"America's Foremost Radiophone Review"

June
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The WIRELESS AGE

The Broadcasters
Prominent Entertainers Interviewed

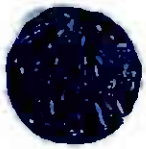
Radio the Educator
Impressions of Dr. Nicholas Murray Butler

Famous W J Z
A Trip Through the Newark Station

The Radio Pictorial
News and Humor — Fact and Fancy

Radio of Today and Tomorrow — By David Sarnoff

WORLD WIDE REVIEW
TECHNICAL FEATURES



Medal and Diploma received at World's Columbian Exposition Chicago, 1893

ELECTROSE

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"MADE IN AMERICA"
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VOLUME 9

THE WIRELESS AGE

NUMBER 9

Edited by J. ANDREW WHITE

Contents

June, 1922

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

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

Advertisers' Index

Why Not?

Why not have the enjoyment this summer that you are planning for next fall and winter?

This relates to Radio, of course.

If you are one of those who have decided to postpone till fall the purchase of a radiophone receiving set because you are afraid you won't get the desired results during the summer months, consider the facts that follow which are set forth for your guidance.

Some folks, who really do not know whereof they speak, have voiced their opinions, as facts, to the effect that successful reception of broadcasting is impossible during the summer months because of static disturbances.

Less than a year ago (July 2, 1921) the first really **big** job of broadcasting was done when a voice description of The Dempsey-Carpentier fight was sent from the ringside, on a hot, muggy day that seemed to be all that broadcasting weather should not be.

> *Reports of successful reception of this transmission were received from as far away as Milwaukee, Wis., Chicago, Ill., Saginaw, Mich., Florida, up in The Maine woods and 1500 miles at sea.*

That event was handled by an amateur association (N. A. W. A.). With their permanent equipment, their trained operators and all their other facilities, it is logical to assume the big broadcasting stations will give you what you want this summer and that you will get their transmitted programs satisfactorily.

So go ahead and get that set. If you stay at home you can take your own time in getting your set rigged up just right.

If you go away pack up your set and take it along. It will be fine company for you, particularly on rainy days. News—concerts—base ball scores and other good things will be brought to you.

And besides—the time to buy is **now** when sets are available. In the fall when everybody else wants one **you** may have to wait longer than you should.

Yours for a radio summer,

WIRELESS PRESS, INC.

MAGNAVOX Radio

MANY a natural born "radio enthusiast" has so far been discouraged from taking up this wonderful new science by the restrictions inherent in the use of the telephone head set —or an unsatisfactory "loud speaker".

Radio brings it MAGNAVOX tells it

No wireless receiving set is complete without the Magnavox Radio

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with 14-inch horn
ideal for use in homes, amateur stations, offices, etc.

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with 18-inch horn
serves the requirements of professional use for large audiences, dance halls, etc.

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2 and 3-stage

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Attached to any commercial receiving set, the Magnavox Radio reproduces every sound in full volume, transforming wireless telephony from a scientific "fad" into a universal *home entertainment* and *inspiration.*

The Magnavox Radio makes it possible to hear all that is in the air as if it were being played on your phonograph. Any dealer will demonstrate, or write us for descriptive booklet and name of nearest dealer.

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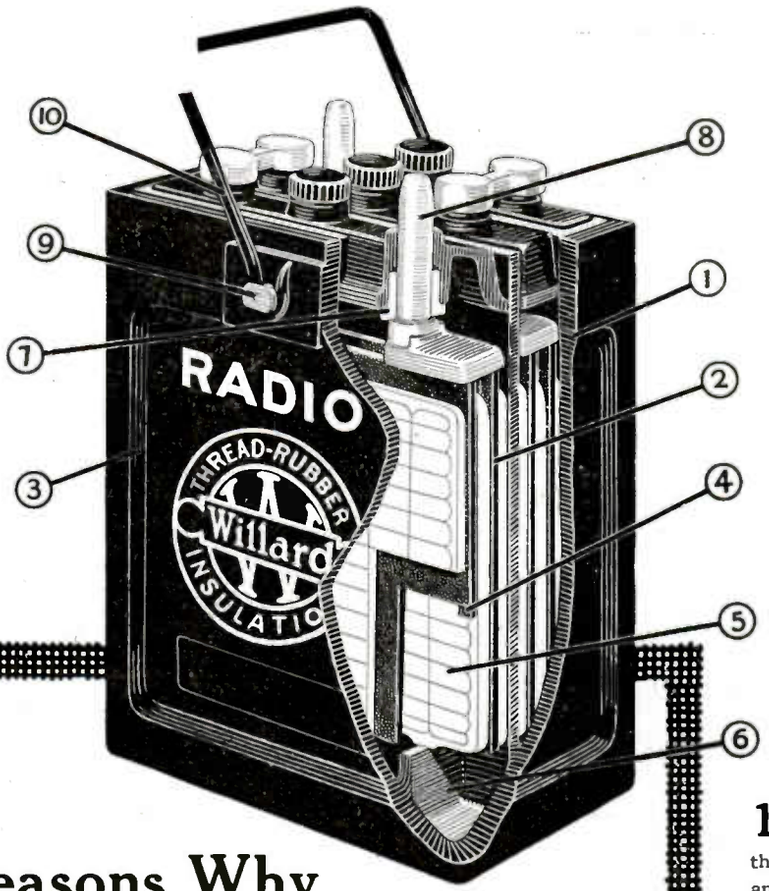

The Willard All-Rubber Radio "A" Battery (shown here) is designed especially for radio use.

Ten Reasons Why The Willard All-Rubber Radio "A" Battery is Better

These reasons, back of the success of this specially designed battery, are as definite as those responsible for the success of the Willard Threaded Rubber Battery, which is now standard original equipment on 195 makes of cars and trucks. Ask for particulars from your dealer or at the nearest Willard Battery Station.

The Willard Radio "B" Battery is a 42-volt rechargeable storage battery, with leak-proof glass jars and Threaded Rubber Insulation. Assures freedom from frying and hissing ground noises.

WILLARD STORAGE BATTERY COMPANY
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Made in Canada by the
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Willard THREADED RUBBER BATTERY

1 The rubber case is made in one piece, thoroughly insulating the battery from cells to ground and from cell to cell, and effectively preventing all ground noises.

2 Plates are insulated with Threaded Rubber Insulation, which by reason of its uniformity allows every part of each plate to do an equal share of work.

3 Battery is shipped in absolutely Bone-Dry condition so that it is brand new when you get it.

4 Insulators are made with special heavy ribs to meet the special requirements of the radio battery.

5 Plates are extra heavy to provide current at steady voltage for considerable periods.

6 Sediment chambers are large to eliminate all possibility of short circuits at plate bottoms.

7 Posts are sealed by soft rubber gaskets, so that solution cannot seep out between post and cover.

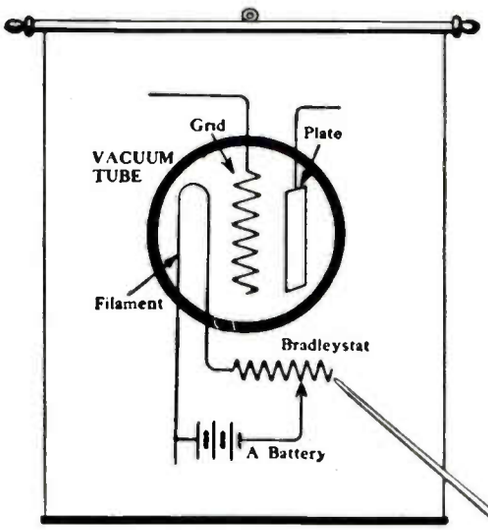
8 Terminal posts are high to permit easy grip of battery clamps.

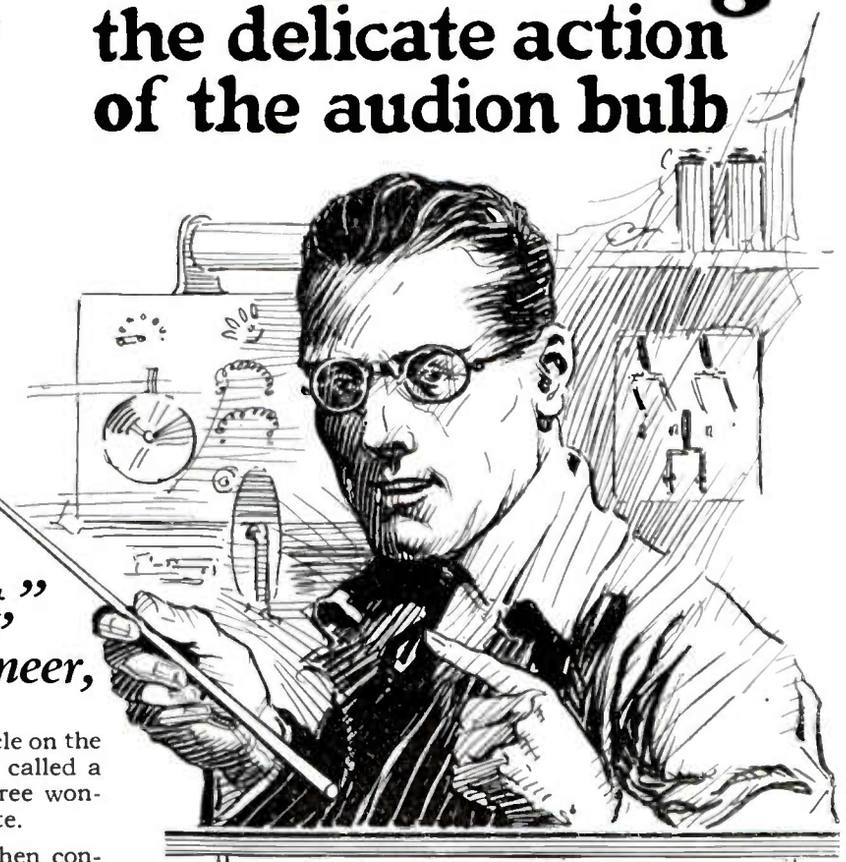
9 Brass knobs sunk into the sides of the rubber case provide a firm hold for the handel.

10 Handle made of a heavy rod furnishes easy means of carrying the battery.

Science is Explaining

the delicate action of the audion bulb





"This is the vital part," says the radio engineer,

"of the receiving set. The heavy circle on the chart is the audion bulb, sometimes called a detector or vacuum tube. It has three wonderful parts—filament, grid, and plate.

"The filament becomes white hot when connected to the "A" battery, and sends out a fairy rain of invisible, electrified particles, which pass through the grid and strike the plate just as a spring rain is driven through the bare twigs of a hedge fence.

"The telephone receivers detect the slightest variation in the rain upon the plate. The broadcasting waves run from the antenna to the grid and interfere with the fairy rain like the leaves on a hedge interfere with a summer shower. So you see, by interfering with the fairy rain, the broadcasting waves make the telephones sing and talk.

"Since it is the fairy rain from the filament which does the trick, it is all-important that you provide noiseless, stepless, and extremely accurate control of filament current. The success of your set will depend upon the quality of your filament rheostat."

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Allen-Bradley Co.

Electric Controlling Apparatus

283 Greenfield Ave., Milwaukee, Wis.

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Bradleystat

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PERFECT FILAMENT CONTROL

Retail Price

$1.85

Postage 10c extra

A single knob applying pressure upon graphite discs provides the amazingly accurate and noiseless control of the Bradleystat. No wire coils, no sliders, no verniers, and no loose contacts to "fry." And above all, the most precise control is available.

The Bradleystat is without equal for filament control of ½ and 1 ampere receiving tubes and sending tubes up to 2½ amperes. A guarantee of one year against factory defects is back of every Bradleystat.

