRELESS AGE will be very much interested to know of your results, which particular circuit you use, and especially the type of filter used.

PRIZE CONTEST CONDITIONS—Manuscript on the subject announced above is 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, $25; Second Prize, $15; Third Prize, $10.

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

WRITING under date of Sept. 4, 1922, C. A. Gorman, of Australia, sends in an echo of the amateur tests of last December. Mr. Gorman says: "On the 12th of December last I copied portions of a C. W. message on a wave length of about 250 meters, as follows: 'Test being conducted by American Radio Amateurs (missed portion) Station of (missed), situated San Francisco.'

"The signals were very weak, and hard to get, which accounts for portions being missed. At the time I did not think it was possible that the message was of American origin, but I kept the copy by me for reference, and also spoke to several members of the Wireless Institute at the meeting next night (December 13th).

"I found out nothing more about the matter till 'The Wireless World' this year published an account of tests conducted between America and England between the dates of December 7th and 16th.

"The first heard in Australia about these tests was months after the signals were received by me, so it appears that they were of American origin. The most unfortunate part was that the name of the station was missed.

"As many of the American experimenters use power of 100 watts and more, this distance is not such a great one to bridge, as we in Sydney have Mr. Maclurcan, who has been heard 2100 miles on nine watts.

"In conclusion, I may state that these signals were received on a single valve, and with the same set I copied Tahiti and the Marama, both over 5,000 miles; also Japanese coast stations and N P M on 600.

Since then Mr. Gorman has been trying to discover what station it was that he copied. He could not believe at first that he had heard the United States, but now has concluded that he did, and wants to hear from the transmitter. Possibly one of our Pacific Coast Amateurs can claim the distinction of having transmitted to Australia. Mr. Gorman's address is 96 West Botany Street, Arncliffe, New South Wales, Australia.

△ △

ALTHOUGH not listed in current call books, 3 ANT is the call for the station of John A. La Fore, Jr., and Robert W. La Fore, Box 977, Narberth, Pa.

△ △

BROADCASTING in the United States has by no means cut down the number of amateur transmitting stations. On the contrary the amateurs are more numerous than ever. On September 1, 1922, there were 16,467 licenses out allowing transmission on 200 meters. On June 30, 1921, there were but 10,809 amateurs authorized to send, but since that time, 15 months ago, 5,658 more have been added to the ranks using 200 meters.

THE French radio amatcurs are following in the footsteps of their American brothers, and are just beginning to take up transmission on 200 meters. Due to war time restrictions being carried over for a considerable period after the Armistice, the French have been confined to listening only for some time, and only a few have secured transmitting licenses. Now, however, the French government has authorized the issuance of licenses for transmission on 200 meters, and a great development of interest has occurred. No longer is it necessary for the radio fan in France to content himself with listening to commercial traffic. Short wave transmitters and receivers are being built and purchased in increasing numbers, especially in continuous wave models.

An excellent picture of the situation in France, which may well arouse the envy of American amateurs, beset with interference, is given in the following editorial, translated from *L'Onde Electrique* (The Electric Wave) of Paris:

"A profound transformation is taking place in the amateur world. We do not speak solely of the numerous new recruits who are interested only in radio telephony; that is but an addition to our ranks. What concerns us is the transformaion, already evident and becoming more manifest daily, from long waves to the study of short waves.

"Yesterday, there was not in France, out of a hundred amateur receiving sets, a single one that could receive on 200 meters, and not more than one in ten could go below 600 meters. Tomorrow it will be cntirely the contrary. The cause of the change is easy to find. It is due to the new regulations which at last give us the right to transmit. Authorization to transmit is generally given only for waves "comprised between 0 and 200 meters," and that is the reason why the antennas are being shortcned and the large inductances are giving way to little ones.

"If many amateurs up to now have been greatly interested in rcceiving the great European transmitters, it was because they had nothing else to listen to; but, after all, it is rather monotonous to hear nothing, at all hours of the day and night, except telegrams addressed to New York or Chicago ordering bales of cotton or similar things. On the little waves it will be quite different. One will be able to talk, and make tests. From one end of France to the other the murmurs of small tube transmitters will be heard. Will one not be infinitely more happy to have rcceived the signals of another amateur putting a few watts of energy in his antenna at the opposite extremity of France, than to have received numerous telegrams from POZ or MUU?

"Already the receiving sets are being installed on all sides. Some still hesitate on account of the rarity of transmitters working on 200 meters, and others also hesitate to install transmitters because of the lack of receivers! It is quite necessary, however, that some one makes a start. We

Listening to broadcast concerts at the Hebrew Orphan Asylum, New York City

would be quite mistaken not to profit now by the calm that reigns on the short waves; we will regret our delay in several months, when the question of interference begins to be serious for us. Now is the moment to establish distance records; let us profit by it. If the transmission on short waves is still rare in France, one can still hear our British comrades transmitting on them continually. Some five or six of them have been heard at Nice on a single detector tube. Let us take up the construction of variometers and instruments with vernier adjustments—we will not regret it.—H. T. S."

△ △

MR. A. F. Parkhurst, Assistant U. S. Radio Inspector for the eighth district, addressed an open meeting of radio enthusiasts at a meeting held Monday evening, September 25th, in the Hotel Henry at Pittsburgh. Mr. Parkhurst was introduced by Dr. Omar T. Cruikshank, President of the Radio Engineering Society of Pittsburgh, who presided.

The purpose of the meeting was to get together the broadcasting interests, the amateurs and the radio dealers to settle any controversies and differences of opinion they might have.

Informal addresses were made in behalf of the broadcasting interests by L. H. Rosenberg, of the Westinghouse Electric & Mfg. Company; G. B. Hill, of the Doubleday-Hill Electric Company; Walter P. Remele, of the Pittsburgh Press, and W. K. Thomas, of the Pittsburgh Radio Supply House.

Mr. Way, of the Wireless Electric Company, spoke from the dealer's standpoint and Mr. [illegible] Baumgarten, of the Rosenbaum Company, defended the amateur.

An announcement was made at this meeting that station KDKA, the pioneer station of the Westinghouse Electric & Mfg. Co., is soon to be licensed as a Class B station. Station KDKA will then have the added honor of being the first Class B station in the Eighth District.

As a result of this meeting it is believed that there will be more co-operation between the different broadcasting stations in the Pittsburgh district, and also more harmony between the amateurs and the broadcasting stations.

Among those present was Mr. H. C. Gawler, of the Radio Corporation of America.

△ △

UNITED STATES Civil Service Examinations for radio positions are listed below. Applications for these examinations may be had from the local secretary of the Civil Service Board at your Post Office, or, if not available there, may be secured from the U. S. Civil Service Commission, Washington, D. C. The examinations are held simultaneously on the dates given in several cities in each state, applicants presenting themselves for examination at the nearest examining office.

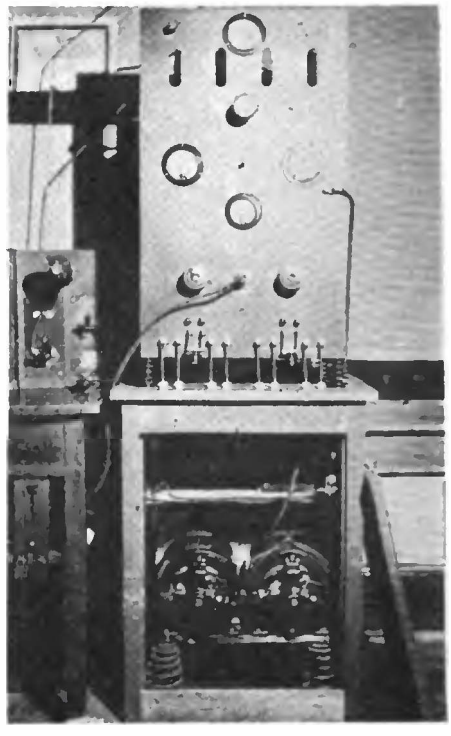
Telegraph Operator. Vacancies in the Bureau of Agricultural Economics, Washington, D. C., at $1,400 a year; vacancies in other departments at $1,200 a year. Examination to be held November 8. Candidates for positions in the Bureau of Agricultural Economics must have had at least two years recent experience as telegraph operators, and have acquired a first-class rating, the experience to have been with commercial telegraph companies, press associations, relay offices of railroads, or with any private company operating a leased wire. Required speed, 35 words a minute in transmitting, and the same in receiving on a typewriter.

△ △

DURING the convention of the American Legion October 16 to 20, at New Orleans, La., many messages were transmitted by radio for the visiting delegates. The New Orleans Amateur Radio Association did the trick with the co-operation of the New Orleans States Publishing Co., which operates a broadcasting station. Operators in all parts of the country assisted in copying and relaying the traffic from New Orleans.

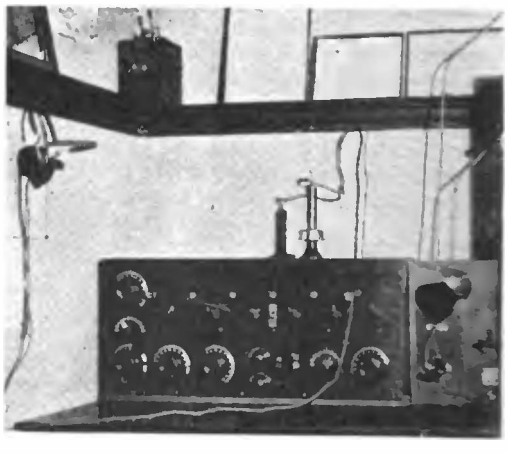
5ZA Talks 3,000 Miles On 50 Watts

MR. LOUIS FALCONI who as 5ZA has been heard in every state and in Canada, Mexico, Honolulu and ships on the Atlantic and Pacific, has rebuilt his station from aerial to ground, improving its looks and adding somewhat to its already large range. The rebuilt station has been reported as being heard by 6ZAC, Hawaii,



The transmitter with generator in the cabinet

which picked up voice and whistling when Mr. Falconi, 3,000 miles distant, in Roswell, New Mexico, was using only 50 watts. As in the original set, the new one is mounted on a frame in a single unit, all



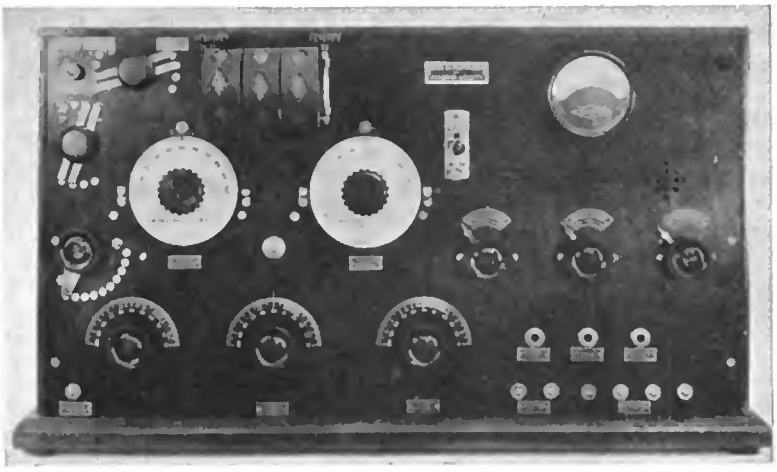
Receiving apparatus at 5ZA

parts being back of the one panel, except, of course, the motor generators, key and microphone. The generators are now housed in the bottom of the cabinet on which the transmitter rests. On a table beside the transmitter are placed the receiving instruments, and key and microphone.

Porto Rico Reaching Out for South America

SUCH satisfactory distance work has been accomplished by the Porto Rico Radio Club, San Juan, P. R., using station 4 JE, that it expects in the near future to be able to act as a relay point between the United States and South America for amateur traffic. Luis Rexach, one of the club's members, who has a 100-watt C.W. transmitter, has been able to work with 4FT, Mr. G. A. Iler, Atlanta, Ga., thereby establishing the club's present DX record with the United States, on September 15. Since then traffic has been regularly handled between the two stations.

The organization is exceedingly alive, giving a free radio instruction course in Spanish to all its 302 members, including transmitting and receiving work. One of the most complete instruments owned by a member is the combined long and short wave receiver built by J. Agusty, 4JE. 3 San Joseph street, San Juan. Mr. Agusty is president of the organization. Standard parts are used, with honeycomb coils and condensers for the long waves, and variometers for short ones. All the instruments are mounted on a single panel, changing from honeycombs to variometers being accomplished by means of an anti-capacity switch. An ammeter is used for filament control of the detector and two amplifier tubes. This receiver has been particularly successful in picking up amateurs and broadcast concerts on the shorter waves, and equally efficient on the longer waves of ship and commercial stations. KDKA has been heard through considerable interference.



Long and short wave regenerative receiver used by the Porto Rico Radio Club

New Tube Operates Without "B" Battery

A NEW type of detector tube has been perfected in the laboratories of the University of Illinois, Urbana, Ill. The tubes have been filed with the Patent Office in Washington, and application made for patents. They represent the result of research and development work by H. A. Brown and Dr. C. T. Knipp, of the University.

The new tube is very efficient and as it does not require a high plate voltage or filament temperature, it should be economical in operation.

Certain alloys or rare elements are introduced into the new tube, where they form a vapor. This causes the tube to function as a photoelectric cell; that is, current flows from plate to filament without the need of a plate or "B" battery when the tube is illuminated by the filament, or by some other source of light.

It is found that these tubes are sensitive detectors at any applied plate voltage from zero to 30 or 40 volts. They are most sensitive at 10 volts.

Using one of these tubes as a detector in a variometer type of short wave

regenerative receiver, the broadcasting stations at Schenectady, N. Y., Detroit, Pittsburgh, Chicago, and Kansas City, can be clearly heard in Urbana without any amplifier, and with zero plate voltage.

In the above mentioned cases the plate circuit return is connected to the negative filament terminal so that the plate current at zero plate voltage is not caused by filament potential drop; it flows in opposition to this potential.

Radio Installation Rules Revised

IN October a meeting was held in New York by representatives of the National Fire Protection Association for the purpose of revising National Electric Code Rule No. 86, governing the installation of amateur, broadcast and experimental radio apparatus.

The National Electric Code contains the regulations for all wiring systems approved by the National Board of Fire Underwriters.

At the October meeting the delegates reviewed their experiences with the tentative rules placed in service throughout the country last March, and recommended certain changes which experience has shown are advisable.

The changes and additions to the radio rules, as recommended, will provide that where electric light wires are employed as the receiving antenna the device used to connect the light or power wires to the receiving set must be approved for this purpose by the Underwriters' testing laboratories.

In receiving circuits each lead-in conductor must have an approved lightning arrester, mounted inside or outside the building. The arrester used must have a break-over capacity of 500 volts or less. A grounding switch may be used but is not required. If used it must be so connected that in its closed position it will form a shunt around the lightning arrester. Fuses in the antenna circuit are not required, but if used must not be connected in the circuit from the antenna to the protective device to ground.

The protective ground conductor may be bare and shall be of copper, bronze or copper-clad steel. The ground conductor shall not be smaller than the lead-in and in no case shall be smaller than No. 14 B. & S. gauge if of copper nor smaller than No. 17 B. & S. gauge if of bronze or copper-clad steel. Grounds may be attached to water pipes, steel frames of buildings or other grounded metal work in the building, or to driven ground rods. Gas pipes must not be used for this purpose.

The protective ground and radio operating ground may be the same conductor, provided it is installed as above specified. In this case the operating ground wire should be connected to the ground post of the lightning arrester.

Where ground wires are exposed to mechanical injury they must be protected by metal or wood housing.

The 1923 edition of the National Electric Code will contain in full the various provisions governing radio installation.

Methods of Radio Frequency Amplification

By Charles Kilgour
Crosley Manufacturing Co.

THE first essential of a radio frequency amplifier is a proper vacuum tube. Upon the grid of this tube is impressed the incoming alternating current. This is accomplished by connecting one side of the secondary coil to the grid and the other to the filament circuit. No grid condenser is used because the tube acts as an amplifier and not as a rectifier or detector.

To cause a vacuum tube to amplify properly the voltage impressed upon its grid, it is necessary to place an impedance, or resistance, in the plate circuit, which is the connection between the plate and the filament. It also is necessary to hold the plate at a positive potential of about 45 volts with respect to the filament. This is accomplished by the familiar "B" battery.

The high impedance required in the plate circuit may be obtained in several ways. A high ohmic resistance may be used, but as this has a high resistance to direct current it opposes the action of the "B" battery, thus introducing difficulties.

An inductance or coil may be used to set up the necessary impedance. An inductance may have very low ohmic resistance and so not interfere with the proper action of the "B" battery and at the same time, due to

(*Continued on page* 81)

Correction of Two Circuit Diagrams

AN error occurred in the circuit diagram of the article entitled "A Convenient Change-Over Switch" appearing on page 68 of THE WIRELESS AGE for October. Figure 1 shows the correct contact connections for the switch arms in the diagram.

In the same issue on page 70, the circuit diagram in the article entitled "An Efficient Loop Circuit," shows no negative lead for lighting the filament of the second tube. This has been corrected in the hook-up shown in Figure 2 and it can be substituted for the original diagram.

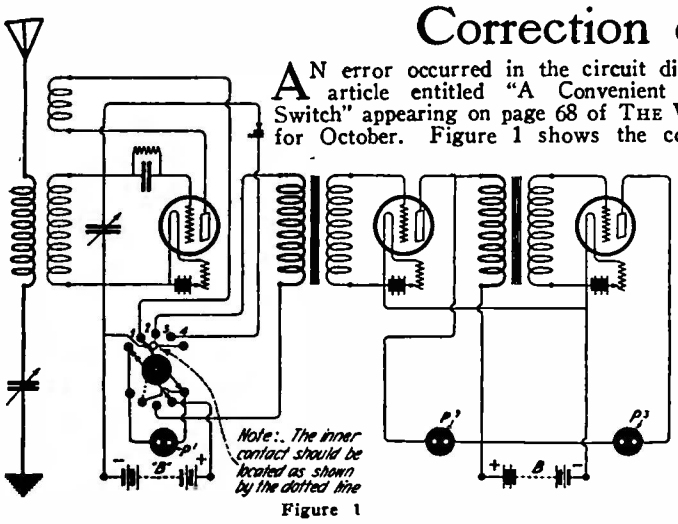


Figure 1

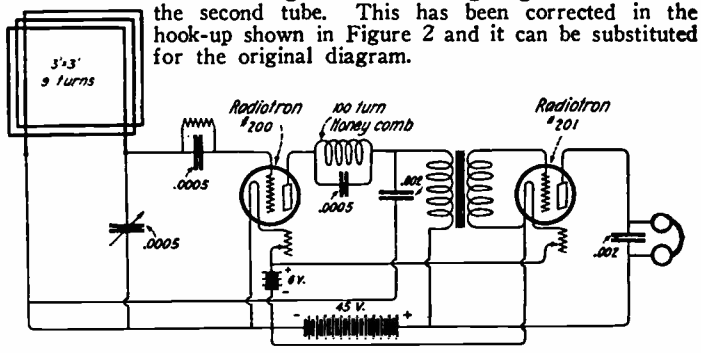


Figure 2

Methods of Radio Frequency Amplification

(*Continued from page* 80)

its reactance offer high impedance to an alternating current such as we wish to amplify. At the high frequency handled a condenser or capacity effect is always present in a coil. This is equivalent to connecting a condenser across the terminals of the coil. This capacity, together with the inductance of the coil, forms a closed circuit which has a natural period of oscillation or is resonant at a certain frequency. It is a peculiar quality of such a circuit that it offers a very high resistance to an alternating current of the natural frequency of the circuit.

In other words such a coil introduced in the plate circuit of a vacuum tube will have a high impedance to one frequency and will cause currents of that frequency to be greatly amplified. It is essential, however, that the amplifier works properly on various wave lengths. For this reason the ohmic resistance of the coil may be increased, broadening the range of the amplifier but materially reducing its efficiency.

By far the best solution of the problem is the use of a rather small inductance with a variable condenser connected across its terminals. The same sort of a circuit is formed as in the last case, but the variable condenser makes it possible to change the natural period of the circuit and so amplify a signal of any desired frequency within the range of the condenser and coil. The ohmic resistance of such a condenser and coil may be very low and paradoxically the impedance at resonance as a consequence will be extremely high. In fact such a circuit is often said to have infinite impedance at resonance. It thus serves to bring out the maximum voltage amplification of the tube.

Not only does this tuned amplifier give us the greatest increase in signal strength but it is very effective in eliminating interference. This feature is rapidly becoming very important with the greatly increased use of radio. Tuning the antenna circuit will, of course, cut out some interference but the addition of a step of tuned radio frequency amplification which amplifies one sharply defined and selected wave length will so increase the selectivity of a set that it must be used to be appreciated.

Sound Photographed for Broadcasting

(*Continued from page* 56)

"talking movie," in which voice and movement are perfectly synchronized. Or as the film already has been successfully used in the WGY broadcasting station—without the listeners knowing that they were experiencing anything unusual—it may be used in the future as an inexpensive substitute for the gathering of expensive artists at the various broadcasting stations.

The singer whose voice is transferred to the film could, it is suggested, "sing" from broadcasting stations all over the world to which duplicates of the original roll might be sent. Or possibly the device could be used for sending photographs by wireless. There is no theoretical obstacle.

Mr. Edison also saw a small induction furnace. It is a coil which turns a steel file red hot in a few seconds. When he put his finger in the same place he felt no heat at all.

Moreover, his friend, Dr. Steinmetz, entertained him with one of his lightning shows—a laboratory simulation of a discharge from the clouds, which split chunks of wood when it "struck," sent the pieces and bark flying, and caused a strip of tungsten to be dissipated instantly into gas. In another laboratory Dr. Irving Langmuir showed him the vacuum tubes which are being used experimentally at Radio Central, on Long Island, and which may eventually replace the large alternators now used in trans-oceanic service. In the afternoon, after luncheon, as Mr. Edison was eager for more, he was guided to other rooms, where secrets not yet publicly hinted at were exposed.

Radio in the Great Desert

(*Continued from page* 61)

for drinking, for grounding the instruments, for use in steam engines, and for cooling gasoline engines; consideration is given to the proximity of a railroad for transportation of supplies; the ground is analyzed; and the conditions under which the personnel will have to live are examined.

This program, drawn up by the Technical Director of Military Radio Telegraphy, is being followed in the establishment of stations. Such a series of tests was under way recently in the vicinity of Ain-el-Hadjar, near Saida, on the railroad between Perregaux and Colomb-Béchar. The new station was to have been the most powerful in Northern Africa, and the chiefs of the Northern Africa Radio Telegraph Mission, of the Sahara Radio Mission, and of the Algiers-Tunis Radio Telegraph Service, all collaborated in the preliminary work. However, at the last moment the project was abandoned in favor of a 25-kw. transmitter near Blida, department of Algiers, which is thought sufficiently powerful to give emergency service with Paris in case of a break in the Algiers-Marseilles cables.

Radio is one of the greatest assets in the peaceful penetration of the French colonies, because it permits the quick punishment of all crimes committed by criminals or by rebels; spreads to the most remote spots the news of the world while it is still novel; and annihilates distance by making instant connection across great spaces.

Telephone Receivers Used in Radio

(*Continued from page 74*)

magnetizing coils consisting of many turns of very fine wire. These coils are wound in series with each other. Very close to the pole pieces is mounted a diaphragm, D, made of a thin, circular disc of special iron. The permanent magnet exerts a force on the diaphragm and therefore attracts the diaphragm to it, even when no current flows through the magnetizing coils. Consequently the diaphragm is slightly displaced towards the magnets when no current flows through the coils, and assumes a distorted shape as shown in figure 2.

When the receiver is operating small currents in the form of impulses flow through the magnet coils. These currents either strengthen or weaken the permanent magnets depending upon the direction of the currents, thus attracting the diaphragm more or less towards the magnet pole pieces. The diaphragm thus vibrates to and from the pole pieces, in unison with the impulses of current in the coils and in this way reproduces the sound of the signal.

A brief and simple analysis will show what factors influence the amplitude of the diaphragm vibration, and hence the sensitiveness of the receiver.

Let (H) be the constant magnetic field strength due to the permanent magnets.