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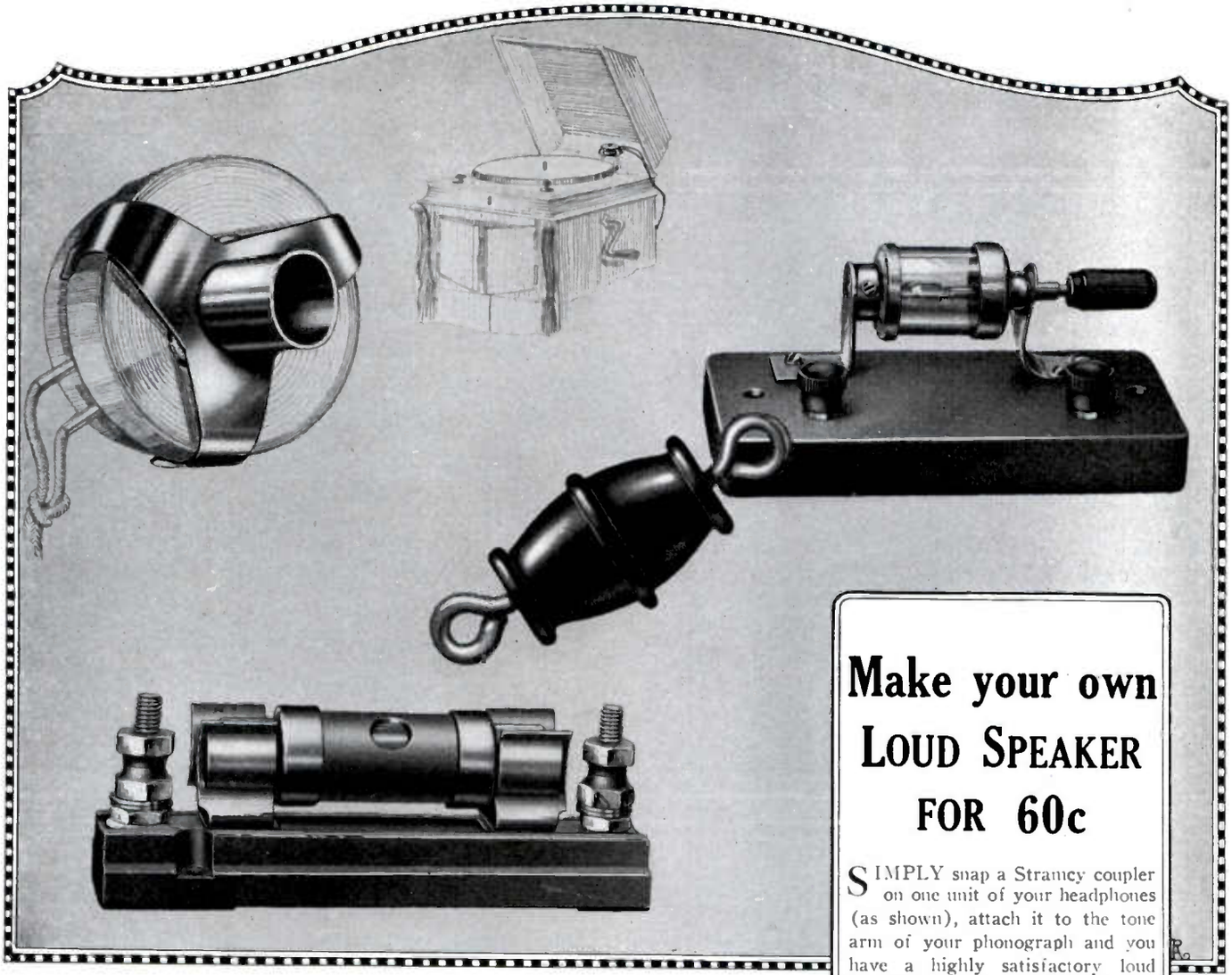

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THE new Radisco PURA-TON Detector Stand provides for unusually fine crystal adjustment without sacrificing ruggedness. Price $2.25. (Parts sold separately to manufacturers of complete instruments.)

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HAND MICROPHONE SET

The most efficient and conveniently arranged Microphone for Radio Telephony is the No. 260-W Hand Set illustrated above. All exposed metal parts are nickel plated and highly polished, and a metal hook is provided for hanging up. The handle is made of corrugated hard rubber and of a size easy to hold. On account of the novel shape and position of the mouthpiece the Microphone is always in proper position for best results.

Fitted with 6 ft. Cord,
Price (in U. S. A.),
$7.00 each

The Amplifpying qualities of the FEDERAL No. 226-W Transformer can be attested to by thousands of satisfied users. The impedance at 500 cycles is the same as the internal impedance of the standard tubes available today. The flux leakage is kept at a minimum, reducing the tendency to oscillate, due to stray fields between circuits in cascade amplification.

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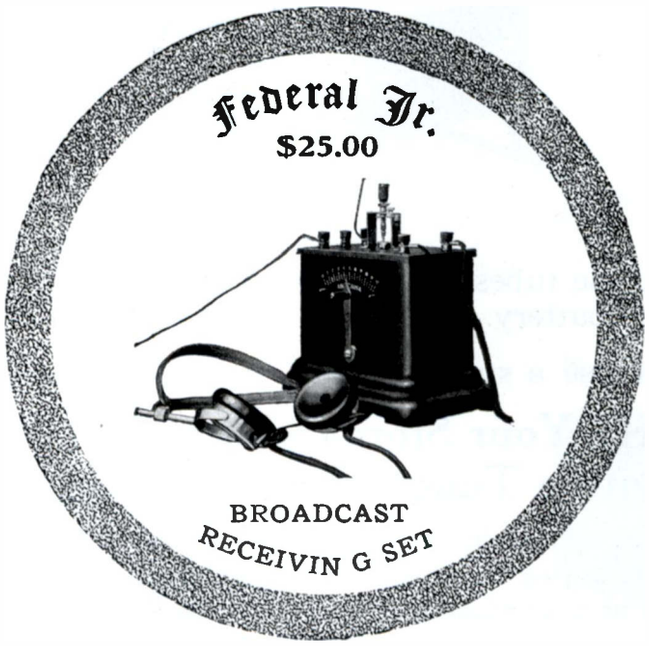

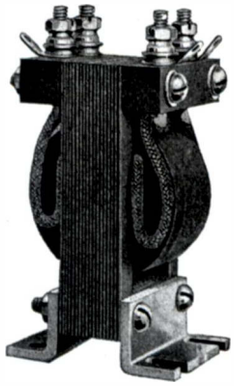

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THE FEDERAL PLEIOPHONE is designed to meet the demand for a loud speaking instrument at a reasonable price, and when used with two or more stages of amplification, will give sufficient signal intensity to fill a room of moderate size. It consists of a special high resistance receiver mounted in a black enamel base over which a horn of scientific design, to give the proper acoustics, is mounted. It requires no battery to operate, being simply connected in place of the Head Telephone.

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No. 9 AMPLIFYING UNIT

FEDERAL No. 9 AMPLIFYING UNITS

One of the latest additions to the already well known FEDERAL line. Undoubtedly the best amplifying unit on the market. Metal shielding eliminates all possibility of howling. FEDERAL Automatic Filament control jacks and circuits, an added convenience, are also incorporated. See your nearest dealer.

Price (in U. S. A,) . . . $58.00

PLEIOPHONE

Federal Telephone and Telegraph Company
BUFFALO, N. Y.

In Our Opinion

THERE is often very marked variation of strength in the reception of messages and music from radio stations. This is popularly known as "fading," and particularly noticeable where stations use the shorter bands of wavelengths.

The "Fading" Problem

Ionization of the earth's atmosphere by the sun, is undoubtedly the cause of this variation in strength. From the research work so far done it seems probable that this ionization occurs in areas. These areas are seldom ionized to the same extent, and, as they are partially conducting and as their positions change with the rotation of the earth, or because of meteorological conditions, the strength of reception from distant transmitting stations varies with the drift of these ionized areas. So the variations are irregular.

Where variations occur at fairly regular periods, the accredited cause is the topography of the earth's surface between two points, or to some local condition at, or near, the transmitting station.

A definite solution of this whole problem, however, is still some distance off.

* * *

A SUBJECT of great interest to radio engineers and experimenters at the present time is the experimental work being done in several parts of the country with condenser antennas.

Condenser Antennas

It is claimed, by some of the experimenters, that this new type of antenna, because of its exceptional efficiency, will eventually be used generally. It is composed of a special type of condenser and of a size for receiving for instance, which will fit easily inside a phonograph sound box.

Through experiments made at the Bureau of Standards it has been determined that the condenser antenna gives a greater signal response than a loop, or coil antenna, and that when comparison was made with an outdoor receiving antenna, heavy static then prevailing was practically eliminated, while signal strength remained constant.

There is little definite information available at hand as yet on the new type of "antenna," except that it requires a condenser of special construction of an approximate maximum capacity of .001. The dielectric is of pyrex glass of a thickness of 2 millimeters, and the plates of the condensers so far used are shimstock steel and form a tight bond to the dielectric by friction. When the condenser is used as a transmitting antenna brush discharge is eliminated by a seal of petrolastic cement, of a special degree of hardness.

The subject is one which offers interesting possibilities for further study and development by students and engineers.

* * *

WITH the coming of summer, increased interference can be expected with the reception of all forms of radio signals, telegraph and telephone, for we are entering the season of atmospheric electricity, known as static, which reaches its yearly peak of activity in July and August, and its minimum in January and February.

Interference from Static

This atmospheric electricity, or static, can be compared to a rainstorm, and consequently, such particles of a static storm as come in contact with the aerial wires of a receiving station run down the wires, through the receiving instruments, to ground, in exactly the same way as raindrops fall on the roof of a house and are conducted to the ground by means of gutters and leader-pipes.

Static storms usually prevail at night during the summer, starting two hours or so after sundown and continuing all night. Sometimes they continue during the day, as well, but this condition is generally an indication of nearby, or possibly distant, thunder-showers, or electrical storms, the effect of the lightning discharges being recorded on receiving apparatus in exactly the same way as signals of transmitting stations are recorded.

The nearest approach to the elimination of static when an outdoor aerial is used is by means of the employment of a selective receiver, which will allow sharp tuning and in doing so insure the reception of satisfactory signals and at the same time affect a considerable reduction of the disturbances caused by static. A more effective way of eliminating static is by the use of an indoor loop, instead of an outdoor antenna, but as the amount of energy received in a loop is small, as compared to the amount received on an antenna, it is necessary to highly amplify the received energy by means of vacuum tubes, in order to obtain the same signal response. Such an arrangement will, however, greatly eliminate the atmospheric disturbances.

* * *

THE success of the amateur trans-Atlantic tests of last December justifies the confidence among amateur operators that before another year rolls around two-way international amateur communication will have been accomplished. At least, during midwinter, the signals of American amateur stations can be heard in Europe. Repeated reception of the signals of Pacific Coast amateur stations in Honolulu has been reported, and a rather amazing report of interference with Australian naval radio work by a west coast American amateur station has been the subject of discussion by the Wireless Society of London. Thus there can be no doubt that the short waves are crossing both oceans to foreign lands, and will continue to do so.

Future International Amateur Activities

Two-way trans-Oceanic communication by amateur stations merely awaits, then, more liberality among foreign governments and raising of the legal restrictions which handicap oversea's experimenters. The French Government, for the first time in history, has authorized transmission by amateurs in that country and to date five such stations have been licensed and are now being operated. These French amateur stations are allowed a wavelength of 200 meters and a power of 100 watts in the antenna. This means an opportunity hitherto denied. And that no time will be lost in making good use of the new privilege is evidenced by the fact that the station of Leon Deloy, in southern France (call 8AB) has already been heard in London.

Something will happen, soon. On this side of the ocean preparations are going forward for the possible reception of amateur signals from Europe. At the moment there is not much definitely known of the plans, but it is a certainty that a special receiving station, with experienced and skilled amateur personnel, will soon be equipped for this purpose.—THE EDITOR.

Brilliant Coloratura Who is a Real Radio Fan

THE success of Mme. Luella Meluis has been as marked over the radio as it has been on the concert stage. In a heart to heart talk with her invisible radio audience on page 31, she explains why her voice carries so clearly through the air

Meet the Movie Star Who Inspired a Radio Song

THE voice of Norma Shearer, spoken over the radiophone, inspired a song writer to compose "Kiss Me By Wireless." The Universal film star, in an interview on page 43, says radio is a force for international amity

Radio Has a High Mission, Says Opera Singer

HELEN YORKE, a young and talented opera singer, who sang from WJZ, believes the radiophone has a mission to fulfill—the introduction of better music into more homes. *Read the interview on page 38*

King of Saxophone Players a Radio Enthusiast

SO widely known is the ability of Rudy Wiedoeft that persons from all walks of life eagerly seek his advice. His radio performance brought many letters and in the interview on page 33. he explains that he. too. is a radio fan

And Now Fashion Seeks Radio for Costume Ideas

The "Radio Girl" seen at the Bal des Quat'z Arts, Tammany Hall, New York City, was a distinct novelty

A radio costume made entirely of paper was introduced at the Paper Costume Show in Chicago

The Radio Head Dress—a circle of pearls worn over the ears, and joined by two strands — was evolved from now common usage of a pair of head telephones

While the Audience Waits and the Director Raves

Back-stage Cleo Mayfield and Cecil Lean listen in and the pleasure they get is recorded by the cameraman

Oh gosh! Oh golly! Joe Jackson's trick bicycle hasn't a chance with Joe when he gets near his radio set in his dressing room

Many witty, instructive, and entertaining things are going through the air these days and Olga Printzalau, a scenario writer in a Los Angeles movie studio, is taking full advantage of them to get ideas for plots for the silent drama. She listens with pencil in hand and when she gets a "hunch" she jots it down, indicating still another sphere of influence for radio

National Leaders Accept Radio as Force for Good

Secretary of Agriculture Wallace uses wireless to broadcast his Arbor Day greeting throughout the country

Along with other members of the cabinet, Secretary of Labor Davis has installed a radio set on his desk

Thomus A. Edison, the inventive genius, has been thoroughly captured by radio as this exclusive photo taken in his laboratory will testify

"Uncle Joe" Cannon will not use his radio set for the purpose of campaigning, as he does not intend to run for Congress any more, but he is an ardent enthusiast, and declares he is "having lots of fun" with his set every evening

Here is Postmaster-General Work, successor to Will Hays, and the newest member of President Harding's Cabinet, receiving radio telephone messages at his desk. Every member of the Cabinet has been smitten by the radio "bug"

Radio Has Become the Modern Alice in Wonderland

Little Rita Rogan, known wherever there are movie fans, is learning the "radio smile"

Baby Alice Murray listens in, too, from a park bench where her nurse has seated her. Radio music apparently keeps Alice contented

Hear over the radio while riding on her bike? You bet, says Josephine Kiernan. At least her smile would indicate she is picking music and speech out of the air

After dinner C. D. Wagoner of the General Electric Company puts the phones on this kiddie's head, and wonder upon wonders! she hears a bedtime story

Radio of Today and Tomorrow

Initial Stages of the Development of Communication Without Wires—Basic Principles Explained—Progressive Steps Leading Up to Trans-Ocean Service and Broadcasting—Plans and Future Possibilities

By David Sarnoff

General Manager Radio Corporation of America

ALL world progress rests upon interchange of intelligence. With the growth and spread of radio, even into isolated communities, humanitarian, educational and social possibilities come into view hitherto envisioned through no other agency. But to approximate the future of radio, we must understand the record of its past.