Let (h) be the additional magnetic field strength due to the small received currents (i) flowing through the magnet coils.

Now the force or pull exerted on the diaphragm is proportional to the square of the magnetic field strength. Hence the constant pull on the diaphragm due to the permanent magnetic field alone is:

$$F_c = KH^2$$

where K is a proportional factor. The pull on the diaphragm when the received current (i) flows through the magnet coils will then be proportional to the square of the sum of the two fields (H) and (h), since both are present. This is expressed by the equation:

$$F_t = K(H + h)^2$$
$$= KH^2 + Kh^2 + 2KHh$$

Thus we see that the total force or pull on the diaphragm is made up of three component pulls. The first component KH^2 is the constant pull due to the permanent magnets, but since this term is always constant it will have no effect on the amplitude of vibration of the diaphragm. Its only effect as we saw before is to put the diaphragm under tension as in figure 2. The second term or component pull is Kh^2, which is proportional to the square of the received current. Since this component pull is not proportional directly to the first power of the received current, but to the second power, it will therefore result in distortion of the signal. Hence in radio work this factor is very small and the design of the receiver is such that the received currents will be very small. The third component of the pull on the diaphragm is 2KHh. This is the effective term and shows that the pull is proportional to two factors:

1—The permanent magnetic field strength (H) of the permanent magnet.

2—The magnetic field (h) due to the receiver current (i).

The amplitude of vibration of the diaphragm, therefore, depends on the above two facts (H) and (h). The

larger the factor (H), i. e., the stronger the permanent magnets, the greater will be the vibration amplitude and the more sensitive the receiver. It is for this reason that the permanent magnet type of telephone receiver — called the polarized receiver — is much more sensitive than the non-polarized receiver. A practical limit is reached, however, in the strength of the permanent magnets beyond which there is no advantage. This limit is set by the saturation point of the magnets, since exceeding the saturation point does not produce any increase in field strength.

The second factor influencing the vibration amplitude of the telephone diaphragm is the field strength (h) resulting from the receiver current (i). This field strength (h) is proportional to the ampere-turns of the magnet coils; i. e.

$$h = in$$

where (i) is the telephone current, and (n) the number of turns in the magnet coils. Thus 1 micro-ampere flowing through 1,000 turns will produce the same effect as 2 micro-amperes flowing through 500 turns, since in both cases the ampere-turns — which is the product of amperes by turns — is the same, namely 1,000. Now in radio work the detector generally has an extremely high resistance. Thus the crystal detector and vacuum tube have resistance values anywhere from 1,000 to 10,000 ohms. Consequently the current that can flow through to the phones is very small, and in order to secure the necessary ampere-turns for sensitivity the number of turns must be made very large. But a large number of turns of the very fine wire that must be used means a very high resistance. Hence the phones used are generally high resistance phones.

It is thus seen that high resistance phones are made necessary by the use of high resistance detectors. If the detector were a low resistance device it would permit the passage of relatively high current through the phones. In this case fewer turns on the magnet coils would suffice to give the required ampere-turns for sensitivity, and thus low resistance phones would be quite satisfactory. The old magnetic detector, which is a low resistance device, was worked with a low resistance telephone of the order of 100 to 200 ohms. Therefore, in general, we may say that for small currents such as are usually received with high resistance detectors, high resistance phones are the most sensitive. And for large currents as received by low resistance detectors low resistance phones are the best.

A high resistance detector requires a high resistance phone, and a low re-

sistance detector requires a low resistance phone, for best results. Is it impossible then to use a low resistance telephone receiver with present-day high-resistance detectors? The answer is no. The telephone receiver may be considered as the resistance load on the detector, figure 3. In other words, the detector may be considered as the input and the telephones as the output circuit. For maximum results the output resistance should be equal to the input resistance. This principle has been established and is quite well known by this time to all experimenters. If we have a device which we can utilize to alter electrically a low resistance telephone into a high resistance telephone, we will be able to use this low resistance telephone with a high-resistance detector. Such a device is the telephone transformer. In figure 4 is shown a high-resistance vacuum tube detector feeding into a low resistance telephone through a step-down transformer. A resistance of (r) ohms in the low voltage side of the transformer is transformed into an equivalent resistance in the high tension side of

$$p^2r \text{ ohms.}$$

Where (p) is the transformation ratio of the transformer.

This is one of the fundamental principles of transformer theory. Thus suppose we have a vacuum tube detector of 8,000 ohms resistance, and we have a standard 80 ohm landline telephone receiver. If we connect the detector and telephone receiver in a circuit as in figure 4, through a transformer whose ratio is 10, we will obtain as good results as though we used a high-resistance phone directly in series with the detector. For the 80-ohm phones in the low tension side of the transformer are transformed into an equivalent resistance of

$$(10)^2 \times 80 = 8{,}000 \text{ ohms.}$$

This was tried out and verified in actual practice. For those, therefore, who desire to use low resistance telephone receivers which they may happen to have around the house, the above suggestion is offered.

In any discussion of telephone receivers special mention must be made of the Baldwin receiver. This particular receiver possesses remarkable sensitivity. A schematic diagram showing the essential working features of the Baldwin receiver is shown in figure 5. The permanent magnetic field is provided by a ring-shaped magnet, the pole piece of which are two U-shaped soft iron pieces. Unlike other types of telephone receivers there is only one coil winding centrally placed between the two pole pieces. In a slot through this winding is pivoted the soft iron armature A. At the end of this armature is connected a lever of brass wire to which is attached the mica diaphragm D. This receiver is more sensitive than others for the following reasons. The magnetic reluctance of this receiver is lower than in others, hence small currents will produce larger magnetic flux and therefore larger forces. The armature of the Baldwin receiver when no current flows, is balance centrally between the pole pieces, whereas in other phones the armature is attracted and under tension as shown in figure 2. Finally the armature and diaphragm are connected in the manner of a lever pivoted at point P. Small forces acting on the armature A therefore result in magnified movements of the diaphragm D.

A final word may be said about the use of the telephone bridging condenser with the telephone receiver. In the circuit of figure 3 will be seen the telephones T shunted by a small condenser C2. Now the detector and phones, being shunted across the terminals of the radio-frequency condenser C1, have a radio-frequency potential impressed on them, as a result of which there is some radio-frequency current flowing through them. Since the telephones have a very high impedance to radio frequency, these cur-

rents would be blocked unless some other low impedance path were provided. When no special path is provided for the flow of the radio currents, they flow through the high distributed capacity of the telephone coil windings and through the capacity of the telephone cords. However, this capacity, although high for distributed capacity, is still relatively low, just a few micromicrofarads, and hence has a high impedance for radio frequency. At the same time the dielectric of the distributed capacity is a poor one resulting in considerable loss in the dielectric when current flows. In order therefore to reduce this loss and provide a low impedance path for the r.f. currents it is necessary to employ a special telephone bridging condenser, as in figure 3.

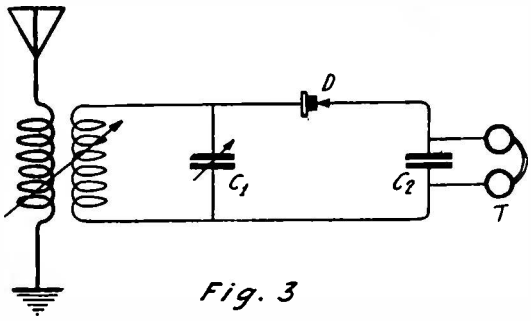


Fig. 3

Circuit showing the telephone bridging condenser

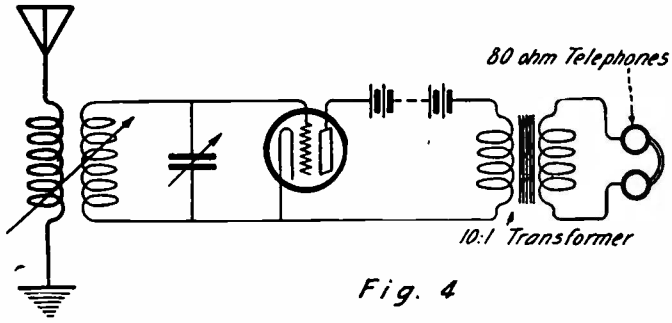


Fig. 4

Tube circuit with a step down transformer

It is hoped that this simple and brief explanation of the telephone receiver will be of assistance to many amateurs, and especially the new amateurs that are increasing in number from day to day.

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.

1IV. C. H. CAMPBELL, 66 Vine St., Bridgeport, Conn. (August and September).

CW.—1aao, (1abm), 1aby, 1acs, (1acu), 1agc, (1agf), (1agi), 1ahm fone, 1ahw, 1aic, 1aip, 1aiq, (1aju), 1akg, 1akn, 1alz, 1anq, 1ant, 1ape, 1ar, 1ary, 1asf, 1aun, (1awb), 1awo, 1axm, 1ayz, 1azd, 1azl, (1azw), 1bbs, (1beo), (1bes), 1bfe, 1bgf, 1bjn, 1bkq, 1bln, 1bnt, (1boa fone), 1boq, 1bqe, 1bqi, 1bqk, 1bgt, (1bna), 1bv, 1bwj, 1bym, 1bra, 1ccs, 1cdo, 1cec, (1fi), 1cgo, 1chj, 1cji, 1cjz, 1ck, 1cmk, 1cne, 1cot, 1cpl, 1cpn, 1crh, 1crk, 1es, 1fb, 1gv, 1hk, 1hx, 1ii, 1il, (1jt), 1km, 1kx, 1pt, 1py, 1qn, 1rd, (1sc), 1sd, (1ts), 1uh, 1uj, 1vt, (1vq), 1xv, 1xx, 1yk, 1ze, 2acy, 2adl, 2aeh, 2aeq, 2fc, 2fp, (2agc), 2aja, (2ajw fone), (2ars), 2auz, 2ave, 2awf, 2awh, (2aws), 2ayf, (2ayv), 2azc, 2azy, 2bdg, 2bdm, (2bdu), 2beh, (2bff), 2bfz, 2bg, 2bgm, (2bgw), 2bml, (2bnc), 2bnz, 2boi, 2bqb, 2bqd, (2bph), (2bqu), 2brb, (2rc), (2bsc), 2bue, (2bum), (2byc fone), 2cah, 2cbc, 2cbg, 2cbt, 2cbw, 2cec, 2cei, 2cfi, 2cge, 2cgj, 2che fone, 2cim, (2cje), 2ckn, 2clj, 2cmb, 2cnz, 2col, (2cox fone), 2cpm, (2cpk), 2cqn, 2cqz, 2cru, 2dk, 2el, (2fc), 2fp, 2fz, 2gk, 2hv, 2hw, 1ig, 2kl, (2kp), 2ku, (2mu), 2nz, 2oe, 2of, 2pf, 2rb, 2rj, 2rm, (2ry), 2ts, 2ud, 2va, 2zl, 3ajd, 3aln, 3alu, 3aqh, 3aqr, 2auu, 3bfu (3bg), 3bgt, 3bhm, 3bij, (3bit), 3blf, 3bnu, 3bva, 3bvc, 3bvl, 3bz, 3cc, (3dt), 3hd, 3ht, 3lp, 3lr, 3mb, 3mk, 3ot, (3pz), 3qv, 3rf, 3vw, 3zo, 3zz, 4bq, 4bx, 4dc, 4ea, 4ft, 4gh, 5ek, 5fv, 8acf, 8afd, 8afy, 8alf, 8alt, 8amd, 8amm, 8amq, 8aqo, 8ard, 8asu, 8atu,

8avl, 8awp, 8axn, 8bcy, 8bdo, 8bdu, 8bfm, 8bfn, 8bfr, 8bjs, 8bnu, 8bny, 8bqh, 8brq, 8bvt, 8bwa, 8bxh, 8bxt, 8cbj, (8ccx), 8cei, 8cgq, 8cgx, 8ci, 8cid, 8civ, 8cjh, 8cjy, 8ckm, 8cko, 8cmm, (8cnw), 8coi, 8cur, 8cyt, 8ft, 8hj, 8ib, 8id, 8kg, 8lt, 8mz, 8ow, 8pc fone, 8pt, 8rd, 8rr, 8sb, 8sl, 8sp, 8ue, 8uk, 8uz, (8wr), 8xe, 8zae, 8zz, 9aap, 9ajh, 9amq, 9apa, 9aps, 9ar, 9arr, 9cgk, 9cja, 9cp, 9dky, 9ei, 9ii, 9pa, 9uh, 9uu, 9xac, (wuba), by4. Canadian 3bp, 3co, 3ko, 9al, 9bs.

Spark.—1adc, 1amq, 1ary, 1ava, 1aw, 1azk, (1boe), 1bjz, 1bvb, 1bvh, (1cdm), 1chq, 1cni, 1dy, 1gm, (1jt), (2ad), 2adk, 2aje, 2ax, 2bjo, 2bks, (2bso), (2bzf), 2clg, (2cox), 2cqc, 2ct, 2di, 2el, 2tp, 2jz, (2nf), 2om, 2pq, (2tu), 8axx, 8bda, 9zn. Canadian 3bp, 3fo.

2AZC. F. B. COMBS, 68 South Side Ave., Freeport, L. I. (September).

CW.—1aao, 1acz, 1ae, (1agh), (1ajp), 1aju, 1avn, (1axi) 1ayg, (1ayz), (1azl), (1azw), (1bbs), (1beo), (1bgf), (1bkq), 1bpj, 1brq, 1bua, 1ccz, 1cgo, 1cho, 1cmp, 1cmr, (1cne), (1cpo), 1crf, (1fb), 1jt, 1vr, 1xx, 1ze, 3aln, 3aqr, (3aqx), (3bgt), 3bhm, 3blj, (3blf), 3bnu, 3brw, 3co, 3cs, (3dt), 3hg, 3mk, 3ot. 4bf, 4bq, 4bx, 4ox, 4ea, 4ft, 4gk, 4lp, 4nv, 4lj, 5bf, 5ek, 5kc, 5sk, 5sl, 5sml, 8ack, 8afd, (8akp), 8anb, 8aab, (8asl), 8awh, 8awt, 8ax, 8azd, 8azf, 8bda, (8bfl), 8bfm, (8bfx), 8bha, 8bim, 8bjk, 8bjx, 8bku, 8bko, 8bon, 8bra, 8brk, 8brl, 8bim, 8brt, 8bsh, 8bss, 8btr, 8bvt, (8bwa), (8cak), (8cgo), 8cgk, 8cgp, (8cgu), 8cin, (8ci), 8cjh, (8ckm), 8cmy, 8cnl, (8con), 8cra, 8cur, 8dak, 8hw, (8sb), 8sp, (8vy), 8zaf, 8zg, 9ags, 9ajh, 9aph, (9aps), 9as, 9awh, (9ays), (9bed), 9bqp, 9bzy, 9dge, 9dpl, 9fm, 9gl, 9ii, 9kg, 9lq, 9uh, 9uu, 9xac. Canadian 3bv. All receiving done on one tube.

8CI. W. D. MARSHALL, 7301 McClure Ave., Swissvale, Pa.

CW.—1fb, 1pt, 1il, 1agi, 1acl, 1bgf, 1cja, 2fp, 2vw, 2bnz, 2bsc, 2bvc, 2cje, 2cje, 2ckl, 3cg, 3iw, 3ot, 3bnv, 3bmn, 4ea, 4jk, 4kt, 4lj, 4nv, 5eg, 5er, 5es, 5kc, 5ke, 5nv, 5uk, 5xa, 5zav, 6ka, 7zo, 8cau, 8cjh, 8cqh, 9dr, 9ii, 9pa, 9uu, 9aon, 9awf, 9bed, 9bld, 9btt, 9bvp, 9bzi, 9cja, 9ayj, 9zaa, 9zaf, 9zn, Canadian 9al.

9DR. D. C. WALLACE, 1830 Stevens Ave., Minneapolis, Minn. (September).

CW.—(1ajp), (2brb), 2fp, (3bnu), 3dc, 3ot, 3vw, 4bq, (5be), 5cy, (5dr), 5ek, 5fv, 5ir, (5kc), (5nr), (5px), 5qi, 5qs, 5sf, 5sk, 5un, 5uo, 5ya, 5yv, 5zg, 5zh, 6cu, 6ea, 6eb, 8en, 6jd, 6ka, 6ma, 6zg, (6arb), 6asj, 6boe, (6bsa), (6xad), (7lu), 7xc, (8ab), 8ai, (8bo), 8ci, 8fi, (8ib), 8kg, 8sb, 8sp, 8ue, 8uk, (8vy), 8zy, (8zz), 8abb, (8adt), 8afd, 8afy, 8aim, (8aio), (8akp), (8asl), (8asv), (8axb), 8axm, 8axs, 8azd, 8bda, 8bef, (8bfm), 8ben, 8bgo, (8bho), 8bjx, 8bke, (8bkn), 8bnj, (8brq), 8btl, (8buc), 8bux, 8bwa, 8bwk, 8cak, 8cdz, 8cgx, (8cko), (8con), 8cpd, (8ctn), 8cur, (8cyt), 8daf, 8zaf, 8zag, 8zje, (9cp), (9et), (9ew), (9ii), (9mn), (9ps), (9uu), (9abv), (9amb), (9aqm), (9ays), (9ayy), (9bvp), (9bxc), (9bxt), (cfi), (9dah), (9dhq), (9dkb), (9dsm), (9dug), (9dun), (9dzl), (9yak), (9zaf). Canadian 3cb (4bv).

Spark.—5jf, (5xac), (8ze), 9cp), (9pe), (9zc), (9zn), (9arr), (9bmn), (9bws), (9bxc).

Book Reviews

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The professional mind is all too frequently theoretical rather than practical, but Prof. Austin happily illuminates his theory with real working facts, thus tying his text closely to actual industrial and experimental applications of the induction coil in its many forms. The fundamental principles are clearly explained, enabling anyone to construct coils to meet his specific needs, and examples are given of the solution of specific problems. There is also an analysis of the condenser, which is an essential adjunct to most coils.

A companion book is Prof. Austin's "Examples in Battery Engineering," which treats of primary and storage cells in the same illuminating manner. It is unusual in that it omits much of the chemistry of batteries, Prof. Austin feeling that this subject deserves a separate work. Only enough chemical data are given, therefore, to indicate the framework of the chemical actions and reactions involved. The book devotes nearly its entire consideration to the electrical characteristics—which is the chief point of interest in a battery anyway, since it is not what goes on within the cell that concerns the average user, but what he can get out of it, and when and how. The book is particularly useful in its extended study of the storage battery.

Induction Coils in Theory and Practice, by Prof. F. E. Austin, E.E. Cloth, 68 pages, $1. Published by the author, at Hanover, N. H.

Examples in Battery Engineering, by Prof. F. E. Austin, E.E. Cloth, 98 pages, $1.25. Published by the author, at Hanover, N. H.

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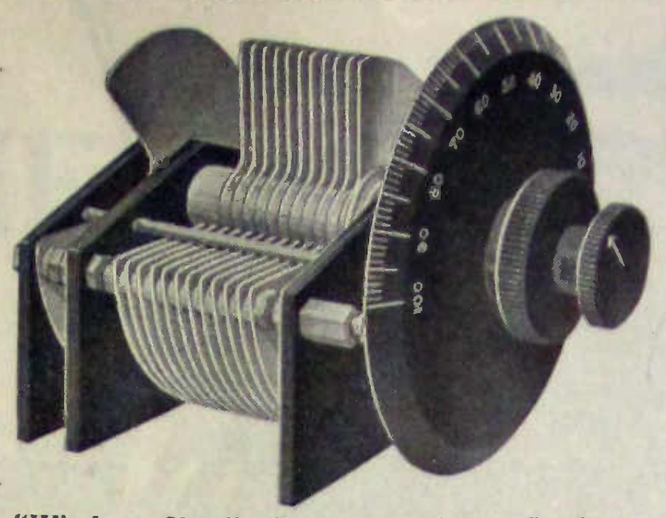

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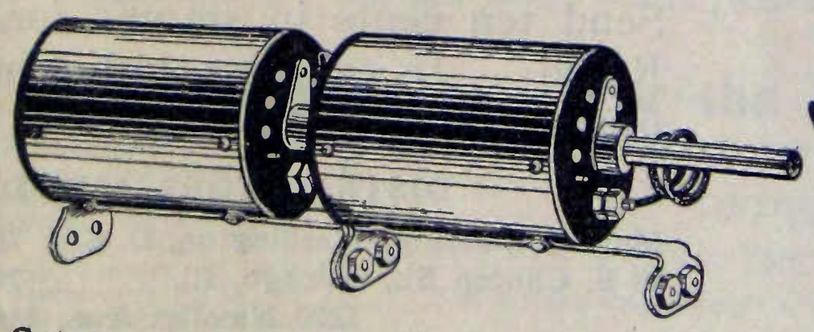

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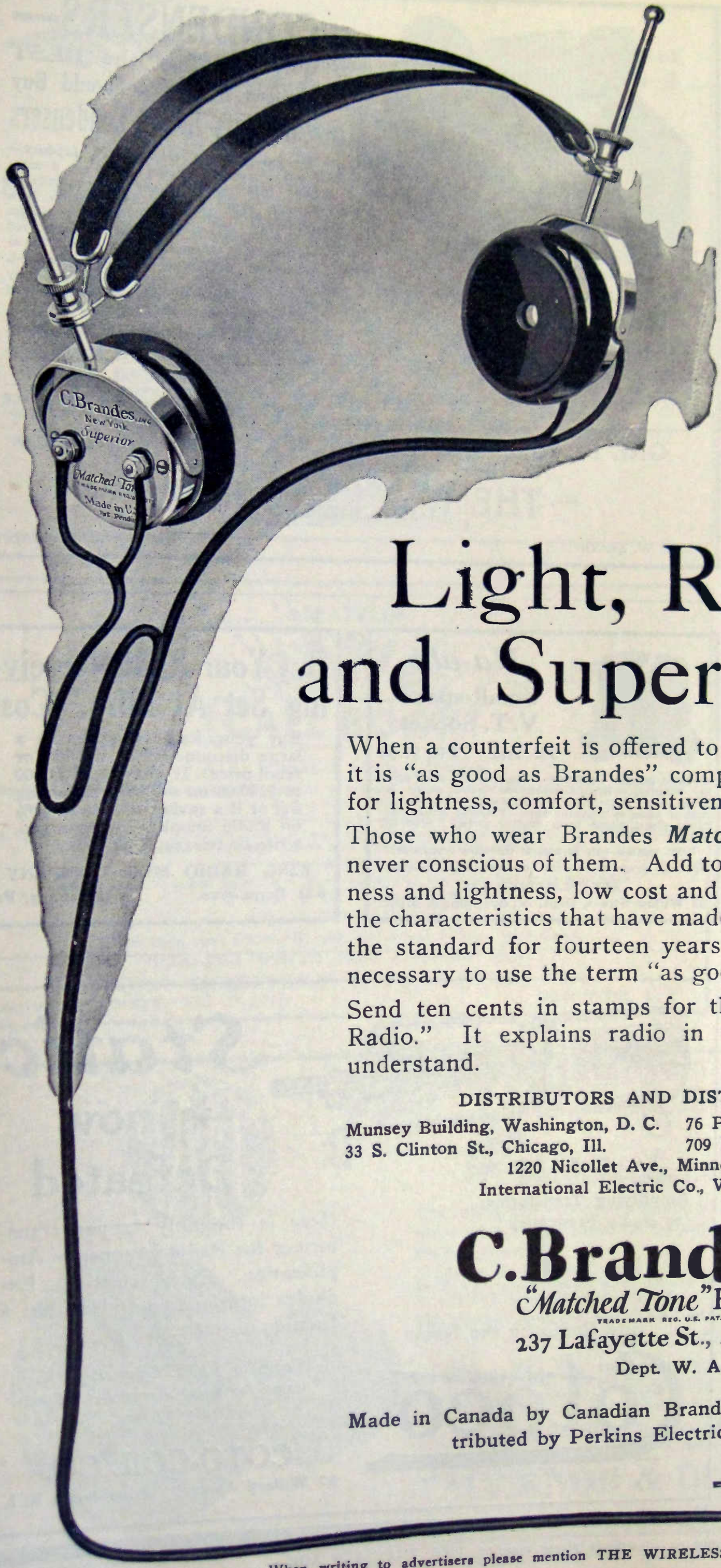