Radio on the ocean forced its way into popular imagination when the first call of distress was flashed by a wireless operator from a sinking ship.

Radio as a means of international communication already has proved itself not only by service rendered to the general public, but by the service it has rendered to government, to industry and to trade. And now radio in the home is bringing entertainment and instruction to millions of people who are just beginning to glimpse the possibilities of the new art.

But the greater radio, the radio of the future, with its manifold ramifications in the transmission of intelligence—this is yet faint upon the horizon.

Early History

The origin of radio lies in the experiments of Hertz, a German scientist. At the time of his discovery, he was using among various laboratory devices, an apparatus known as an induction coil—an electrical device which causes a spark. Its operation begins at a low voltage, or electrical pressure, which it then steps up to so high a point that the electric discharge or spark flashes across between the spark points. Hertz found in experimenting with the spark coil that he had set into electrical vibration metallic bodies and various electrical devices. Knowing that there was no connection between these and his sending apparatus he realized that he faced a new phenomenon, and by careful analysis of the effect of the current he came to this conclusion: That "ether," which pervades everything, is capable of carrying electric waves (or, as later defined, "electro-magnetic waves") and that these waves travel outward through the air in all directions.

Marconi's Invention

This discovery was widely published. It meant nothing at that moment, however, to the general public or the lay mind—just as the Einstein theory, for example, means very little to us today. Yet, it registered with a deep understanding on the mind of an eighteen year old youth then studying in Italy,

David Sarnoff, author of this article and administrative head of the greatest radio organization in the world

Guglielmo Marconi. He reasoned that if it were true that the ether carried these electro-magnetic waves, if by this medium, electric energy could be carried, it would be desirable to break these waves up into a series of dots and dashes corresponding to the Morse alphabet used in ordinary telegraphy. Having done that, the ether could be employed to do the work hitherto done by wire telegraphy.

With this definite objective he began his task. He experimented extensively and found that, in order to send out the electric waves efficiently, it was necessary to connect up an insulated wire suspended in the air with one side of the induction coil. And it was in this simple form there came into being the first type of wireless sending apparatus ever used in the world.

A definite return path was desirable for the electrical circuit, so he used the ground, connecting it by wire to the other side of the coil, still utilizing, of course, his connection to an aerial wire (or antenna, as it is technically called). The wires one sees suspended over so many housetops now are these antennas.

Having found the means of sending electro-magnetic waves through the air, the next question was how to receive them. To accomplish this, he developed an instrument known as a coherer, the action of which was very simple. It consisted of a small glass tube within which were a number of filings; a wire from one side connected it to the aerial; another wire from the other side went to the ground, through various coils or other apparatus. When the electric wave emitted from the sending station impinged on the receiving aerial, an electric current passed through the little coherer tube and acted upon those metallic filings. Electrically speaking it changed their resistance. In ordinary language this means simply that the character of the filings changed; and every time that change took place, something happened; either the telegraph relay closed, or a noise was made in the receiving telephones, or an ink recorder operated. That is, the feeble action on the tiny metallic filings was used to do a specific job—to make intelligible by sound or by a mark the dots and dashes of the telegraphic code. This was the original radio system; a transmitting instrument which shot out dots and dashes by breaking up at intervals of short and long duration the electro-magnetic waves sent out into the ether. These electrical impulses, traveling through the air found their way to any aerial wire suspended in the air; they would then go through the little coherer device, and be made intelligible either by sound or by record on paper.

Principles of Tuning

The next problem presenting itself was to arrange matters so that if more than one emission of electro-magnetic waves was carrying dots and dashes through the air, the receiving apparatus would not get the conflicting and simultaneous messages in the form of a jumble of signals; in other words, there arose the problem of interference. The answer to that was tuning. Implied by that single word are many of the familiar terms appearing in the daily press, such as wavelengths, tuning apparatus and tuning coils, variometers, condensers, and many other pieces of electrical apparatus that resolve themselves into associated devices to accomplish the end. Yet the principle of tuning is simple. Consider—by way of analogy—the effect of resonance in music. It is common knowledge, for example, that using a violin, when one string is tuned to a certain pitch and played upon, another string attuned to the same pitch will be set into sympathetic and powerful vibration; that it will of itself respond and give out music, or a single note of music. In music this effect is known as syntony, or resonance. We call it the same thing in radio. The receiving apparatus is electrically tuned to

and a condition of resonance is set up between the two circuits. Only then do we get a response.

The electro-magnetic waves of radio travel outward from the transmitter in all directions. To use another simple analogy: When a stone is thrown into the water, an ever-widening series of ripples radiate outward; those waves die out gradually, and the length of them and their character depend upon the size of the stone and the force with which it was thrown. Just so with radio. A stream of electro-magnetic waves is sent out, and its character and its length, are regulated by the kind of apparatus used. Traveling in all directions, radio can do that which is possible with no other means of communication; it passes through everything; the message it carries practically cannot be stopped.

So much for the fundamentals of radio communication, which it has been attempted to set down without a bewildering array of technical terms.

SHIP TO SHORE COMMUNICATION

Quite naturally radio was first employed in ship to shore traffic, for prior to that time there was no way of communicating with a moving vessel. Marconi had taken his invention to England where he had been greatly encouraged by the British Post Office; there had been placed at his disposal every available facility, and a number of tests were made which proved that wireless could travel, first, a mile, then five miles, then fifty miles, and so on. Then a ship was equipped with wireless apparatus and sent out to sea.

The first American vessel to carry radio was the steamer *Philadelphia* of the American Line, a ship still in existence. The installation comprised the induction coil and the coherer receiving apparatus. Marconi himself made a trip for experimentation; and communication was established with a coastal station erected on shore in England, the ship maintaining contact with the shore, first over a very short distance, and then over increasingly larger distances, until the practicability of this method of communication between ship and shore had been thoroughly demonstrated.

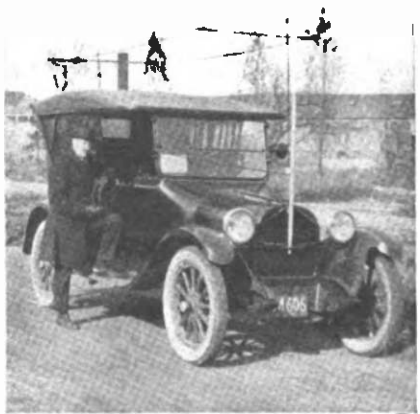
Installations on many ships followed, but the real significance of the invention to the maritime world was not appreciated until it played for the first time a dramatic role in a marine disaster. That was in 1909, when the steamship *Republic* of the White Star Line met in collision an Italian ship, the *Florida* off the "Banks" near Nantucket Island. The crash came in the middle of a dark night. It was then that radio came into its own. When a young wireless operator named Jack Binns, pressed his key and through the agency of radio called for the succor and relief of 1,500 human beings on a sinking ship, his signal sent a thrill around the world.

The famous distress call, CQD then represented the international signal meaning, "I am in distress; I want help!" Binns followed this call by the position of the ship in latitude and longitude. Then, as now, when a wireless operator hears the distress signal all else must stop until help is given, or until the situation is made thoroughly clear. Today the distress signal is SOS, but the meaning and procedure are the same.

On the night that Binns sent out the famous CQD it was picked up not only by a number of ships, but by a little station at Siasconset, on Nantucket Island, Mass. Jack Irwin, the operator on watch there, received the call and immediately notified other ships of the appeal from the *Republic* and the position of the vessel. Help came quickly, and 1,500 lives were saved.

The next dramatic part played by radio telegraphy came with the sinking of the steamship *Titanic*, ten years ago. It so happened that I was then a wireless operator assigned to the Wanamaker station in New York. On the roof of the building a large plant had been installed for the purpose of sending messages between Philadelphia and New York, and also between other points.

It will be recalled that for a long time it was impossible to get definite information of what had happened on the ill-fated *Titanic*. In those days we had no "loudspeakers," or any of the refinement of apparatus of the present day. Radio operators were required to wear headpieces with telephones clamped over the ears, in which the faint buzz of the dots and dashes were heard. For three days and three nights, on a continuous stretch of seventy-two hours, I sat with the headpiece clamped on my head, straining to hear a word or a detail that might come through the air.



Radio communication of the future obviously tends to include all moving vehicles; above is shown a present-day installation

Finally I was rewarded. I began to receive the first details of the disaster —the fact that the *Titanic* had sunk, that the *Olympic* had taken off a number of passengers. I immediately gave the news to the press. Then bedlam broke loose. Reporters and relatives and friends of passengers on the doomed liner hung breathlessly over my shoulder while I copied the names of those who had been saved, scanning every letter as I placed it on paper and hoping that the next word would spell the name of a loved one.

But the very tragedy of the *Titanic* disaster crystallized in the minds of everyone the value of radio and the art was given a new status. One almost immediate result was the passing of laws of national and international character to safeguard life at sea by making it compulsory for every ship carrying fifty or more persons to be equipped with radio telegraph apparatus, with provision for two operators to be constantly on watch so that distress signals might be received or sent out in time of need.

For some little time thereafter the development of radio followed the activities of the sea; installations aboard ship multiplied and the coastal station system expanded. Message traffic from ship to shore was the principal function of a radio telegraph company, and the manufacture, operation, and maintenance of apparatus to give this service was practically its sole activity. A system of handling messages was developed, following the general practice of telegraphy, a procedure which remains virtually unchanged to this day.

COMMERCIAL RADIO TRAFFIC

An outline of the process may be of interest for the question is often asked, "Just how is a message filed for transmission to or from a ship at sea?" It is not a complicated process.

The sender files the message for a vessel at sea at any telegraph office, giving the name of the passenger and the ship and marking the radiogram "Via RCA," if he desires the Radio Corporation of America to handle his message. The handling of the message then is as follows: It is telegraphed by landline to the nearest coastal radio station, which in turn calls the ship through the air, using the call letters which the Government assigns to each vessel as an identification. Operators on ships are required to listen for these messages. They acknowledge the call for their particular vessel and accept the message transmitted from the shore. If an answer is required the ship calls by radio the three-letter designation of the coastal station wanted, transmits the reply, which in turn is put on the telegraph wires directed to the person addressed, anywhere in the United States, or, for that matter, in any part of the world.

WAVELENGTHS

There are two main points in this process which appear confusing to the lay mind. The first is, how does the ship operator know when he is to be called? The answer is that he does not; he listens; maintains a "watch," during which time it is his duty to be on the alert for signals intended for his ship; hearing his call, he answers, and the message is then forwarded. The second question is: How is interference, confusion of messages, avoided when several stations are working at the same time? This is a matter of tuning and wavelength; that is, the radio waves are of definite length just as the ripples from a stone made on water are of different length measured from peak to peak. Transmitters are adjusted to radiate a specified length of electro-magnetic wave, and the receiving instruments are also made selective so as to receive as nearly as possible only the desired wavelength. International regulations govern the length of wave on which the various classes of messages are sent. For example, ship to shore traffic is generally conducted on 600 meters; the call for a ship or coastal station is made on that wavelength. If the air is not congested at that moment the message is then transmitted on that wavelength; but if it happens that several ships are working in the vicinity, to avoid interference the operators, by agreement, shift to a band between 300 meters and 450 meters or a band of wavelengths above 1800 meters, also designated for this class of message traffic.

A great number of messages thus can be transmitted through the air at one time without causing interference or confusion. The generally used wavelength bands run from 200 meters, used by the amateurs, up to 20,000 meters, employed by commercial trans-oceanic stations. Control of the length of the radiated wave came in the early stages of the development of radio communication and this feature obviously has contributed largely to the rapid expansion of the present day system.

The vastness of the so-called "world-wide wireless" system today is little appreciated by the general public. A score of nations in Europe and Asia are in regular radio telegraph communication with America and millions of words are exchanged in a straight commercial message business operated day and night.

A great network of high power stations is required to maintain the world-wide system of the Radio Corporation of America; powerful transmitters are located in Massachusetts, Long Island, New Jersey, California and Hawaii. South America, too, will soon be adequately provided for, and already America is conceded the foremost position in the matter of commercial radio communications. The corresponding stations abroad are located in the important communication centers of Europe, Hawaii and in Japan.

In the accomplishment of the reliable trans-ocean service which prevails today, radio telegraphy has made some wonderful strides in technical development. The old time "spark" station has made way for a newer type, transmitting signals carried on a continuous wave, through which speed and accuracy have been increased and interference reduced to a minimum. This great improvement is largely due to the development of the Alexanderson alternator, a radio frequency machine which gives an output of 200 kilowatts, and which is produced by the General Electric Company. More than a dozen of these machines have been installed in American stations.

Marked increase in the radiating efficiency of these transmitting stations has come, too, through improved design and application of the multiple tuned antenna. And of equal importance is the corresponding development of long-distance reception, whereby messages are now automatically transferred from the receiving station over land wires direct to a single office located in the heart of New York's financial district, there to be recorded automatically at high speed in ink on paper tape and transcribed on message blanks by operators.