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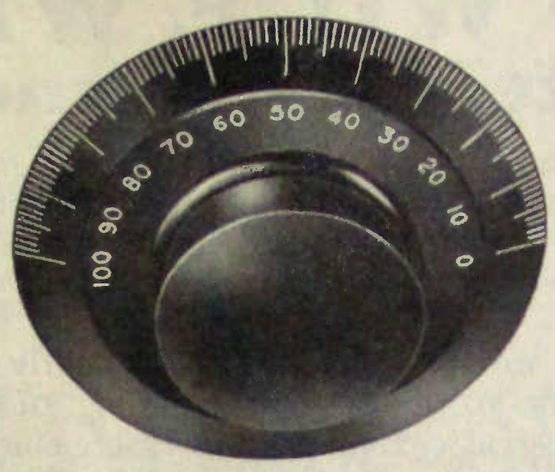

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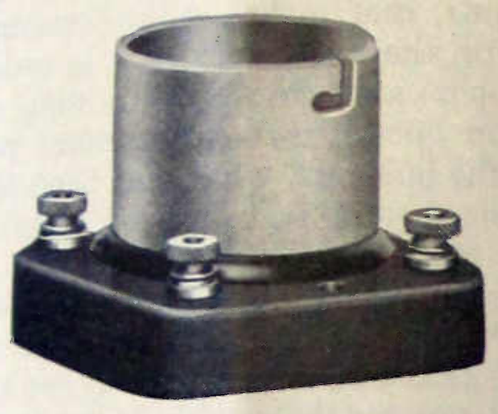

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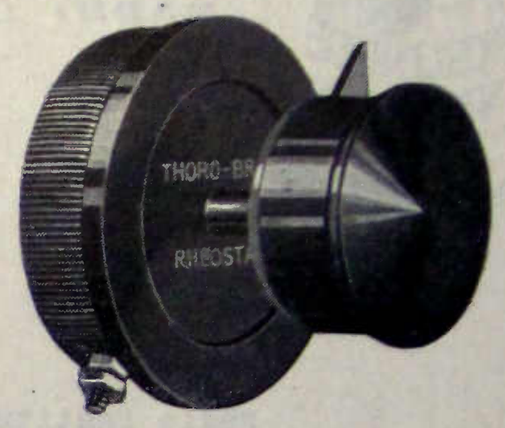

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EASTERN DIVISION

J. B. DUFFY
SUPERINTENDENT

NEW YORK March 24, 1922.

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6 JT	Andelin, M. S.	Richfield, Utah
6 JU	Francisco, W. E., 538 37 St.	Oakland, Calif.
6 JV	Spenser, H. E., R. F. D., Box 14	Rivera, Calif.
6 JW	Tyler, O. B., 352 Illinois St.	Pomona, Calif.
6 JX	Best, G. M., 109 Greenbank Ave.	Piedmont, Calif.
6 JY	Pashgian, A., 211 S. El Moline Ave.	Pasadena, Calif.
6 JZ	Beckel, A. H., 372 25th Ave.	San Francisco, Calif.
6 KA	Nikirk, F. E., 1050 W. 89th St.	Los Angeles, Calif.
6 KB	Klahn, L. L., 27 Chenery St.	San Francisco, Calif.
6 KC	Jacob, R., 2601 University St.	San Diego, Calif.
6 KD	Irey, E. R., 683 State St.	El Centro, Calif.
6 KE	Taft, Leslie, 5653 De Longpre Ave.,	Los Angeles, Calif.
6 KF	Binkley, R. E., 339 Fresno Ave.	Fresno, Calif.
6 KG	Belknap, C. R., 6516 Fountain St.	Hollywood, Calif.
6 KH	Fleming, R. P., 606 San Benito St.,	Los Angeles, Calif.
6 KI	McIntosh, H. S., 1274 Mariposa Ave.,	Glendale, Calif.
6 KJ	Meyer, G. H., 184 S. El Molino Ave.,	Pasadena, Calif.
6 KK	Fagg, S. J., 1826 Broderick St.	San Francisco, Calif.
6 KL	Bates, Wm., Jr., 4457 Manila Ave.	Oakland, Calif.
6 KM	Adams, K. A., 2060 E. Main St.	Stockton, Calif.
6 KN	Rose, M. F., 1314 40th Ave.	Oakland, Calif.
6 KO	Mosley, S. P., 1050 E. 47th St.	Los Angeles, Calif.
6 KP	Garrentsen, O. S., 116 Fairmont Ave.,	Eagle Rock City, Calif.
6 KQ	Truitt, L. S., 317 W. Doran St.	Glendale, Calif.
6 KR	Warner, S. W., 474 27th St.	Oakland, Calif.
6 KS	White, E. E., 990 E. Mountain St.	Pasadena, Calif.
6 KT	Swift, E. M., 220 Franklin St.	Napa, Calif.
6 KU	Brown, C. C., Valta Power House	Manton, Calif.
6 KV	Evans, Wm., 1416 5th Ave.	Long Beach, Calif.
6 KW	Nourse, R., 883 S. 10th St.	San Jose, Calif.
6 KX	Stammers, D., 2119 Whitson	Selma, Calif.
6 KY	Dalton, E. P., 121 23rd St.	Los Angeles, Calif.
6 KZ	Piedmont High School	Piedmont, Calif.
6 LA	Britton, W. J., 2115 Myrtle St.	Oakland, Calif.
6 LB	Thorne, L. P., 537 Hobart St.	Oakland, Calif.
6 LC	Bartholomew, L. A., 849 W. 79th St.,	Los Angeles, Calif.
6 LD	Lacher, J. C., 740 S. San Antonio St.,	Romona, Calif.
6 LE	Wilson, C., 3040 Benvenue Ave.	Berkeley, Calif.
6 LF	Harris, J. B., 651 S. 12th St.	San Jose, Calif.
6 LG	Cartwright, H., Box 515	San Gabriel, Calif.
6 LH	Perkins, G. B., 161 Oak Knoll Ave.,	Pasadena, Calif.
6 LI	Bullen, E. L., 430 National Ave.,	National City, Calif.
6 LJ	Gleason, E., 800 S. 8th St.	San Jose, Calif.
6 LK	Everitt, F., 1628 Formosa Ave.	Hollywood, Calif.
6 LL	Spagnole, M. 721 Kirkham St.	Oakland, Calif.
6 LM	Corpe Bros.	El Monte, Calif.
6 LN	Stedinger, B., 1967 Courtland Ave.	Oakland, Calif.
6 LO	Mumford, W. E., 1421 28th St.	Sacramento, Calif.
6 LP	Stegman, H. H., 18 Virginia Ave.,	San Francisco, Calif.
6 LQ	Lemon, M. L., 815 N. Hollister St.,	Pasadena, Calif.
6 LR	Brown, F., 479 34th St.	Oakland, Calif.
6 LS	Coover, W. R., 2719 5th Ave.	Sacramento, Calif.
6 LT	Clisham, W., Rt. 1, Box 63	Stockton, Calif.
6 LU	Lavender, G. H.	Willows, Calif.
6 LV	Baker, W. A., 235 7th Ave.	San Mateo, Calif.
6 LW	Sunserl, N., 1260 E. Colorado St.,	Los Angeles, Calif.
6 LX	Lindsay, R., 231 Salem St.	Los Angeles, Calif.
6 LY	Stith, R. B., 7278 Hollywood Blvd.,	Los Angeles, Calif.
6 LZ	Barnes, L. C., 1316 Walnut St.	Glendale, Calif.
6 MA	Fassett, L. O., 4326 Balboa St.,	San Francisco, Calif.
6 MB	Heppenstall, W., 2047 W. 29th St.,	Los Angeles, Calif.
6 MC	McGown, D. B.	San Jose, Calif.
6 MD	Cossar, R. J., 1606 N. Alexandria Ave.	Los Angeles, Calif.
6 ME	Albin, B. D., 1030 Arapahoe St.,	Los Angeles, Calif.
6 MF	Schaffner, L. L., 1320 Illinois St.,	Los Angeles, Calif.
6 MG	Farman, I. L., 427 S. Alvarado St.,	Los Angeles, Calif.
6 MH	Smith, H. J., 3415 Glen Albyn Drive,	Los Angeles, Calif.
6 MI	Munson, W. A., 1323 Portola Ave.,	Los Angeles, Calif.
6 MJ	Bell, A. E., 1152 S. Berendo St.,	Los Angeles, Calif.
6 MK	Fremont High School	Oakland, Calif.
6 ML	Gubin, L. J., 845 Grenshaw Blvd.,	Los Angeles, Calif.
6 MM	Lincoln High School	Los Angeles, Calif.
6 MN	Teschan, C. V., 3602 Glassell Ave.,	Los Angeles, Calif.
6 MO	Warrington, P. E., 4810 Gramercy Place,	Los Angeles, Calif.
6 MP	Fitzpatrick, G. H., 3690 3rd St.,	San Diego, Calif.
6 MQ	Chaffee, H. S., 1111 Los Robles Ave.,	Pasadena, Calif.
6 MR	Schmidt, Wm., 51st and Vermont Sts.,	Los Angeles, Calif.
6 MS	Sant, R., 746 Main St.	Long Beach, Calif.
6 MT	Heyn, H., 6122 De Longpre St.	Los Angeles, Calif.
6 MU	Roberts, H. W., 5327 Monte Vista St.,	Los Angeles, Calif.
6 MV	Thompson, A. K., 1025 W. Florence St.,	Los Angeles, Calif.
6 MW	McKee, J. L., 123 N. Alta St.,	Los Angeles, Calif.
6 MX	Freitas, E. A., 9851 "B" St.	Oakland, Calif.
6 MY	Searing, H., 300 N. Alta St.	Los Angeles, Calif.
6 MZ	Gray, J. F.	Del Mar, Calif.
6 NA	Nielsen, A. S., 849 Athens St.	Oakland, Calif.
6 NB	McHolland, R. I., 3545 7th St.,	Los Angeles, Calif.
6 NC	Thompson, R., 1730 T St.	Sacramento, Calif.
6 ND	Hill, A. W., 1121 B. St.	Eureka, Calif.
6 NE	Evans, G. W., 414 Emerson St.	Palo Alto, Calif.
6 NF	Cornelison, R. E., 827 O St.	Fresno, Calif.
6 NG	Thornalley, R. W., 3027 E. 16th St.,	Oakland, Calif.
6 NH	Thomas, R., 2949 Summit St.	Oakland, Calif.
6 NI	Brainard, W., 1914 Brush St.	Oakland, Calif.
6 NJ	Griffith, R. E., 1015 N. Center St.,	Stockton, Calif.
6 NK	Heller, B., 1133 W. 41st Place.	Los Angeles, Calif.
6 NL	Middlebrook, R. P., 2744 Columbia St.,	San Diego, Calif.
6 NM	Daniels, E. H., 266 Lindere Ave.,	Long Beach, Calif.
6 NN	Clayton, R. S., 1404 66th St.	Berkeley, Calif.
6 NO	Cross, C., 5564 Broadway	Oakland, Calif.
6 NP	Hart, G. L., 3785 Albatross St.,	San Diego, Calif.
6 NQ	Nelson, H. S., 22 Kensington Apts.,	Salt Lake City, Utah
6 NR	LeConte, L. J., Jr., 2501 Piedmont Ave.,	Berkeley, Calif.
6 NS	Somers, M. G., 1828 41st Place,	Los Angeles, Calif.
6 NT	Frederickson, C. J., Front and Montesuma St.,	Rio Vista, Calif.
6 NU	Keiser, H. W., 312 Orange Ave.,	Monrovia, Calif.
6 NV	Van Woods, P. O., 1719 Scott St.,	San Francisco, Calif.
6 NW	Upchurch, J. F., 114 Daniels Ave.,	Vallejo, Calif.
6 NX	Quement, F. J., 51 Pleasant St.	San Jose, Calif.
6 NY	Bickel, J. R., 745 N. Pickering St.,	Whittier, Calif.
6 NZ	Capwell, C. E., Monte Cresta Ave. and Kelton Ct.	Oakland, Calif.
6 OA	Bernett, L. P., 428 B. St.	Hayward, Calif.
6 OB	Knights of Columbus, 150 Golden Gate Ave.,	San Francisco, Calif.
6 OC	Van Gorder, L.	Corning, Calif.
6 OD	Gardner, D., 515 El Centro St.,	So. Pasadena, Calif.
6 OE	Johnson, S. F., 2940 Maiden Lane.	Altadena, Calif.
6 OF	Martin, J. A., 6002 Linwood St.,	San Diego, Calif.
6 OG	Young, A. L., 516 Gertruda St.	Redondo, Calif.
6 OH	Mannon, J. B., 404 Dora St.	Ukiah, Calif.
6 OI	Doan, La C., 1148 9th St.	Douglas, Ariz.
6 OJ	Bullen, C. C., 918 5th St.,	National City Calif.
6 OK	Schauer, R. H., 1009 E. Haley St.,	Santa Barbara, Calif.
6 OL	White, R. M., 1509 S. Brand Blvd.,	Glendale, Calif.
6 OM	Hutchins, G., 403 N. Benton Way,	Los Angeles, Calif.
6 ON	Thompson, H. E., 458 Lakeshore Blvd.,	Oakland, Calif.
6 OO	Mackin, G. R., 88 Peralta Ave.	San Francisco, Calif.
6 OP	Heer, H. H., 1400 Jones St.	San Francisco, Calif.
6 OQ	Paper, E., 904 Irving St.	San Francisco, Calif.
6 OR	Hill, J. C., 743 Mildreda St.	Fresno, Calif.
6 OS	Unassigned.	
6 OT	Berry, F., 359 E. 18th S. St.,	Salt Lake City, Utah
6 OU	Babcock, J. W.	Inverness, Calif.
6 OV	Schomaker, G., 199 Douglas St.,	San Francisco, Calif.
6 OW	McCormick, C. K., 39 Cliff St.,	Santa Cruz, Calif.
6 OX	Rominger, G. E., 241 S. Orange St.,	Glendale, Calif.
6 OY	Deerr, S., 137 S. Cedar St.	Glendale, Calif.
6 OZ	Unassigned.	
6 PA	Paso Robles High School Radio Club,	Paso Robles, Calif.
6 PB	Fowler, L. B., 703 Olive Ave.	Redlands, Calif.
6 PC	Packard, L. W., 1121 Bresee Ave.,	Pasadena, Calif.
6 PD	McArdle, J. J., 263 Day St.	San Francisco, Calif.
6 PE	Mallander, H. C., 423 Westminister Ave.,	Salt Lake City, Utah
6 PF	Maher, T., 426 29th St.	San Francisco, Calif.
6 PG	Redmond, J., 340 30th St.	San Francisco, Calif.
6 PH	McGuire, E. J., 1855 Church St.,	San Francisco, Calif.
6 PI	McGlashan, B. S., 2533 W. 21st St.,	Los Angeles, Calif.
6 PJ	Schmidt, H. D., 27 Dakota Ave.,	Santa Cruz, Calif.
6 PK	Wilson, L. R., 319 E. 14th St.	Tucson, Ariz.
6 PL	Brockaway, D. C., 4402 Sunset Blvd.,	Los Angeles, Calif.
6 PM	Conner, L. H., 2017 J. St.	Sacramento, Calif.
6 PN	Stewart, L. M., 3850 7th St.	San Diego, Calif.
6 PO	Dety, P. I., 9 Pine St.	San Jose, Calif.
6 PP	Matteon, S. F., 7364 Hollywood Blvd.,	Los Angeles, Calif.
6 PQ	Finley, M. H.	Santa Ana, Calif.
6 PR	Willey, O. F., 89 May St.	Santa Cruz, Calif.
6 PS	Stevens, C. T., 434 60th St.	Oakland, Calif.
6 PT	Easton, G. E., 505 Madison St.	Monterey, Calif.
6 PU	Alford, J. H., Box 248	San Jose, Calif.
6 PV	Hammerly, H. C., 527 Merrimac St.	Oakland, Calif.
6 PW	Wilson, P. S., 136 Caine Ave.	San Francisco, Calif.
6 PX	Early, F. J., 525 Manila Ave.	Oakland, Calif.
6 PY	Bowers, P., 364 Santa Clara St.	Oakland, Calif.
6 PZ	Noack, H. P., 309 Perry St.	Oakland, Calif.
6 QA	Doig, J. R., 4437 View St.	Oakland, Calif.
6 QB	Burgess, A. M., 8125 Geary St.	San Francisco, Calif.
6 QC	Polytechnic Radio Club, Frederick St. and 1st Ave.,	San Francisco, Calif.
6 QD	Uecker, W., 3590 Lincoln Ave.	Alameda, Calif.
6 QE	Unassigned.	
6 QF	Schack, F., 1014 Castro St.	Oakland, Calif.
6 QG	Montgomery, A. R., 512 E. 9th St.	Los Angeles, Calif.
6 QH	Lifschis, P., 1257 Guerrero St.	San Francisco, Calif.
6 QI	Jefferies, K. W., Rt. 1, Box 180	Monrovia, Calif.
6 QJ	Rickey, S. H., 278 Moline Ave.	Long Beach, Calif.
6 QK	Bell, R. H., 482 Callisch St.	Fresno, Calif.
6 QL	Pitter, E. M., 2910 P St.	Sacramento, Calif.
6 QM	Conner, G. E.	Lewiston, Calif.
6 QN	Van Fleet Electric Co., 642 4th St.	Santa Rosa, Calif.
6 QO	Weeks, G. N., 1535 E. 38th St.	Oakland, Calif.
6 QP	Simpson, R. J.	Ross, Calif.
6 QQ	Belcher, F. G., 241 W. Kalima St.	San Diego, Calif.
6 QR	Lewis, G. M., 606 W. 5th St.	Reno, Nevada.
6 QS	Unassigned.	
6 QT	Unassigned.	
6 QU	Pickard, C. J., 660 19th St.	Richmond, Calif.
6 QV	Wattson, H. B., 110 Los Robles Ave.	Pasadena, Calif.
6 QW	Unassigned.	
6 QX	Welch, C. V.	Tonopah, Nevada
6 QY	Chase, F. L., 24 Walnut Ave.	Santa Cruz, Calif.
6 QZ	Tinsley, C. R., 533 Liberty	San Francisco, Calif.
6 RA	Jones, D. P., 620 Mariposa St.	Oakland, Calif.
6 RB	Cooney G. & Pfeiffer, V., Box 219, Rt. A.,	Los Gatos, Calif.
6 RC	Polytechnic High School Radio Club, 16th and Atlantic St.	Long Beach, Calif.
6 RD	Snow, D. L., 3700 4th Ave.	Sacramento, Calif.
6 R.E	Flygare, R., 2421 Jefferson Ave.	Ogden, Utah
6 RF	White, R., 435 Oakland Ave.	Pasadena, Calif.
6 RG	Brolly, A. H., R. F. D., Box 42.	Saratoga, Calif.
6 RH	Unassigned.	
6 RI	Unassigned.	
6 RJ	Mangalsdorf, F., 248 15th Ave.	San Francisco, Calif.
6 RK	Bradshaw, L., 1601 Hyde St.	San Francisco, Calif.
6 RL	Bryant, L.	Redwood City, Calif.
6 RM	McKae, D. E., 2730 13th St.	Salt Lake City, Utah
6 RN	Henry, J. B., 1199 Oak Knoll Ave.	Pasadena, Calif.
6 RO	Neifert, R. G., Box 26	Orange, Calif.
6 RP	Sloan F. W., 1145 K St.	San Diego, Calif.
6 RQ	Concannon, C. F., 520 6th St.	Richmond, Calif.
6 RR	Ballard, C. P., 415 N. Gower St.	Los Angeles, Calif.
6 RS	Polson, K., 208 N. Bright Ave.	Whittier, Calif.
6 RT	Larson, C. E. 1909 Filberg St.	Oakland, Calif.
6 RU	Espinesa, E. E., 3124 Moore St.	San Diego, Calif.
6 RV	Hubbard, D. B., 6386 Hillegass Ave.	Oakland, Calif.
6 RW	Wiler, R. W., 1230 26th Ave.	San Francisco, Calif.
6 RX	Holts, H. O., 2302 Dwight Way	Berkeley, Calif.
6 RY	Swanson, W. L., 1044 18th St.	Oakland, Calif.
6 RZ	Marden, G., 3340 N. Chicago Ave.	Los Angeles, Calif.
6 SA	Stone, F. P., 1513 I St.	Areata, Calif.
6 SB	Greene, T., Jr.	Forestville, Calif.
6 SC	Sargent, E. M., 1200 Franklin St.	Oakland, Calif.
6 SD	Eaheart, L., 2607 Merced St.	Los Angeles, Calif.
6 SE	DeHall, E. W., 642 Sierra St.	Los Angeles, Calif.
6 SF	Schneider, C. A., 8363 Weber Ave.	Stockton, Calif.
6 SG	Dinedale, R. M., Rt. 1, Box 30	Woodland, Calif.
6 SH	Bowers, J. W.	Weaverville, Calif.
6 SI	Rogers, L., 644 4th St.	Richmond, Calif.
6 SJ	Saville, S. E., 1387 Stratford St.	Salt Lake City, Utah
6 SK	Aufdenkamp, O. L., Forest Ave.	Laguna Beach, Calif.
6 SL	Pauli, A., 753 Laguna St.	San Francisco, Calif.
6 SM	Mitchell, S., 629 Sycamore St.	Oakland, Calif.
6 SN	Dickow, H. W., 1235 Plymouth Ave.,	San Francisco, Calif.
6 SO	Unassigned.	
6 SP	Szukalski, J., 5608 Mission St.	San Francisco, Calif.
6 SQ	Lutgen, C., 2520 Webster St.	Berkeley, Calif.
6 SR	Oakdale Union High School	Oakdale, Calif.
6 SS	Christensen, H., 707 Palm Ave.	Burbank, Calif.
6 ST	Flowers, F., 214 McHenry St.	Modesto, Calif.
6 SU	Fitch, F., Rt. 6	Stockton, Calif.
6 SV	Adams, C. A., 1376 12th St.	Oakland, Calif.
6 SW	Heizer, C. S., 3412 Kansas Ave.	Los Angeles, Calif.
6 SX	Nickels, Lee, 1318 12th St.	Oakland, Calif.
6 SY	Larnach, D., 2005 Calia Road	Honolulu, T. H.
6 SZ	Young, E. E., 1123 Clarendon Crescent,	Oakland, Calif.
6 TA	Babcock, A. H., 227 Piedmont Ave.	Berkeley, Calif.
6 TB	Burger, Wm., 741 E. 25th St.	Los Angeles, Calif.
6 TC	Rathbun, W. C.	Colusa, Calif.
6 TD	Martin, M., 1815 Virginia St.	Berkeley, Calif.
6 TE	Thoades, R., 2812 Piedmont Ave.	Berkeley, Calif.
6 TF	Berg, E. M., 306 W. E St.	Ontario, Calif.
6 TG	Stott, R. D.	Ojai, Calif.
6 TH	Glessner, J. M., 2637½ Piedmont Ave.	Berkeley, Calif.
6 TI	Greer, H. R., 414 Fairmount St.	Oakland, Calif.
6 TJ	Ayres, E. B., 292 Jayne Ave.	Oakland, Calif.
6 TK	Greensfelder, B., 106 3rd Ave.	San Francisco, Calif.
6 TL	Bowles, J. M., 415 N. Mott St.	Los Angeles, Calif.
6 TM	Mayo, W., 1018 Clayton St.	San Francisco, Calif.
6 TN	Cushing, C. A., Pioneer Ave.	Sandy, Utah
6 TO	Davis, W. F., 3045 McKenzie Ave.	Fresno, Calif.
6 TP	Lacabanne, W., 54 Carl St.	San Francisco, Calif.
6 TQ	Cantin, K. A., 1592 Pilioi St.	Honolulu, T. H.
6 TR	Cannon, C. H., 367 4th Ave.	San Francisco, Calif.
6 TS	Paladini, W., 540 Clay St.	San Francisco, Calif.
6 TT	Associated Radio Amateurs, 2960 Linden Ave.,	Berkeley, Calif.