Guglielmo Marconi as he is today; the inventor who at age eighteen established and attained the definite objective of radio communication

By this method elimination of the human relay at the receiving station has been effected, an obvious saving in time and an aid to accuracy. Of still more recent date is the new method devised by which two or more radio signals may simultaneously be transferred to the central operating office over a single wire, and the concurrent development of devices which make it possible to receive signals from four European stations on one receiving antenna without mutual interference.

Only a few "high spots" have been touched in the foregoing reference to the radio system existing at the present day; it includes, of course a commercial organization represented in principal cities by branch offices, and a messenger service adequate to take care of message traffic—a traffic which has grown within the past two years to something more than twenty per cent. of the total business handled by seventeen cables connecting the old world with the new.

THE RADIO CORPORATION

The Radio Corporation of America was formed as the result of an appeal from Government sources calling upon the patriotism and vision of the great electrical industries in the United States to establish an American-owned, operated, and controlled radio communication company, powerful enough to meet the competition of the radio interests of other nations and to develop the new art to the greatest possible service of the American people and the American Government.

The supreme inventive genius of the country, the greatest organizing ability, and the most powerful resources were placed at the service of the new art, with the result that radio has made greater strides in the past two years than it had in the ten years previously. The Radio Corporation of America now enjoys the benefits of the highly developed manufacturing and research organizations of the General Electric Company, American Telephone & Telegraph Company, Western Electric Company, United Fruit Company, Wireless Specialty Apparatus Company and the Westinghouse Electric & Manufacturing Company together with its subsidiary, the International Radio Telegraph Company.

A BROADCASTING FEAT

The greatest feat of radio telegraph broadcasting, was the opening message sent from the Radio Central Station on Long Island, the super-power plant erected by the Radio Corporation of America. The station, the largest plant of its kind in the world, occupies about ten square miles of land, and when completed will cost about $10,000,000. It was built to send messages to a great many countries simultaneously. On November 5th last, it was officially opened to service by President Harding, who by pushing a button in Washington started the apparatus on Long Island and automatically sent out to the whole world a message of greeting from our nation's Chief Executive. That message was received simultaneously in twenty-eight different countries. It was received directly as far as New Zealand and Australia, Japan and in South America. It was a feat that meant practically an instantaneous encircling of the

globe with a single message. It was one of the crowning achievements of modern radio.

Turning to the discussion of the partially developed radio telephone, the basic principles are exactly the same as in radio telegraphy. With the radio telephone the voice control of the electro-magnetic wave is substituted for the telegraphic signal control; vacuum tubes replace the old time coil and coherer; but everything else remains the same in principle, except that in telephony, as stated, the wave is modulated or changed in accordance with the vibrations of the human voice, exactly as is the case with ordinary currents for wire telephoning.

Transmission of speech or music has been made possible almost entirely by development of that marvelous device, the vacuum tube. In physical appearance it resembles an ordinary electric light bulb, but inside the glass bulb are three metallic elements, a plate, a filament, and a grid. A single one of these vacuum tubes, of fair size, can generate as much power as would run an ordinary fan motor, or about one-sixteenth horse power. There are tubes now being made which generate a power of twenty kilowatts, or nearly thirty horse power.

POSSIBILITIES OF THE RADIOPHONE

What are the possibilities of radio telephony when the art will have developed to the approximate perfection of wireless telegraphy? It is difficult to keep one's feet on the ground in contemplating the subject. It staggers the imagination.

Think of radio telephony as a means of better understanding between man and man, creed and creed, and even nation and nation.

On a recent Sunday, while I was at home, I listened to a sermon delivered by radio by Dr. Foster of Newark; it was a sermon on religion. His opening remarks ran somewhat as follows: "I cannot address you as citizens of Newark, because my voice is being heard beyond the limits of the city. I cannot address you as fellow Americans, because my voice is being heard perhaps in Cuba, in Canada, and in Central America. I cannot address you as brethren of my faith, because only a very insignificant part of the great number who are listening to me are of my own faith. And, therefore, I must address you as fellow human beings."

He struck a chord which, I am sure, was answered by every intelligent man or woman within the hearing of his voice, regardless of religious affiliation, regardless of nationality.

Consider that the great difference between man and animals is the fact that man can express himself, and that human beings have the ability to make others of their kind understand what they think and what they would like them to know. With the coming of the telegraph, man learned to transfer that power of expression to a telegraph operator, and thence to the wire. With the wire telephone, he found that he could himself send his message to a given point. And now with radio broadcasting he can radiate not only his message, but his very personality; and that power is a very wonderful one.

As an internationalizing agency, radio broadcasting is an instrumentality which, if properly used, may well break down prejudices, help men to understand each other, sway and even govern national and international motives by bringing the personality, the intelligence, and the thought of the world's great men to millions and hundreds of millions of people everywhere. It is right to think of this wonderful invention in terms removed from mere amusement; to conceive it as leading to something more than the hearing of a sound.

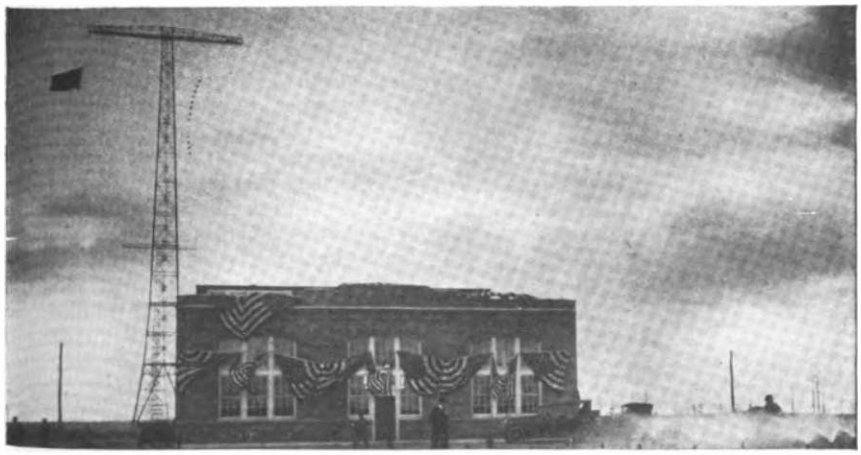
School children are already receiving the baseball scores via radio, as this picture shows, but soon they will receive classroom instruction by the modern method of communication

FUTURE DEVELOPMENT

Radio communication of the future obviously tends to include all moving vehicles; it is already beyond the experimental stage for installations on ships at sea, submersibles, in aircraft, and railroad trains. It is reasonable to expect its eventual application to automobiles and even in some cases to individuals.

In a competitive sense, the future of radio is equally bright. Its opportunities in long distance communication are manifold, as evidenced in the single fact that messages can be sent through the air at tremendous speeds of transmission and, commercially, more words per minute mean less cost per word. With lessened cost, there will naturally be created new classes of service until the day may come when a business man will look upon the writing of a letter to Europe on an urgent subject as an archaic practice.

The practical vision of the future of radio does not include, however, the scrapping of undersea cable systems: radio will supplement, rather than supplant the cables. In the first place, experience has shown that new inventions usually result in the improvement of previously existing methods. In the second place, communication facilities always have been inadequate—just as new subways never quite relieve congestion—and the increase in facilities will cause increase in new services. It is inconceivable that the development



Radio Central Station, which is credited with having accomplished, in its transmission of a single message simultaneously to twenty-eight countries, the greatest radio broadcasting feat in history

of the transmission of intelligence will go forward at a leisurely pace; everything points to a very great acceleration. In putting an end to the single point-to-point limitation imposed upon the cable, radio will become the dominating method of conducting long distance communication and will hold that leadership.

In some measure, the same considerations apply to the future prospects of radio telephony over land. In the mobile services, in connecting up isolated communities, and the shore with the sea, there is a rich field for development. That radio will supplant the wire telephone is not to be contemplated. Wire telephone communication, as we know it today, has the greatest utility for the type of service rendered. It is a wonderfully developed and complete system for seeking out for the user, through a wire network and the central exchange personnel, the particular individual wanted. This entire system, this entire service, would have to be duplicated to establish radio telephony on a parity in usefulness; and even if this were technically practicable with radio telephony—which it is not—there is no economic justification for such duplication. The radio telephone, on the other hand, has a large sphere reserved for it in reaching locations where wires cannot be placed or maintained, in spanning inland waters or connecting up islands off the coast. As a supplement to wire telephony alone, radio is assured of a great future—which again directs me to the subject of broadcasting, a field that distinctively belongs to radio.

EARLY BROADCASTING PLANS

To those of us who watched every step in the onward march of radio, who saw scientific principles shaping themselves into business facts, who sensed the trend of research in the development of wireless, the instantaneous success of radiophone broadcasting has not come as a surprise. In 1915, from the possibilities that could be foreseen I had worked out a plan for radio broadcasting in commercial detail, and submitted it for consideration by my Company.

The time was not ripe, however, for action on this project; we were in the midst of war activities and the devices for radiophone transmission and reception had not been perfected to the point they have been brought to at the present day. Broadcasting is a reality now, and it has been made possible only by fine co-ordinated effort within the industry, a large part of the credit being due to the Westinghouse Electric and Manufacturing Company for being first in establishing it on an organized basis. Radio telephone broadcasting is not in itself an invention; it is the application of principles previously established.

The hearth-side circle is only a small part of the unmeasured sphere of its influence, however. Country schools cannot afford to employ the best teachers or the most able lecturers. Think of a system of rural education, augmented through the setting up of a broadcasting station with a range of several hundred miles, and connecting up within that radius a thousand country schools! Appraise the benefit of having one skilled lecturer in history or geography, or hygiene, or whatever the subject may be, deliver his lesson as the children listen in their schoolrooms, possibly with the interspersing of appropriate items of entertainment and music to hold the children's interest.

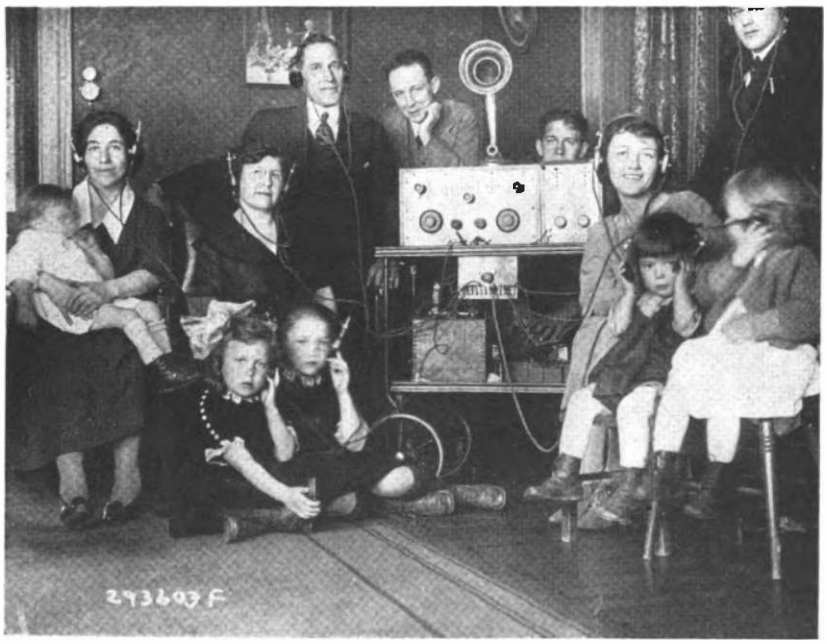
And what may we expect when the telephone reaches across the ocean? Up to the present time there has been no way for trans-oceanic transmission of the human voice, because the cables lying on the bottom of the ocean are not suitable for speech transmission. They can carry feeble currents for telegraphy, but not for telephony, because of the distortion of the speech, and other technical reasons. But with the radio telephone, it may be predicted that within the next few years, and possibly sooner, we shall be talking across the Atlantic Ocean. It will be possible then for a man in New York to pick up his ordinary wire telephone, secure connection with the radio telephone station which will carry his voice across the ocean and connect up with his partner or business associate on the other side.

PHONING OVER THE OCEAN

Trans-oceanic radio telephony is not a theory; it is an accomplished fact. Speech was first transmitted to France by the American Telephone and Telegraph Company; and even a greater distance was covered by its engineers when their equipment at the Arlington Naval Station, near Washington, enabled speech to be heard in Hawaii. This company and the associated engineers of the Western Electric Company have attained very practical results in their experimental work in the ship to shore field, enabling me a few evenings ago to talk from my home, over the ordinary wire, to the Captain of the steamship *America*, 400 miles out at sea. On board the ship was a highly developed ship radio telephone transmitter made by the General Electric Company.

Consider also one application of international broadcasting by radio; an international conference to make open covenants openly arrived at—and the whole world "listening in." Some day, and perhaps in the not very distant future the dream will be a reality. When it is possible for the peoples of the world to listen to the deliberations of statesmen, to have first-hand knowledge of the functioning of their Executives in power, then the voice of the people may literally be heard.

The position of radio at the moment is a conspicuous one, not alone in the fact that it has suddenly caught the public fancy, but because the country wide buying movement of radio devices was begun in a period of business depression and the public's welcome to the new art brought needed stimulus to the great electrical industry. It will grow more conspicuous from day to day, with new uses and new develop-



The hearthside circle where broadcasting exerts its great influence for good is well illustrated by the family of Alfred Rinehart, Jr., every member being a radio fan

Mme. Meluis presents a striking stage appearance

"AMATEURS have no business broadcasting. It takes years of experience to develop that art," said the well known coloratura who has become a great favorite with radio audiences. "The secret lies in a correctly trained voice"

An Interview With

Mme. Luella Meluis

By Sydney R. Burke

I WANTED to know what secret Mme. Luella Meluis has discovered that gives those who listen in on the radiophone the very maximum of enjoyment. So I asked her.