6 TU Cole, B. R., 16 Ellenwood Ave...Los Gatos, Calif.
6 TV Whysall, C. C., Hernandex and Ellenwood Sts., Los Gatos, Calif.
6 TW Dann, W. W., 1258 Cypress Ave..San Diego, Calif.
6 TX Thacker, R. M. .....Baldwin Park, Calif.
6 TY Gabin, L. A., 845 Crenshaw Blvd.Los Angeles, Calif.
6 TZ Greenquist, E. A., 516 W. San Carlos St., San Jose, Calif.
6 UA Jones, M. H. .....Dewey, Utah
6 UB Welch, C. V., 209 Elm St.....Hanford, Calif.
6 UC Beckman, L. C., 522 E. 11th St....Hanford, Calif.
6 UD Heer, A. A., 1400 Jones St....San Francisco, Calif.
6 UE McBurney, A., 37 Greenbank Ave...Piedmont, Calif.
6 UF Cook, S. R., College of Pacific....San Jose, Calif.
6 UG Grunbaum, R. H., 336 Olive St....Piedmont, Calif.
6 UH Merrill, L., 3126 Elm St.....Oakland, Calif.
6 UI Pope St. George, 835 Walker Ave...Oakland, Calif.
6 UJ Howard, F., 4103 Emerald St.....Oakland, Calif.
6 UK Huston, J. M., 345 N. 21st Ave...Phoenix, Arizona.
6 UL Unassigned.
6 UM Yeaw, W. H., Rt. 4, Box 1025...Sacramento, Calif.
6 UN Arnberger, F., 1354 Grove St.....Alameda, Calif.
6 UO Newcombe C. B., Main St.....Yerington, Nevada.
6 UP Harris, A. E., 3901 S. Wall St..Los Angeles, Calif.
6 UQ Thompson, C., 1896 15th St...San Francisco, Calif.
6 UR Maxson, R. B., 486 Eddy St...San Francisco, Calif.
6 US Larson, C. E., 1909 Filbert St.....Oakland, Calif.
6 UT Blom, E., 525 Pacific St.....Alameda, Calif.
6 UU Gabinett, G., 90 Maple St....San Francisco, Calif.
6 UV Pendleton, A. F., 1240 California St., San Francisco, Calif.
6 UW Farwell, L., Broadway.....Los Gatos, Calif.
6 UX Phillips, A., 1333a Stevenson St.San Francisco, Calif.
6 UY Wirth, H. L., 3757 Dalton Ave..Los Angeles, Calif.
6 UZ Fisher, Y. A., 573 Scott St....San Francisco, Calif.
6 VA Cornwell, L. and Pope J., 1138 Michigan St., Salt Lake City, Utah.
6 VB Anderson, E., 1371 6th Ave....San Francisco, Calif.
6 VC Umbrisco, M., 2828 Market St.....Oakland, Calif.
6 VD Drake, H. B., 5834 Colby St.....Oakland, Calif.
6 VE Kluss, E., 414 Moss Ave.....Oakland, Calif.
6 VF Giannini, L., 501 Brussels St..San Francisco, Calif.
6 VG Butler, L. S., 2926 J St.....San Diego, Calif.
6 VH McCoy, H. J., 1305 Arch St.....Berkeley, Calif.
6 VI Wihrle, D. M., 5844 Colby St.....Oakland, Calif.
6 VJ San Diego Co. Boy Scouts.....Del Mar, Calif.
6 VK O'Brien, D., 643 Poirier St.....Oakland, Calif.
6 VL San Diego Co. Boy Scouts.....Balboa Park, Calif.
6 VM Parsons, P., 633 Middlefield Road..Palo Alto, Calif.
6 VN Johnson, C. L., 2104 Prince St.....Berkeley, Calif.
6 VO Crawford, H. C., 800 S. Central Ave.Glendale, Calif.
6 VP Davis, F. G., 1009½ Diamond St., San Francisco, Calif.
6 VQ McMahon, L., 911 Rand St.....Sacramento, Calif.
6 VR Ogle, H. B., c/o S. C. E. Co., K. R. No. 1 Edison, Calif.
6 VS Chex, J. C., Jr., 818 24th St.....Ogden, Utah.
6 VT Thompson, W. C., 102 Lincoln Ave.Long Beach, Calif.
6 VU Knox, A. M., 7245 Franklin St...Hollywood, Calif.
6 VV Kilgore, L., 1482 W. 45th St...Los Angeles, Calif.
6 VW Roseberg, B., 290 Richland Ave.San Francisco, Calif.
6 VX Hunt, A. A., 122 Market St.....Los Gatos, Calif.
6 VY Stimson, T. E., 4533 Marmion Way Los Angeles, Calif.
6 VZ Burrows, C., 103 W. Pleasant St.Santa Paula, Calif.
6 WA Blackburn, J. F., 1719 N. Gardner St., Los Angeles, Calif.
6 WB Barnes, G., 725 W. 4th St.....Reno, Nevada.
6 WG Barrow, R., 7618 Hollywood Blvd.Los Angeles, Calif.
6 WD Hart, A. H., 3976 24th St.....San Francisco, Calif.
6 WE Dobson, R., 951 Eden Ave.....Los Angeles, Calif.
6 WF Harrison, G. R., Stanford University.....Calif.
6 WG Honsinger, W., 1412 10th St.....Sacramento, Calif.
6 WH Ward, R., 170 Arlington Drive.....Pasadena, Calif.
6 WI Alboe, G., 1241 W. 40th St.....Los Angeles, Calif.
6 WJ Bourguignon, G., 198 Johnson Ave.Santa Clara, Calif.
6 WK Felt, L., 2044 India St.....San Diego, Calif.
6 WL Muncy, C. F., 226 Grove St.....Berkeley, Calif.
6 WM Ellert, F., 325 E. St. James St.....San Jose, Calif.
6 WN Alexander, B., 4340 Cleveland Ave.San Diego, Calif.
6 WO Leech, A. G. S., 987 54th St.....Oakland, Calif.
6 WP Irthum, E. J., 1090 55th St.....Oaland, Calif.
6 WQ Murray, G., 1437 Hyde St.....San Francisco, Calif
6 WR Khazoyan, A. H., 484 S. Los Robles Ave., Pasadena, Calif.
6 WS Whalen, C., 163 S. Pacific Blvd., Huntington Park, Calif.
6 WT Sutherland, C., 340 Moran St.....Reno, Nevada.
6 WU Richardson, C., 406 W. 28th St..Los Angeles, Calif.
6 WV Lembke, A. W., 818 Montrose Ave., So. Pasadena Calif.
6 WW Lewis, B., 2666 Orchard Ave.....Los Angeles, Calif.
6 WX Korf, E. W., 816 N. Main St.....Napa, Calif.
6 WY Fensky, E. A., 689 62nd St.....Oaklaand, Calif.
6 WZ Otto R. W., and Wisner, F. L., 1906 Chestnut St., Berkeley, Calif.

Eighth District

RE-ASSIGNED CALLS

8 AA Charles E. Nichols, 739 Weadock Ave....Lima, Ohio
8 AG Albert E. Helges, 32 Vaughn St.....Wheatland, Pa.
8 AH Arthur H. Waynick, 774 Casgrain St..Detroit, Mich.
8 AI Frank T. Lene, 3606 Behrwald St....Cleveland, Ohio
8 AS Albert Pochelon, Jr.....Lovells, Mich.
8 AU I. T. M. Kelvey, 157 Edgwood St., Wheeling, W. Va.
8 AW John J. Lipko, 41 Cleveland St.....Hudson, Pa.
8 AX L. E. Larson, 68 Oliver St...No. Tonawanda, N. Y.
8 AZ J. E. Fetzer .....Berrien Springs, Mich.
8 ABJ Oscar E. Swanson, 184 Bath St.....Elyria, Ohio
8 ABL Ralph Wm. Harris, 1099 Bigfalls Ave...Akron, Ohio
8 ADY Charles C. Davis, 411 Poplar St.....Fenton, Mich.
8 AFZ Carl E. Welsher, 69 Ransom Court. Lockport, N. Y.
8 AHA Max A. Krombach, Miami Ave.....Cloves, Ohio
8 AIL Henry A. Wohlers.....Oak Harbor, Ohio
8 AKI W. P. Van Behren, 2149 Scottwood Ave., Toledo, O.
8 AMG Joe M. Mauzy, 522 N. Main St.....Sidney, Ohio
8 ANE Stanley Stevens, 416 Railroad St....Bloomsburg, Pa.
8 ATA Moncrelf A. Spear, 529 Wheeler Ave..Scranton, Pa.
8 ATI Fred J. Neupholm, 918 10th Ave., Port Huron, Mich.
8 ATU Jacob K. Mareus, 87 Kelly St.....Rochester, N. Y.
8 AUW Virgil G. Wiley, 119 Dallas St.....Sidney, Ohio
8 AVP M. Crosby Bartlett, 1440 Seymurn Ave., Detroit, Mich.
8 AZK Robert L. Thomas, 1126 Neil Ave., Columbus, Ohio
8 BD Vernon L. Lathrop, 11 White St..Bloomfield, Mich.
8 BW Samuel Greco 622 12th Ave.....New Brighton, Pa.
8 BX Donald H. Steward, 314 Vine St.....Van Wert, Ohio
8 BY Evening News Association (Belle Isle Yacht), Detroit, Mich.
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8 BNG Howard E. Wisterman, 2465 Lawton Ave., Toledo, O.
8 BNV Clarence W. Vogel, 129 S. Van Lear St., Dayton, O.
8 BRB Ralph Weller, 322 Bird Ave.....Buffalo, N. Y.
8 CA Kendall H. Speer, Jr.....Lowber, Pa.
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8 CJ Albert Threm, 207 E. Clifton Ave., Cincinnati, Ohio
8 CK Duane Ingraham, 83 Main St.....Herminie, Pa.
8 CN A. Cimildoro, 266 W. Genesee St., Auburn, N. Y.
8 CT W. E. Hiler, 121½ W. Main St....Wellington, Ohio
8 DA Charley M. Sandridge.....Harpster, Ohio
8 DH Alexis W. Russin, Oak Hill Road.....Union, N. Y.
8 DI Dusenberry Radiolectric Station, 46-48 S. Saginaw St., Pontiac, Mich.
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8 EF Albert D. Miller, 219 Hazlett St., N. W., Canton, O.
8 EH E. S. Leavenworth, 8998 Martindale St., Detroit, Mich.
8 EP A. B. Schwer, 901 W. Washington St., Grafton, W. Va.
8 ER La Verne W. Hughes, 958 Richie Ave., Lima, Ohio
8 ES George G. Collins, 601 S. Maple St.....Akron, Ohio
8 ET Electric Equipment Co., G. B. Harris, Exposition Grounds, Erie, Pa.
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8 EU Ervin L. Maneval, 1470 W. 4th St.Williamsport, Pa.
8 EX Chas. A. Plunkett, Jr.....Lewisburg, W. Va.
8 FF Robert V. Austin, 533 Park Place.....Elyria, Ohio
8 FF William F. Davis.....New Straitsville, Ohio.
8 FK P. A. Marsal, 1527 Lakeland St....Lakewood, Ohio.
8 FM Clare L. Guswiler, Church St.....Roscoe, Pa.
8 FO William M. Near, 210 Orange St....Jackson, Mich.
8 FP Peter Tennyson, 102 W. Union St...Nanticoke, Pa.
8 FR Seldon I. Davis, 30 Winders St.....Pittsburgh, Pa.
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8 GT Ray M. Lacey, 2001 Seward Ave.....Detroit, Mich.
8 GU Aberdeen Germain, 1513 19th St..Port Huron, Mich.
8 GS H. S. Brooks, 151 W. 1st St.....Fulton, N. Y.
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8 HL Elwyn S. Marvin, 121 W. Miller St..Elmira, N. Y.
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8 MK Colvin Dresen, 1643 Jefferson Ave...Buffalo, N. Y.
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8 MQ Robert A. Wilkinson, 210 South Ave..Van Wert, Ohio
8 MS Stanley Preston, 65 Magnolia St..Battle Creek, Mich.
8 MT Wayne Hannum, R. F. D. No. 6.....Kent, Ohio.
8 MY Henry W. Levison, 2255 Adams St., Norwood, Ohio
8 NF George W. Parker, 80 E. Huron St..Pontiac, Mich.
8 NH Albert P. Vandergrift P. N. Elving, 1017 Manhattan St., Pittsburgh, Pa.
8 NK Donald T. Willard, 6th St.....Elizabeth, Pa.
8 NP Neil Spencer, R. F. D. No. 5.....Watertown, N. Y.
8 NS H. Moorshfelder, (Carnegie Institute of Technology) Pittsburgh, Pa.
8 NW Thomas H. Cooper, Jr.....Coopers, W. Va.
8 OD Paul O. Farnham, 36 Butler Ave...Ticonderoga, N. Y.
8 OE Ralph H. Mercer, 539 Broad St.....Ashland, Ohio.
8 OM Burton Marks, 25 Tennyson St.....Detroit, Mich.
8 ON Gordon Jewett, 331 S. Rutland St.Watertown, N. Y.
8 OV C. S. Abbott, 123 E. 4th St.....Jamestown, N. Y.
8 PG Wm. Y. Morris, 715 Mulberry St..Clarksburg, W. Va.
8 PK Ethelbert Seller, Box 114.....E. Bloomfield, N. Y.
8 PN James L. Smith, 14 Davis St.....Geneva, N. Y.
8 PR Don Jay Marshall.....Cass Lake, Mich.
8 PT William H. Wilson, 19 Marvin St....Clinton, N. Y.
8 PV Maurice E. Fox, 5280 Bangor Ave....Detroit, Mich.
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8 RA A. Romeyn Bitter, 626 Platt St.....Toledo, Ohio.
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8 SB Harry W. Ruby, 429 S. Fountain Ave., Springfield, O.
8 SF Theodore A. Graul, 810 Main St...Sharpsburg, Pa.
8 SM Rgt. Hdqts. 108th Inft., N. Y. N. G., A. R. Marcy. (Emergency) Jefferson St.....Syracuse, N. Y.
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8 VD Harry Ritchey, S. Central Ave.....Lima, Ohio
8 WG Emery V. Qualman, R. F. D. Harbor Rd., Port Clinton, Ohio
8 VJ Charles F. Neice.....Girardville, Pa.
8 WV Geo. E. Hoffstetter, 79 S. 18th St...Columbus, Ohio.
8 WX Floyd M. Williamson, 622 Helen Ave.Detroit, Mich.