"I always explain my songs to my audience," she replied, "by talking to them slowly and clearly. It adds great interest.

"I also ask them to write me and give me their true opinion of my work and my songs so I can know what to sing to please them.

"In other words, I try to put my personality over the radio, broadcasting right into the very hearts of my hearers."

This seemed to me the answer why the talented coloratura soprano has acquired such a tremendous following among radio telephone enthusiasts.

But when I called upon the favorite of the concert stage in her Long Island home I discovered a second reason for the genuine popularity that exists for her. It was there that I learned that this singer of repute throughout both America and Europe, is a real radio fan herself, and that she owns and operates regularly a powerful and expensive radio set. She has made a study of radio reception and the thought she puts into her broadcast programs is the result of the constant application she gives to acquiring a greater knowledge of the technical side of radio.

"I have made a study of broadcasting," she told her interviewer, "in order to learn just how to be heard to best advantage. As you see, I have a very finely equipped outfit and I am interested from the scientific end. In fact I am working now during my spare time perfecting a little instrument that if successful, will greatly aid singers in producing more of the true quality of voice over the radio."

"What," I asked her, "do you do that makes you heard so more plainly than many others?"

Letters—hundreds of them—she has received tell repeatedly that her voice came over most clearly, and the reason for this as determined by Mme. Meluis, I thought would be of interest to the broadcasting fans. She had, I found, analyzed carefully the elements making up the secret of her remarkable success.

"It is very simple," she said. "One must greatly accentuate all consonants and vowels when broadcasting, as words are very important. The audience cannot see the artist so all the imagination and attention of that unseen audience is concentrated on two things: quality of voice and diction. Amateur singers have no business broadcasting, as it takes years of experience to develop art. Besides, unusual quality of voice is required to 'go over' successfully, to make any kind of an impression."

Radio fans may readily see from the above that Mme. Meluis has given more than casual thought to the matter of air entertainment. She often has been referred to as the "Galli-Curci of the wireless."

This unsual artist in real life is Mrs. W. F. Melhuish, Jr., wife of a Wall Street broker. Her husband is as deeply interested in radio as she, and together they are endeavoring to perfect the device she hopes will make the tone quality of the broadcasting artist even more satisfactory than it is now.

Back of the impeccable technique, finished musicianship, pure tone and vocal authority which made Luella Meluis successful in Paris, Nice, Monte Carlo, Cannes, and other European centers—back of her complete proficiency alike in concert and opera—stands a record of hard work and unswerving purpose which completely filled her youth from childhood to maturity—the same determination she now is showing in her radio activities.

The celebrated star was born in Appleton, Wisconsin, and showed promise at an early age. At sixteeen she entered the Chicago Musical College, studying voice with Herman Devries.

For a year following she studied French opera repertoire with Mr. Devries, and then she went to Europe where she sang for Jean and Edouard de Reszke. They were so impressed they agreed to prepare her for opera, but this training was interrupted owing to the outbreak of the World War, which compelled her return to America.

Her first American recognition came after accepting an offer from the Keith vaudeville interests, and she is believed to have been the first American artist to introduce grand opera to patrons of this class of entertainment. At the end of two years she returned to Europe and resumed study.

It is interesting to note that during one of her recent radio concerts she sang in five languages, Italian, English, Swedish, French and German, and she had replies from persons of each of those nationalities telling her in no uncertain terms how greatly her efforts pleased them.

Before I left her she repeated a request she had made earlier in the conversation to assure all radio fans that she is one of their real friends, and that they will hear her often if the opportunities will permit.

Mme. Luella Meluis probably holds a record among singers of note and ability in the number of radio concerts given. She has sung brilliantly over the ether wave no less than five times in the East and in Chicago.

Business Growth

IN submitting national figures covering radio broadcasting, Arthur Weisenberger, director of the Bureau of Research and Information of the National Retail Dry Goods Association, indicates the surprisingly large growth which has taken place within a short space of time. The data, in the form of a comprehensive survey, have been compiled with particular reference to the part the department stores play in radio merchandising.

It is brought out that broadcasting stations of the standard 360-meter wave length in the United States number over 100, representing a 50 per cent. increase within the last month. Department store broadcasting stations of this type are stated to have increased 100 per cent. during this period, and, at present, constitute 13 per cent. of the total number. There are more than 200 manufacturers engaged in the manufacture of radio apparatus, according to the survey, and their number is growing.

An interesting fact brought out in the figures presented is that there are more broadcasting stations in the Middle West and on the Pacific Coast than there are in the East. In each of these groups of States, the number of stations broadcasting is thirty-six, whereas there are only twenty-eight in the Atlantic seaboard group.

Movie Studios Use Radio

MARSHALL NEILAN, it is announced, is the first film producer to install a radiophone at his California studio. The players are at the studio from nine in the morning to midnight practically every day. Much tedious waiting is experienced by players when scenes are taken in which they do not appear and between scenes. This is especially trying on players when working long shifts.

Neilan has discarded the phonograph and substituted the radiophone, which gives the players great diversion and keeps them pepped up and fresh when they are called to appear before the camera. The players are now dancing to famous orchestras, listening to famous singers, or hearing the news bulletins when not actually before the camera.

Mary Garden Likes Radio

RADIO telephony has a new "fan" and Mary Garden noted opera star and directoress of the Chicago Grand Opera company, has a new "hobby."

Miss Garden on arrival in San Francisco recently, with her company of song birds for two weeks of opera ordered as her first official act installation of a radio telephone set in her hotel room.

First "Wireless College"

ENTERING a field of almost limitless possibilities in the realm of education, Tufts College has announced the completion of plans for what is probably destined to be the world's first wireless college. This college already has a "faculty" made up of some of the most eminent scholars in their respective departments, who, by means of the radio telephone broadcasting apparatus at the American Radio and Research Corporation plant at Medford, Hillside, Mass., will twice a week give free lectures to more than 35,000 persons.

Nothing approaching this plan for spreading instruction has even been devised even by extension or correspondence schools. Some of these institutions number their pupils by the thousands, but the limits of the new Tufts Wireless College are marked only by the number of people who cannot afford to purchase the simple and inexpensive apparatus for receiving wireless telephone messages. There will, of course, be no charge for instruction. In having no tuition fees, no buildings, no campus, no enrollment, the Tufts Wireless College will be unique among colleges of the world.

In the initial statement it was made clear that the lectures will be of a popular nature and not beyond the understanding of the thousands of young men and boys between the ages of fifteen and twenty-five who are especially interested in wireless. Also the lectures will not exceed thirty minutes in length and will be delivered in such a way that "students" can take notes if desired. Some of the lectures will be given in the afternoon in order that women, many of whom are taking an interest in the radio telephone, may listen. Those in charge of the course at Tufts point out that by the use of the sound amplifier it will be possible for scores of persons to hear the same lecture from one receiving apparatus.

The Radio College at Tufts. Left to right: Dr. Arthur I. Andrews, Prof. Edw. H. Rockwell, Dean G. C. Anthony, Prof. A. H. Gilman.

Music For N. Y. Busses

RADIO music was received recently on a New York City motor bus, it was announced by the Fifth Avenue Coach Company, of that city. It was not necessary to erect antennae or to construct a dragging ground wire. The metal roof of the bus served as an aerial and the counterpoise grounding was accomplished by attaching the ground wire of the radio set to the rail of the bus stairway.

The radio set was a Westinghouse senior, with ear receivers. Starter Zimmerman held the receiving set in his lap and enjoyed the noon programme from WJZ in Newark, while Joseph Conniff stopped the bus on Riverside Drive at various points from One Hundred and Thirty-fifth street to Ninety-sixth street and back. No interference was experienced and the radio novelty was enjoyed by the passengers.

Experiments are to be continued with receiving sets and amplifiers on the busses.

Radio At Reformatory

THE New Jersey State Reformatory for Boys, at Rahway, will install a complete wireless receiving outfit for the benefit of the 500 inmates. The complete radio set with amplifiers is the gift of the Radio Corporation of America. Boys will be permitted to attend concerts every night provided their conduct has been good during the day.

Plan Regular Farm Service

VEGETABLE market reports from the Indianapolis, Pittsburgh, Chicago and Cincinnati markets soon will be sent to Indiana vegetable growers by radio twice daily, according to H. B. Brown, of Lafayette, secretary of the Indiana Vegetable Growers' Association.

The vegetable market reports will be sent from radio station WOH of the Hatfield Electric Company, at 10:15 a. m. and 4 p. m., in conjunction with the live stock market reports now being sent out daily by the Indiana Federation of Farmers' Associations.

An effort is being made to get the United States government to supply radio service that will give information concerning the daily vegetable market in Chicago, Cincinnati and Pittsburgh. A request has been made to have this information sent by radio or telegraph from Washington or some other station, direct to the Indianapolis radio station. From this station it will be broadcasted so that the farmers and vegetable growers who have receiving sets as well as the country farm agent may pick it up.

Rudy Wiedoeft Says:

"Radio Will Help The Musicians I Am Sure Of That"

Star saxaphone player is convinced that the public attends concerts not only to hear the music, but to see the musicians as well. However, he is equally certain radio has found a permanent place, and he says so in the following interview.

By James N. Barnes

SOME few years ago—not so long, but that most of us remember it—there was a nation-wide wave of enthusiasm for saxaphone music. The fever to learn the instrument of melody found victims alike among the young and old.

In 1914 a young man—by the difficult-to-spell name of Rudy Wiedoeft—quit playing his regular instrument, the clarionet, and adopted the saxaphone, and he so concentrated his study of the new harmony maker that eight years later—1922—we find him recognized as "the greatest saxaphone player in the world." The term "greatest" is, unfortunately, very easy to say and often can be quite vague and meaningless. But Rudy has no peer on his chosen instrument; all musical authorities agree on that.

Those who have heard Rudy Wiedoeft play, and this includes a host of radiophone listeners, know it, too.

Like all instrumentalists who have devoted years to the making of music records, Wiedoeft found that his recording experience helped him in his broadcasting, for the fundamental points of execution are the same.

"I believe the time will come," Wiedoeft told the writer, "when music records will be recorded by radio. I will be able to play in Chicago, for instance, and have the record made here in New York. From my viewpoint, this is one of the most practical usages to which the radio telephone may be put."

Wiedoeft had one amusing experience that he wants to pass on to the radio public.

Sure "She's" Sweet!

About a week after he broadcasted, some lovesick swain in a state nearby New Jersey, who thought that the announcer had said "Ruby Wiedoeft" instead of "Rudy Wiedoeft," wrote the following:

"Dear Madam: I am taking the liberty of writing you after your wonderful concert over the radio tonight. I am sure you are as sweet and as beautiful as the glorious music you sent over. Won't you send me your picture so that I can put it on my wall? Please do, Ruby dear. And won't you write to me and let me know if you ever come out this way? I would like to meet you very much. Devotedly yours, ..."

Rudy and his wife had a good laugh over it.

Rather than spoil the illusion, for Wiedoeft is surcharged with a finely molded sense of humor, he did not send the photograph, though he was tempted to get a picture of some circus "bearded lady" and send it on to the smitten youth.

In order to present this star saxaphone player to the radio audience I asked him to sketch his history briefly.

From the Wiedoeft melody, or even the Wiedoeft photograph, the public cannot tell that it was as a boy of nine years that he commenced his professional experience. Yet that is the fact. His home is in Los Angeles, where incidentally he recently organized a twelve-piece orchestra which soon will come East, and which he claims will make "every other orchestra of its kind sit up and take notice." He has handpicked his men, he says, and every one is a real musician; each one a soloist equally capable of perfect playing of an operatic aria or jazz number.

A Husky Chap

In 1917 he toured the country on the B. F. Keith vaudeville circuit, and following that he appeared in "Silks and Satins" a musical production in New York. In appearance he could be called "husky," which helps him, he says, for to get the best results from the saxaphone one must use considerable "wind."

The saxaphone, Wiedoeft adds, lends itself especially well to radio broadcasting, in that it only has a range of two and a half octaves, thus making possible the clear transmission of every single note.

Wiedoeft is certain radio will "help the musicians' game," as he put it. He does not believe there is any occasion for alarm among musicians in that unemployment will be created because of the broadcasting of music.

"After all," he told me, "radio music is somewhat like phonograph music. It is 'canned.' People like to see the musicians. I don't believe that the number of orchestras will be reduced by virtue of the possibility of several houses being able to utilize one over the radio. The general effect will be a greater demand for orchestras, because radio is educating the people to a greater appreciation of music."

The saxaphone has been more than an Aladdin's Lamp to Rudy Wiedoeft. It has been the "Open Sesame" to many a palatial Fifth Avenue mansion.

On one occasion, a very wealthy and influential New Yorker called Rudy on the telephone and begged for an appointment. Rudy won't tell the man's name, but he assured us that were he to tell it, folks out in Timbuctoo would recognize it as readily as would those on Wall Street.

The wealthy gentleman wanted Rudy to teach him to play the saxaphone. He had heard the star player over the radiophone, and had rushed out to buy an instrument—nay, two of them of different sizes. Rudy told him he did not make a practice of giving lessons, and so the wealthy New Yorker insisted Rudy come to his home as his guest, and even begged Rudy to come down to Palm Beach, Fla., to pass the winter!

The Perfect Fool

"MAMA ETHER, Papa Ether, and all the little Ethers are having a whale of a good time up there these nights, or else they're taking a lot of punishment!" So says the star comedian and producer of the first entire musical production to be broadcast

A Talk With

Ed Wynn

By T. J. Dunham

SUNDAY night, February 19th, 1922, must go down in the history of radio broadcasting as the night on which the first successful attempt was made to broadcast an entire musical comedy production. To WJZ station, Ed Wynn, producer and star of "The Perfect Fool," took his company.

More than two thousand letters from as many different points scattered throughout the United States and Canada, and from ships out at sea, testify volubly to the success of the undertaking which, incidentally, required nearly one hundred persons from the George M. Cohan Theatre in New York City, to journey to Newark, and these included an orchestra of twenty-six musicians under the leadership of Leon Rosebrook.

To lend atmosphere to the performance a considerable part of the wardrobe of the company, used in the nineteen scenes of the play, was taken along and as each of the different episodes were presented and sent out into the ether through the microphone, rouge, powder and all of the essentials necessary to milady's make-up were brought into play.

Only the sight of the pretty chorus and the scenic effects were missing. Even the clog dance was reproduced, when the mirophone was lowered to within a few inches of the floor and it recorded faithfully the tap—tap—tap of the jigging feet.

Dramatic and musical critics in the principal cities of the country where "The Perfect Fool" is scheduled to appear, were invited by letter to listen in on what really may be called an "advanced first night" of one of the season's biggest musical comedy successes.

By Ed. Wynn

"Remember the fellow who mailed a postcard to his brother forty miles away? Eleven years after it was mailed it was delivered. I can readily appreciate the poor fellow's feelings. I am still getting letters from those who listened in while I broadcasted. Like giving a performance and waiting two months for applause!"

* * *

"Mama Ether, Papa Ether and all the little Ethers are having a whale of a good time up there these nights, or else they're taking a lot of punishment!"

* * *

"A first night on the radio may come after the thousandth performance on the stage—but it always will be good for a first class case of 'stage fright.'"

* * *

"The ether did not seem to effect me for the reason, I suppose, that when I was a mere boy, I had three teeth pulled and—I'm used to Ether."

* * *

"Another thing. My father used to hire tailors, and they smelled of ether."

* * *

"As I was to do broad-casting, I wore my broad-rimmed hat; thought it might help."

* * *

"I tried to radio-ate good cheer, but it is very discouraging not to have reciprocity with a return laugh or even a giggle."

Among the persons who took part in this pioneer movement besides Mr. Wynn, were True Rice, John Dale, Jay Velie, Flo Newton, Estelle Penning, Anita Furman, Janet Velie, and the girl quartette composed of Harriette Keyes, Persis Babcock, Lorna Lincoln and Ivy Kirkwood. Even the little Japanese trio, which takes an important part in the show, contributed its share in this really epoch-making event.

It was this Japanese trio, Toma, Kiku and Yoishie Meyako, upon a specially prepared dance pad that sent out the "pitter-patter" of their intricate and distinctive dance.

I dropped into Mr. Wynn's dressing room at the theatre recently. There was the star, busy with his grease paint, preparing for the evening's entertainment. His weird collection of hats, those funny little things he uses to provoke mirth, were also receiving his careful scrutiny. Wynn takes pride in those hats.

He was bubbling with enthusiasm about his broadcasting. I asked him what he thought about it all, and without hesitation he said— and there was no joking this time—that "radio has brought new life and happiness to the human race."

"I have a recollection of my first appearance on a platform before an audience which jammed Franklin Field, Philadelphia," he continued.

"My club was giving a program of some kind for charity. I marched on the huge, especially built platform bravely. My job was to introduce the various events as they were to occur. I picked up the megaphone for the first announcement and lifted it to my mouth, endeavoring to speak.

"But I couldn't say a word. Just scared to death. Talk about thrills! I was speechless. Never since have I experienced that terrible sensation, and since that time I have taken active part in many public functions.

"But it was left for a near repeti-

tion of such a condition to be repeated on the Sunday we broadcasted the performance.

"I know now what real stage fright means. Try as I may I just couldn't bring myself to a proper adjustment. First my hat was misplaced and then it was my collar that seemed to be askew. Foolish, of course, as the people couldn't see me, but it was just the novelty of it all, I reckon. I started off wearing the wrong costume, and my introductory music didn't seem to be played in the right tempo."

His valet called him for a scene, and I watched him from the wings. Upon his return, and while the house was still roaring from his witty sayings, he took up the thread of the conversation in a most skillful manner.

"Science," he said, "certainly is filled with alluring romance. Look at the telegraph, telephone, dictaphone, and now the radiophone. . . . to say nothing of *my* inventions," he added humorously.

He referred to one of his little skits, wherein he introduces to the audiences his most recent inventions. One shows a "patented" cup and saucer, built and designed especially for those who, in the habit of drinking coffee from their saucers, experience a most irritating nuisance, not to say costly, through the spilling of some of the coffee during the operation of transferring the fluid from the cup to the saucer.

I won't divulge Mr. Wynn's marvelous secret, but it may be said emphatically that he eliminates the spilling entirely. Then, too, he has an invention for eating corn on the cob, so that human hands avoid the usual smearing of butter, and his invention also prevents the corn from sticking to the cheeks.

"It was Theodore Roosevelt, I believe," continued the comedian, "who said that ninety per cent of one's success depended upon personality. But Roosevelt did not reckon with radio. It would seem to me that personality had become a secondary consideration when appraising the varied ramifications born in the broadcasting of our mental thoughts. Personality counts for much, but who can say that the personality is lost in transmission of voice by radio? I don't think it is, although I realize many disagree with me.

"You remember Bellamy's 'Looking Backward.' Nearly all of his prophecies have come true, in fact many things that now are a reality were undreamed of in Bellamy's imaginative mind. The one thing that impressed itself upon me during the broadcasting of my play was the simple verity of that old saying, 'truth is stranger than fiction.'"

ED. WYNN ASTRIDE HIS "RADIO AUTO"

By George

"TO begin at the beginning" as Hans Anderson said, it is necessary to point out that this is a very serious anecdote. It concerns a marvelous invention. To fully understand, it is necessary to tell you about the inventor. He is none other than Ed Wynn who outside of his more serious role as an inventor of radio equipment, is "The Perfect Fool," before capacity theatre crowds.

Not only is Mr. Wynn thoroughly efficient himself, being about the funniest man on the American stage, but he also is careful in his selection of men with his organization.

For instance, there is his publicity man, Mr. P. Hill, who has a remarkably fertile brain. It was his idea to establish radio history by having the entire show in which Ed Wynn is starring broadcast from WJZ. This marked the first broadcast of an entire musical production, as described on this page.

The experience seemed to have imbued Mr. Wynn with a creative genius that would have done credit to Marconi himself, or possibly the inventive genius was created within Mr. Hill's fertile brain—no one seems to know—at any rate it was Mr. Hill who handed me the photograph you see reproduced on this page. I turned the picture over and noted that the caption on the rear read—"Ed Wynn, The Perfect Fool, in his radio guided car." Mr. Hill then told me:

"Yes, you see, it was this way—Ed Wynn becomes very tired in the course of the performance every night. In fact, he is utterly exhausted at its conclusion, so he equipped his automobile so it could be controlled by radio and each night as the tired Mr. Wynn stumbles helplessly out of the theatre stage entrance and flops on the seat of the auto, utterly exhausted, Mrs. Wynn from her home on Long Island touches the key and guides the auto containing The Perfect Fool into the garage on the estate."

! ! ! ! !

Without a smile, in fact, very seriously, I re-examined the photograph. As you can see, it showed Mr. Wynn straddling the radiator of his automobile. Just outside of the wind shield there was a small Aeriola Junior set and perpendicularly between Mr. Wynn and the receiver a spiral aerial.

"Very remarkable," I said, "quite remarkable."

"Yes, yes," Mr. Hill said enthusiastically, "yes, yes!"

I murmured that "there seemed to be a very wonderful story here."

"I should say so—a very remarkable story," interposed Mr. Hill quickly.

And there is.

This picture proves that Mr. Wynn is a good comedian.

W J Z

A Trip by Picture and Printed Word Through the Radio Corporation—Westinghouse Broadcasting Station at Newark, New Jersey

THE birthday of the now famous WJZ station was coincident with the initial use of radio in an-

ing the upper horizontal part about 200 feet above the street level. The aerial "flat top" consists of 6 wires extend-

of the General Electric Company, and J. Andrew White, Editor of THE WIRELESS AGE.

Frank Conrad of Pittsburgh, Assistant Chief Engineer, C. E. Stephens and J. A. Whaotton of the New York office, are also given credit for their efforts in earlier stages in the development of WJZ.

Hundreds of letters are received at WJZ from those who hear the concerts. These letters are used as a basis from which to work up programmes and no suggestion is overlooked. Not every suggestion is followed of course, but all receive consideration. Criticism is valued, but only on receipt of a considerable number of complaints of any particular feature is a change made. As an instance—someone wrote in protesting very vigorously against broadcasting of music composed by Germans. No attention was paid to this communication in view of the fact that popular sentiment does not reveal the same expression.

The attitude of the officials is, however, that radio belongs to the people, and that every effort be directed toward giving the people the kind of entertainment they want.

LETTER FROM CANADA

It will be of interest to reproduce herewith one of the many letters which the company received. This one is from S. H. Rushbrook, aboard the cable ship "Lord Kelvin," and was mailed from Halifax, Canada. It follows:

"It may be of interest to you to learn that I have been receiving your radio concerts during the evening, a distance of nearly 1,700 miles from your station.

Original Studio at WJZ. This photo shows the Kouns Sisters singing into the microphone

"My ship was stationed off the Azores for over six weeks, during November, December and January, engaged in cable repairs and, on account of this was able to stand by for you night after night at this distance. I was using the ordinary ultra-audion circuit with one step of radio amplification only, and the music the majority of the time was remarkably clear and strong."

Wireless operators aboard ocean-plying vessels write that the broadcasted concerts are giving much to brighten the lonely hours spent away from shore. They send in copies of their logs and they always urge that under no circumstances should WJZ cease its efforts.

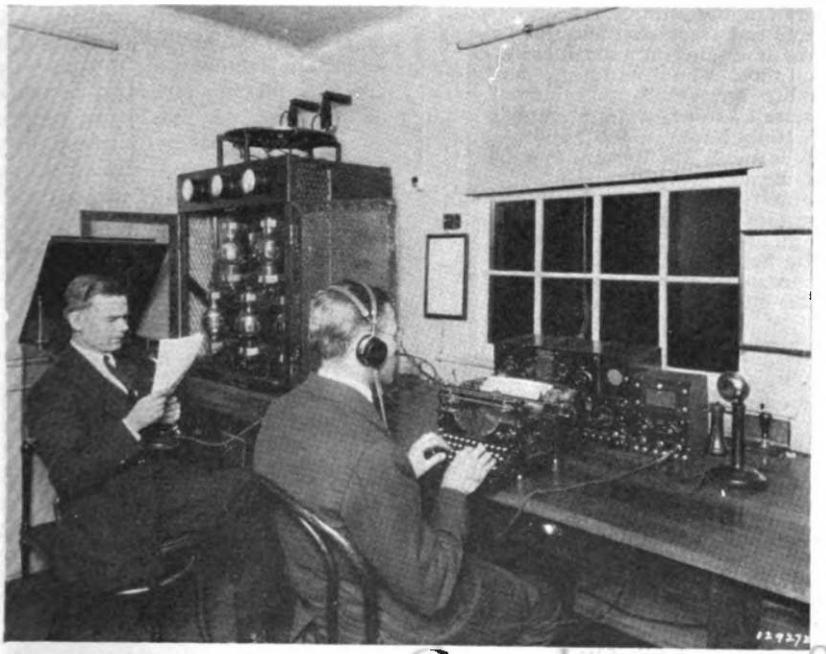
In closing this little sketch of WJZ it seems appropriate to include the communication from two wireless fans —"C. H. and H. E. H."—who felt the urge to try their hand at poetry; they prepared and sent in the following:

"GOOD NIGHT, ALL"
To W J Z

We're two poor hicks, who listen in
Each night from out at Lisle;
To song and story, harp and flute,
And quips that make us smile.
But all these things as nothing are
Compared with, when we hear,
Your voice across the wireless wire,
Announcing, loud and clear,
W J Z Good Night.

You see, we're only simple things,
So rustic and demure;
And though we have a lot to learn,
Of one thing we're quite sure.
We'd hate to miss the kick we get,
So personal, you know,
When floating through the damp night air,
Your voice comes, soft and low,
W J Z Good Night.

And so we take our pen to hand,
To tell you how we feel;
So lonesome and so desolate,
(Ah, life's more woe than weal!)
Our husbands listen, too, 'tis true,
But they're of coarser clay,
I do not think they get the thrill,
That we do when you say,
W J Z Good Night.



Station on the roof at WJZ, where the voices and music transmitted from the studio is amplified several thousand times and changed into electro-magnetic waves

Helen Yorke Outdoors

"IN the excitement of the knowledge that I was to send my voice through the air I quite forgot about an operation I was to have in two days!" And a chuckle accompanied this charming admission

Edwin Hall, An Interviewer, Seeks

Helen Yorke

And Discovers a Young Opera Star With Three Loves—Home, Out-of-door Exercise, and the Operatic Stage

8 P. M. RECITAL BY HELEN YORKE

THAT was the simple announcement on the regulation program of WJZ, on a certain Sunday night not so long ago. Helen Yorke sang, and the radio audience was charmed by the clear and colorful notes of her well rounded voice.