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9 CVD Joseph J. Bremken, 217 N. 26th St....Omaha, Nebr.
9 CVE Dale M. Ashby, 415 N. Church St...Gibson City, Ill.
9 CVF L. M. Schwabe, 508 N. William St...Columbia, Mo.
9 CVG Fred C. Heinze.....Wilson, Kans.
9 CVH W. E. Ranney, 1646 Beechwood Ave...Louisville, Ky.
9 CVI E. T. Howell, 611 Van Buren St...Milwaukee, Wisc.
9 CVJ Paul M. A. Milker, 912 N. 8th St..Fargo, N. Dak.
9 CVK Edwin J. DeCosta, Box 153.....Lake Villa, Ill.
9 CVL Carl P. Budke, Gore and Glendale Rd. Webster Grove, Mo.
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9 CVN John F. Palmquist, 2908 S. 42d Ave., Minneapolis, Minn.
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9 CVP J. P. Burke, 3011 Union Ave....St. Louis, Mo.
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9 CVS F. Mumm, 7219 Jackson Blvd....Forest Park, Ill.
9 CVT B. W. Alden, 723 N. 9th St....Kansas City, Kans.
9 CVU N. W. Knoernschild, 644 28th St. Milwaukee, Wis.
9 CVV R. D. Leffhoim, 2616 4th Ave., S. Minneapolis, Minn.
9 CVW E. Goodberlet, 3712 Finney Ave....St. Louis, Mo.
9 CVX R. H. Fitch, 1408 Capitol St.....Ypsilanti, Mich.
9 CVY E. D. Lindsay, 1017 Admiral Blvd. Kansas City, Mo.
9 CVZ L. M. Turner, 412 State St.....Joliet, Ill.
9 CWA O. G. Cathcart, 1404 E. Third St....Webster Groves, Mo.
9 CWB George Furtney, 1302 Wilson Ave...Chicago, Ill.
9 CWC L. J. Simms, 850 Faulkner Ave.....Wichita, Kans.
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9 CWH Norman J. Atwell .....Denver, Colo.
9 CWI Everett Stone, 90 Pewable St.....Houghton, Mich.
9 CWJ Fred A. Lankton, 148 W. Dakota St..Denver, Colo.
9 CWK Vance E. Olson, 847 E. 57th St.....Chicago, Ill.
9 CWL Edwin S. Van Buskirk, 829 14th St..Denver, Colo.
9 CWM H. T. Hintgen, 224 Dakota Ave..Wahpeton, N. D.
9 CWN Harry Samuels, 411 North 7th St..St. Louis, Mo.
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9 CWQ David C. Maloney, 1824 Pine St....Marquette, Mich.
9 CWR Edwin L. Benton, 222 Main St....La Crosse, Wis.
9 CWS R. F. Edgar, 3821 S. 4th Ave...Minneapolis, Minn.
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9 CWV Verner Hicks, 901 S. Mechanic St.....Marion, Ind.
9 CWW Robert H. Freeman, Chicago Ranch..Brighton, Colo.
9 CWX C. A. Brockert, 911 W. Main St..Platteville, Wis.
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9 CWZ Paul Wichman .....Belmont, Wis.
9 CXA Ben Herr, R. F. D. No. 3.....Lebanon, Ind.
9 CXB Garvin H. Dyer, 1321 Concord St..Springfield, Ill.
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9 CXD Robert Van Derwarh, 1305 Park Ave.Racine, Wis.
9 CXE C. J. Burnside, 322 Quincy St..Rapid City, S. D.
9 CXF Clemens E. Spellman, 810 Ella St..Beatrice, Neb.
9 CXG Robert F. Bartl, 1515 State St....La Crosse, Wis.
9 CXH Leo L. Drolet, 265 Main St.....Bourbonnais, Ill.
9 CXI A. G. Schwerling, 733 Linden Ave...Newport, Ky.
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9 CXK William Barrett, 3200 Gilham Rd..Kansas City, Mo.
9 CXL Theresa E. Finnell, 621 E. Water St...Pontiac, Ill.
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9 CXN G. E. Marshall, 2045 S. Lawrence St.Wichita, Kans.
9 CXO T. H. Paisley, 3706 Washington St.Kansas City, Mo.
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9 CXQ H. R. Heuer, 5666 Cabanne Ave.....St. Louis, Mo.
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9 CXS C. Wagner, Main St.....West McHenry, Ill.
9 CXT R. M. Purinton, No. 154 9th St.....Lincoln, Neb.
9 CXU R. E. Gorzney, 512 Morris St., W.....Morrison, Ill.
9 CXV W. W. Wymer, 811 Douglas Ave....Yankton, S. D.
9 CXW D. E. Sparks, 3638 Rokeby St.....Chicago, Ill.
9 CXX W. L. Perdue, 104 Brown St.....Hopkinsville, Ky.
9 CXY F. L. Reed, 2906½ Arsenal St.....St. Louis, Mo.
9 CXZ H. Hushower, 722 Pennsylvania Ave., South Bend, Ind.
9 CYA C. Radio Shop, 128-38 S. Second St., DeKalb, Ill.
9 CYB R. L. Herchert, 1619 Union Ave., St. Louis, Mo.

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9 AYY McKinley High School, Missouri and Russell Sts. St. Louis, Mo.
9 BSH A. B. Jordan, 1014 Good Hope St., Cape Girardeau, Mo. St. Louis, Mo.
9 CCB General Radio Laboratories, Inc., 1730 Tribune Bldg. Chicago, Ill.
9 DIS J. B. Bayard, Jr., 505 N. 6th St....Vincennes, Ind.
9 DJL L. M. DeVoe.....Zionsville, Ind.
9 GT R. Wright, 2114 Morse Ave.....Chicago, Ill.
9 QB S. Burdett, 6464 Dorchester Ave.....Chicago, Ill.
9 UH V. R. Lucas, 820 N. 4th St.....Fargo, N. Dak.

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9 AKR A. C. Mertz.....Byron, Wis.
9 AIL R. W. Martin, Rochester St.....Mukwanago, Wis.
9 ALX S. Tollman, 3927 Beachwood Ave.....Pine Lawn, Mo.
9 AMI J. E. Decker, 119 Second St., S. E., Mason, City, Iowa
9 ANF H. C. Harvey, 135 N. 13th St.....Lincoln, Neb.
9 APK H. B. Smith, 114 Ridge Ave.....Evanston, Ill.
9 ATT S. E. Fey, 402 Armory St.....Campaign, Ill.
9 AZR H. C. Armgost, 327 W. 4th St.....Florence, Kans.
9 BAX B. F. Miller, Box 165.....Coloma, Wis.
9 BAZ J. B. Wathan. R. R. No. 1, Box 97, Mocking Bird Valley, Louisville, Ky.
9 BBF E. T. Sperling, 21 S. Jefferson St., New Ulm, Minn.
9 BBL R. Schwartz, No. 616 Montgomery St., Waukegan, Ill.
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9 BCV J. E. Prather, No. 100 Oak St.....Chicago, Ill.
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9 DSL J. H. Best.....Kewanee, Ill.
9 DXO V. F. Munson, 328 Willard St.....Lexington, Ky.
9 EP J. W. Coleman, 211 N. Broadway....Indianapolis, Ind.
9 KM L. Biddle, 442 Bosart Ave.....Minneapolis, Minn.
9 LN W. C. Grover, 3214 S. Colfax St., Nermal, Ill.
9 PP H. F. Wilson, 1105 Franklin Ave....Evanston, Ill.
9 QG R. E. Hughes, 519 Asbury Ave.....Evanston, Ill.
WDAP Midwest Radio Central, Inc., Drake Hotel, Chicago, Ill.

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9 XO Morkrum Co., 1410 Wrightwood Ave...Chicago, Ill.
9 XP Carrington, G. L., 300 S. Main....El Dorado, Kans.

SPECIAL

9 ZI Anderson, R. E., 235 Man St.....Lexington, Ky.

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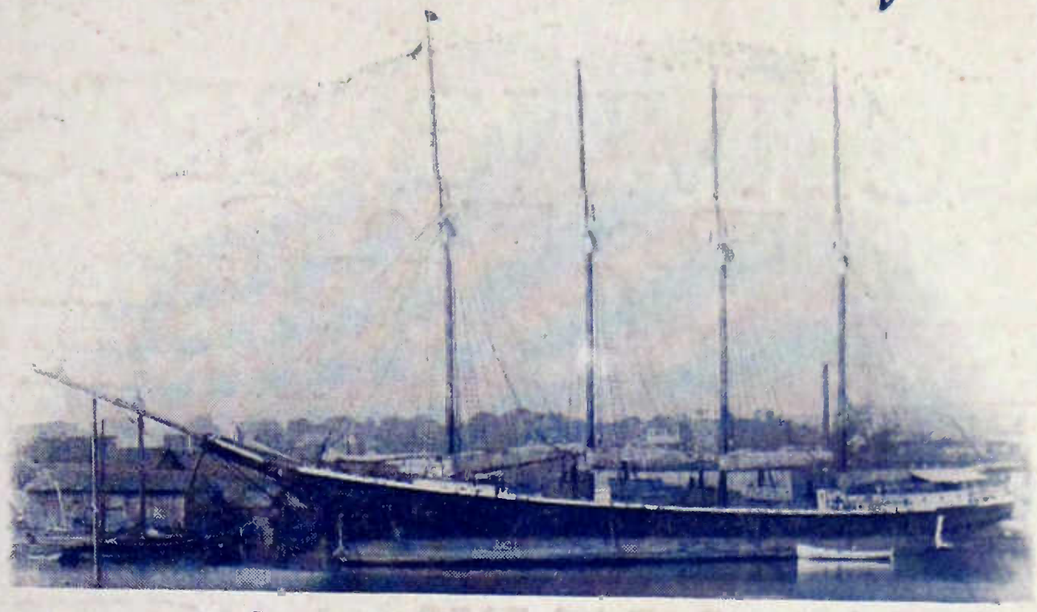
9 YAQ Southeast Mo. State Teachers College, Normal Ave., Cape Girardeau, Mo.



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