I too listened in that night. In her singing I not only detected the charm of a skilled and trained voice, but youth as well, and I felt certain that the other listeners would feel as I, and want to meet her and know her better. So I sought her in her New York apartment where she lives with her mother.

I *found* youth—youth whose eyes sparkled with a native enthusiasm; youth with wholehearted craving for the beautiful and health-giving things of life; youth that despite a splendid assurance and reserve built up from a contact with the world of art, still maintained a charming and contagious unsophistication. That is the Helen Yorke you heard over the radiophone—beautiful, young, vigorous, talented.

"Come right in," was her greeting; then, after introducing her mother, "I've just been ironing," she added with a chuckle.

"But I never knew that opera, radio, and concert stars ironed?" I said half in jest.

"What is that slang phrase?" she ruminated, and then answering herself, "'you don't know the half of it!'"

Perhaps—but I know now.

A thing the public does not know about the brilliant singer is that she is thoroughly "domesticated," as she herself expresses it. When she told me she had been ironing she did not say it as some might have, merely to make an impression with the public that she was not "up stage." She really had been ironing and taking considerable enjoyment from the supposed drudgery.

The choicely furnished and appointed apartment of the star and her mother overlooks beautiful Central Park at 107th Street. In one corner of a living room in which you immediately feel at home, is a phonograph and, strange to say, in the entire collection of records in the Yorke household there is only one which was made by the singer herself, despite the fact that she has made very many of them and they have had an unusually heavy sale. But she is far too modest to force upon visitors her own creations.

To really commence the story of her broadcasting on that Sunday night, it is necessary to go back about two years. She was riding on the subway one day when some very stout and heavy man apparently thought that it would be much more comfortable to rest on her foot than on the corridor of the subway floor, so he placed his elephantine pedal extremity on Miss Yorke's foot immediately over what is commonly called the big toe.

Then he pivoted, grinding his heel on her foot, much in the fashion of the way the old cliff dwellers used to crush grain between huge boulders. There resulted two years of much suffering and finally her physician decided that the toe must be amputated.

Just about this time her call came to broadcast from WJZ and rather than make it appear that she did not want to sing for the public, she said nothing about the necessity of her undergoing an operation two days later. The night she sang her foot pained exceedingly, but until those who listened in (and even those who were in the broadcasting studio with her that night) read these lines, will they have the faintest idea of her bravery.

"To tell the truth," she said, "in the excitement of the knowledge that I was to send my voice through the ether I quite forgot about the operation that was to take place in two days.

"I really felt terrified in a way, not in the sense of being stage frightened, because I have sung before audiences far too many times for that, and not in the sense of the novelty of singing into the little instrument, for the experience is very similar to recording records.

"But when you record for the phonograph and it does not please you, you can destroy it and you can keep on recording them until you get just the kind of a record you want and no one knows the difference—but when you broadcast you leave no permanent record behind: you do not get a chance to correct your errors if you have any, and you have no idea of how your audience will receive your efforts.

"You wonder if they will like it; you shudder at the thought of their turning off the instruments.

"I like to have my audience in front of me where I can see them and know whether I am holding their attention; but you have no way of doing that over the radio. All you can do is to sing and give your best efforts and hope that you made an impression on them."

Which Miss Yorke certainly succeeded in doing.

Folks up New England way are right proud of (1) their summer resorts (2) their Colonial history and (3) the unusually large number of prominent opera and concert artists who claim that section as their birthplace.

One of these is Helen Yorke, the brilliant young opera singer, whose home life is sketched in the accompanying article. Radio audiences are familiar with Miss Yorke's talents and every now and then when she is singing in a small town one of those who heard her over the ether waves will make himself or herself known, to her great delight.

Miss Yorke made her operatic debut with the Mercandante Opera Company in Naples, Italy, to which country she went to complete her studies. In her own country she has had important rôles with the De Feo Opera Company, in which company she is scheduled to sing this summer in Baltimore.

Music By Radio Heard In Chile

A PARTY of Americans, residents of Iquique, Chile, have been given a forcible reminder that distance is no barrier to the rapid stride of radio communication.

This party of Americans, officials of the Nitrate Agencies, Ltd., were visitors aboard the Grace Line steamship *Santa Luisa*. While they were seated in one of the reception rooms suddenly there came to them distinctly and clear a volume of music so plain that the notes of a violin playing a solo part could be distinguished as plainly as if the artist were in an adjoining room.

Following came an operatic selection by a well known star, whose words and notes came with startling clearness through more than 4,000 miles of space —a cheering reminder of "home," of Broadway, bright lights, friends and familiar faces.

Oo! La! La!—Listen—

WIRELESS on Milady's parasol is the very latest fashion report from Paris.

A young Parisian inventor hopes shortly to enable the fashionable Parisienne when promenading the Bois de Boulogne to enjoy the strains of the orchestral music sent out by the Eiffel Tower wireless, to hear the latest scandal concerning her best friend and to receive a detailed report from her cook concerning the progress of the pot-au-feu for lunch.

This young inventor has placed the radio antennae in a parasol so that madame when expecting a commnication from home or desiring to hear a concert has only to raise her dainty parasol and "listen in."

Picks Up Radio From Philippines

THE Lamport & Holt liner *Vauban*, passed through 6,000 miles of unusual radio activity on the run up from Buenos Ayres.

Soon after clearing from Rio de Janeiro the ship's operators heard a series of news bulletins which were being sent out from the United States government radio station in the Philippines.

The messages, which had to do with world events, were exceptionally strong and clear, but occasionally they were jammed by interference from radio stations at San Francisco and Hawaii. They were heard at intervals until the *Vauban* had crossed the equator. The *Vauban's* operators said the static conditions in the Atlantic were exceedingly favorable for long distance transmission and there was much speculation on board as to whether the Philippine messages were coming over the continents of Africa or South America. The ship's officers estimated the shortest distance to be between 10,000 and 11,000 miles.

While the *Vauban* was lying in the harbor of Buenos Ayres, which is about 6,000 miles from New York, the radio operators said they read messages being sent from New York to ships at sea and got news bulletins from the British station of Leefield at Oxford.

French Trains Get Radio

NUMEROUS disastrous accidents on French railways in the last two years, which have spread alarm among the traveling public, have caused French railway officials to experiment with radio telephones in communicating between moving trains and stations.

In recent tests carried out by the Compagnie du Nord under the direction of the French ministry of public works, experimenters succeeded in transmitting orders from different points in the station at Bourget-Triage to the switching towers up to a distance of more than 400 yards. According to reports of the United States consul at Bordeaux, portable apparatus used is described as consisting of an antenna in a frame, a commutator, a stick tipped with iron to place in the ground, and a microphone, the total weight of which was fifteen pounds. Other experiments were made between places in the station and a train moving at a speed of nineteen miles an hour. The results were satisfactory as far as hearing the message was concerned. They could be heard satisfactorily during the entire time the train remained in motion for a distance of more than ten miles, irrespective of the speed of the train.

Radio for Lonely Isle

THE Rev. Henry Martyn Rogers and his wife, British missionaries, have sailed on the Tacoma Maru from Cape Town for the lonely island, Tristan da Cunha, in the South Atlantic Ocean, 1,500 miles west of the South African coast. Mr. Rogers will take up the duties of chaplain to the 119 people of polyglot mixture who inhabit the island; his wife will interest more particularly the children.

The intense isolation of Tristan appealed to the people of Cape Town. A suggestion from the staff of the Education Department there to present a wireless set to Mr. Rogers was quickly taken up and an apparatus with a range of 1,000 to 1,500 was given him.

To Trip Motor Crooks

RADIOPHONE will be used to trip up motor thieves.

This is the plan of John Wall, president of the Kansas Branch of the Anti Horse Thief Association.

"If we could have a radiophone communication between the various stations in the state," said Mr. Wall, "it would be the end of motor car stealing. By broadcasting instantaneously the information of a theft, we would have every sheriff and peace officer in the state looking for the thieves. I believe the plan has great possibilities and I am going to try to develop it to a practicable end."

With the advent of wireless communication many states are equipping various cities with wireless for rapid inter-communication.

Miss Isabelle Bennett, in Paris, demonstrates her "Wireless Parasol." All she has to do is open her parasol and listen to music sent from Eiffel Tower

"CONSIDER the little country schoolhouse. It has been handicapped for teachers because of the drift to the cities. But I believe that everything that it lost will be regained through the medium of the radio telephone"

Dr. Butler

Radio Is an Educational Force, Says

Dr. Nicholas Murray Butler

President Columbia University

In an Interview With Maurice Henle

WITHIN a comparatively short time two man-made inventions, first devised to entertain, then exploited and made to serve commercial purposes, have caught the attention of educators; for in them they have seen instruments which can be usefully applied in educational fields.

It has not been many years since the motion picture was discovered to be a medium to spread not only amusement and entertainment, but knowledge as well, and gradually a greater number of teachers of the more thoughtful school have introduced motion pictures to help them bring home to the pupil, more vividly than the printed word does, lessons in history and literature.

The other of the two inventions referred to is the radio telephone, and despite the fact that the possibilities of this device have only been sensed by the educator for weeks, as compared with years in the case of the motion picture, still the lesson learned from the motion picture has only served to quicken the appreciation of the possibilities of the radio telephone.

The above were impressions of Nicholas Murray Butler, President of Columbia University, as he gave them to me in an interview. Dr. Butler carries an enviable reputation not only as the executive head of one of our most famous universities, but he also is nationally known as a student of economic and political affairs of such standing that he received serious consideration as a candidate for the Republican presidential nomination at the last convention.

Compared With Movies

Dr. Butler maintained, throughout the interview, that the radio telephone is to be compared to the motion picture in educational fields; that what the motion picture does for the eye, radio will do for the ear; that what the motion picture will do for the eye-minded, the radio telephone will do for the ear-minded; that, while it is true that the eye-minded person has a more highly developed mentality than the ear-minded person—and for that reason the motion picture probably can do more for those whose education has been developed to a more advanced stage—still it is equally true that there are many times more of the ear-minded person in the world. Consequently the value of the motion picture to the smaller group is more than offset by the fact

One of thousands of country schoolhouses about which Dr. Butler speaks

that the radio telephone will bring so much happiness and help to the greater mass of people throughout the country.

"Consider," said Dr. Butler, "the 'little red school house' out in the country. It has long been handicapped for teachers because of the drift to the city, but I believe that everything that it lost from this cause will be regained through the medium of the radio telephone. Scholastic isolation will be overcome soon and the rural community in reality will become annexed to great centers of learning like New York or Chicago. And the big men of the world, the 'doers' of great things, will in effect become next door neighbors.

"Let us suppose—to use an example—that a man like Balfour of England comes to New York for a visit. It is quite impossible for Mr. Balfour to visit every little school house in this country. He is only permitted to speak to a fortunate few who just happen to be lucky enough to hear him.

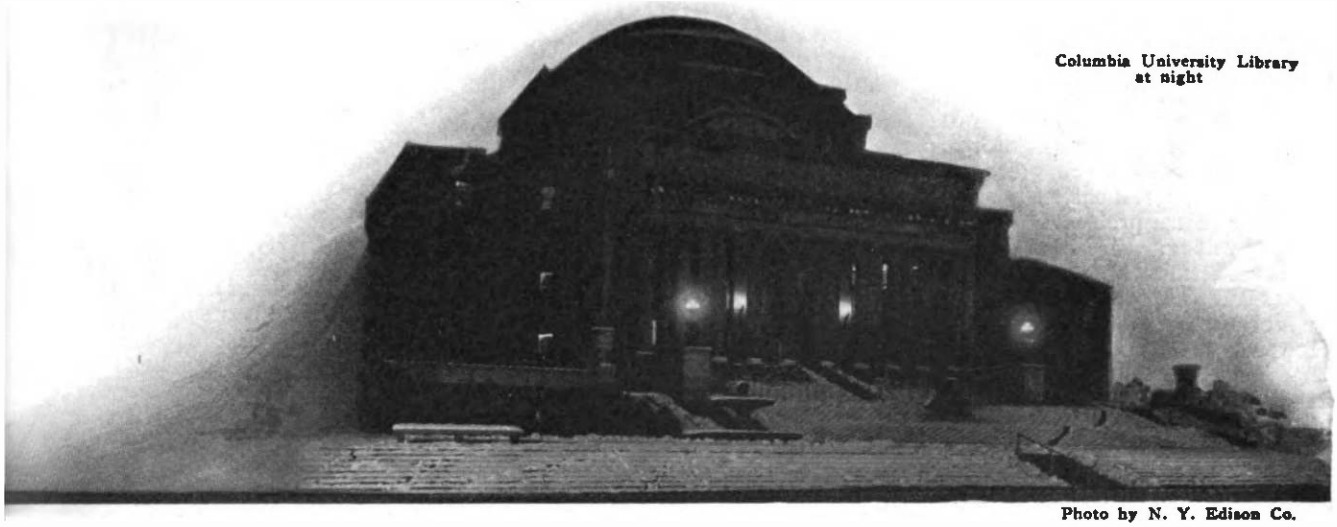
Rural Districts Lose

"Those who hear him are the comparative few who have drifted from 'the little red school house' into the city and have grown up with it. Their children, too, are permitted to hear him because they also have been fortunate enough to grow up in the city where the biggest minds eventually come.

"The people then out in the rural districts lose, and are unable to hear Mr. Balfour and must be content with the few words reproduced in daily print. Many times even the press accounts do not reach the farming regions, and then the people out there lose entirely. And many times they not only do not know what Mr. Balfour has said, but do not even dream that he has said anything at all.

"All this will be changed with the radio telephone. When Mr. Balfour speaks to an association of two or three hundred men in New York City, let us hope that his voice not only will be heard by the few hundreds who happen to be in the same room with him, but also that his voice will go through the air into every little school house in the most remote hamlet as clearly as it will go into the radio transmitter which will be placed before him on the platform.

"Although we know the motion picture is just getting started and is being used by many teachers, we on the sidelines cannot tell really just how extensively the radiophone will develop in its application to educational work; but we



Columbia University Library at night

Photo by N. Y. Edison Co.

do know that the value of the radiophone to educational work will depend, just as the work with the motion picture does, upon the material you give.

"A motion picture production of one of Shakespeare's plays can do an amazing amount of good because it can reach so many more people, and more cheaply, than the legitimate stage play. This is putting the motion picture to a good purpose from an educational viewpoint, and I hope that the time will come when some of the large producing companies will turn some of their efforts in this direction. The same holds true of the radio telephone. It all depends on what you give them.

"We really must overhaul our methods in education. Much time is now being wasted with old worn out methods of instruction. The motion picture and the radio telephone will materially help a good teacher. It is true that the teacher is naturally conservative and that he will hesitate to use new instruments as a means of instruction, but he cannot fail to recognize the value of the radio telephone just as he gradually has acquired a sense of appreciation of the virtues of the motion picture.

Greater in Number

"The development along these lines really has only begun and the eye-minded person as well as the ear-minded person will in the future be acquiring his knowledge more and more through the medium of one of these two great man-made instruments.

"The radio audience will be greater in number, I believe, in an educational way than any field in which the motion picture could be used; and the value of the radio telephone will be great if the personality of the one who is speaking over it is not lost in the contact he makes. If the personality is lost in transmission via the radio telephone then the good effect will be greatly reduced, but as long as the personality of the speaker is not dependent upon the message for the good that it must accomplish, then the radio telephone will be an instrument for good in such a tremendous way that it is difficult for the average mind of man to conceive even of its possibilities."

The photograph you see at the top of this page is that of the Library, of Columbia University, New York. It is in this building that Dr. Butler has his office.

And it might be added that the atmosphere of his office is as quiet and subdued as the picture of the building under the spell of a Winter's moon, as you see it above.

How does the president of a gigantic higher institution of learning shield himself from the many who would break in upon the solitude he needs in directing the affairs of the university?

It was necessary for his interviewer to send a communication to him. Then there was a lapse of a week until a message came to him via the president's personal secretary, that the interview had been granted. Off of the main office on the first floor of the Library Building is a private elevator, used exclusively for Dr. Butler and his secretary. It goes direct into the private office on the next floor, an office that is huge, airy, comfortable.

There is no one else in this office when the secretary and the interviewer emerge from the elevator. Dr. Butler is standing. Introductions, a hearty handshake from the president, and then a direct, forceful launching into the subject in which the interviewer is interested.

Dr. Butler's opinions command a national respect—one might without fear of contradiction say international. He is one of the most eagerly sought public speakers in the United States, and the interest shown in his words would not be any more marked at a country schoolhouse gathering than it would be at the weightiest political conclave, for Dr. Butler, besides being an educator of experience, is a deep student of national politics, and his name always comes in for serious consideration by the Republican party when that worthy body is shaping the destinies of another presidential election.

The present president of Columbia University was born in Elizabeth, N. J., on April 2, 1862, thus making him exactly sixty years of age.

He received his degree of A.B. from Columbia in 1882, his A.M. in 1883, and his Ph.D. in 1884. Throughout the history of his career one finds many instances where Dr. Butler received honors for his knowledge of philosophy.

During the latter part of 1884 and during 1885 he was a student at Berlin and Paris.

Two years after returning from Europe he married Susanna Edwards Schuyler. This was in 1887. In January 1903 his wife died, and four years later he again went to the altar, this time with Kate La Montagne.

He was made president of Columbia University in January of 1902. He also holds the presidency of Barnard College and the College of Pharmacy. He was the first president of the N. Y. Teacher's College in 1886.

Three books that he wrote are very well known. They are: "Meaning of Education," "True and False Democracy," and "The American As He Is." He has written others.

In 1888, 1904, 1912, and 1916 he was a delegate to the Republican National Convention, and in 1913 he was the Republican choice for vice president. And finally, during the most recent Republican national convention he was mentioned for president.

It can be readily seen that the man who predicts for the radio-telephone a happy future in educational fields, who believes it will be a salvation for country schoolhouses in that it will in reality annex them to big educational centers, is a student of humanity, of education, and of history and that his words are significant.

As Aid To Business

AMERICAN business has, with its characteristic promptness, been quick to seize upon the advantages offered by radio broadcasting. Throughout the country department stores are planning to erect stations, if possible, to aid them in the problems of advertising and selling. Five hundred representatives of the National Dry Goods association considered that problem in New York some weeks ago.

However, quite apart from the retailer's point of view, which must inevitably be influenced largely by considerations of publicity quite as much as of business, certain trade organizations are using or planning to use the radio to disseminate information in the same manner as the Chicago Board of Trade is now sending out crop reports to the farmers.

As a consequence, there is now going out regularly a broadcast among members of the silk trade, giving quotations and other up-to-the-minute market information. Several other lines are using this method with more or less regularity. And the Department of Commerce is assisting by broadcasting cabled information from abroad to those interested, as for instance, a report of automobile conditions from South America to automobile manufacturers in the United States.

"Talking Movies," by Radiophone.

A DEVICE has been perfected whereby any number of motion picture theatre projection machines can be operated in synchronism with a master projection machine at the radiophone broadcasting station. This master machine itself projects a picture which furnishes cues to the actors who supply the words and sounds heard by the theatre audiences.

Frank Bacon (center) experiments with talking movies

At the theatres the master projection machine begins throwing the photoplay upon the screen at the broadcasting station and simultaneously, to a fraction of a second, the silversheets at the various theatres are illuminated with the shadow-drama.

At the broadcasting station the movie actors re-enact the drama, speaking out their lines, word for word, but watch the film being screened by the master projector very closely in order to synchronize the spoken words with the pictures.

The first experiments took place at the Chicago studio of the Rothacker Film Co. Frank Bacon, famous as the star of "Lightnin'" took part in them.

"Appeal To Public Interest"

POSSIBILITIES of the wireless telephone as a means of appeal to public interest were demonstrated in a call sounded in behalf of the Citizen's Military Training Camps, by Major General Robert L. Bullard, commanding the Second Corps Area.

This call was broadcasted from the army wireless telephone on Bedloe's Island, where the Statue of Liberty is located. A call was sent out one evening and reached the 30,000 amateur wireless fans on the army circuit. They were requested to use ordinary telephone in acknowledging the message, it was said.

Within fifteen minutes after the call was sent out the telephone in the office of Major Harvey H. Fletcher, recruiting adjutant, began to ring. It has been ringing ever since and several hundred applications from young men to attend these camps have been received.

Broadcasting Stock Quotations

IT is reported in the New York financial district that a new company is being formed for the purpose of "broadcasting" stock market quotations as they come from the ticker, keeping up a steady flow of market news from the opening until the close of the session. Members of the Stock Exchange, in view of the present wording of the constitution about the use of quotations, are inclined to scoff at the proposal, but most of them admit that it is but a question of time until it will be necessary for the use of the new method in getting the financial news quickly to all parts of the country.

Storm Warning

DETECTION of approaching thunderstorms in time to make necessary adjustments in operation of electric service is a valuable practical use of the radio, according to the report of the electrical apparatus committee before the convention of the National Electric Light Association. The radio serves also to detect defects in electrical apparatus and equipment more efficiently than any other agency. "The entire radio art has reached an advanced practical and dependable stage," the report states. "Trans-oceanic telegraphy on a basis comparable to that of the cables probably represents both the greatest investment and the most spectacular operation. The marine use of radio, including not only ship communication but also position-finding for vessels at sea, are of tremendous importance. In Europe, wireless telegraphy is coming into extensive use for inter-city communication. Some attempts in this direction have also been made in the United States.

"The broadcasting of news and weather despatches, musical and other entertainments, speeches and church services, by radio telephone is providing a valuable service to hundreds of thousands of listeners. Radio has also proved its importance as a wire line auxiliary in the railroad field. Train despatching by radio has been accomplished many times, and some far-seeing railroads have installed radio equipment as part of their permanent plant."

Politics Taboo

AN insight into the future attitude of the Administration was learned when it was made known recently that plans of the National Woman's Party to broadcast speeches at the formal dedication of the party's national headquarters, the old Capitol, on Capitol Hill, were balked by Theodore Roosevelt, Acting Secretary of the Navy, who refused permission for the use of the naval radio service. Arrangements had been made to have the speeches broadcasted to the Pacific Coast and throughout the country.

Successful radio reception tests tempted the Lackawanna R.R. to install a permanent set in a buffet car

Acting Secretary Roosevelt explained that his refusal was based on a decision that the naval radio should not be used for political purposes.

He said that if the naval radio service was placed at the disposal of the Woman's Party for the ceremonies it would set a precedent which probably would result in hundreds of applications for the use of the radio service for political purposes.

"THERE is such a thing as welding Canada and the United States even more strongly together, and I predict that the Radiophone will play its part in doing that. It will make two nations one in thought and ideals!"

The beautiful and thoughtful film actress who gleaned these impressions from her first broadcasting is

Norma Shearer

and in an interview with St. John Martens this winsome Canadian girl speaks frankly

Miss Shearer
Before the Camera

ONLY two short years ago lessons occupied most of the time and attention of Norma Shearer. This was in a Montreal, Canada, high school.

Today she is rapidly gaining recognition as a motion picture actress of ability and beauty.

And in radio circles she is known as "the girl who inspired the song."

My attention was attracted toward Miss Shearer by a remark that Fred Hager, recording director of the General Phonograph Corporation chanced to make.

Besides controlling the destinies of the Okeh music records, Hager is a composer and publisher of sheet music as well, and he has to his credit, in collaboration with others, that new song-hit "Kiss Me By Wireless."

Hager and I were journeying by boat from the Battery, in New York City, to Bedloe's Island, on which the Statue of Liberty stands majestically, and on which, too, the Signal Corps has a broadcasting station. One of his artists was to sing this night over the radio.

"Do you know how I happened to catch the idea for the song?" he asked me. And he then answered himself immediately: "It's all due to radio,—and a girl named Norma Shearer."

It seems that one night, some weeks before, Miss Shearer had been invited to the (now silent) WDY station at Roselle Park, N. J. She was asked to speak over the radiophone, and this she did to the delight of many thousands, for although her beauty and grace were lost on her audience, her voice carries that elusive something that makes it appealing.

Silence in Room

Somewhere over on Manhattan Island Fred Hager was listening in. There was silence in the room in which sat the little group of which he was a part. And then as the sweet and musical words of the star ceased, some one sighed and remarked:

"I wonder when the time will come when you will be able to kiss the owner of a voice like that by wireless."

That gave Fred Hager his inspiration.

It gave me one.

Will Play No Part

So I sought out Miss Shearer. She was busily engaged in filming one of the series of "The Leather Pushers," the prize fight pictures released by the Universal Film Company. She is the one who takes the part of the Creole flower girl in the fifth release of the series, and in it she was co-starring with Reginald Denny.

She found time, however, for a few words on her impressions on the latest of home entertainment providers.

"Of course," she said, "radio will play no part in my profession, in my opinion. So I may regard it in a most impersonal way. I cannot conceive of anyone inventing an apparatus that will transmit motion pictures by radio. It seems too ridiculous to even talk about it.

"But when we regard it in the light of its own limitations and in its own special sphere, it does command 'respect' to say the least. Everyone tells you, I suppose, that it strikes them as being 'wonderful,' 'marvelous' and all that. Well, it is all that to me, and something more.

"You know I am a Canadian. Born and raised up there, and it occupies the same warm spot in my heart as this big open hearted country does. I am thinking of the two, as two nations side by side. The ideals of the peoples of both are too nearly alike to provoke any serious quarrels. We might say there are not two nations, but one,—one big country with a single altruistic aim, to live in peace and to constantly improve the condition and life of mankind.

"There has been no quarrel, however slight, between these two countries for a long time. I don't think there ever will be one. It would be more like civil war. But what I am driving at is this: whereas we two, Canada and the United States, are bound together in such strong ties that we do not even have to fortify the border, there is such a thing as being welded even more tightly together. This is constantly happening. And one of the biggest factors in the future to accomplish this all important mission will be the radio telephone.

"Radio will be the telephone girl, as it were, between the Voice of America, and the Voice of Canada."

A Canadian Girl

And having rid herself of these rather serious bits of contemplative research, the star smiled once more, bid me a dainty goodbye and went back to her work before the camera.

Miss Shearer came to New York from Montreal about two years ago. Her first engagements consisted of small parts in the Vitagraph and Selznick Studios. Her work attracted the attention of other producers and in 1921 she played a leading ingenue role in "The Stealers." In this picture she shared honors with the veteran actor, William S. Tooker. Since then Miss Shearer has had prominent parts in productions, among which are "The Man Who Paid," "The Trial of the Law," and "Channing of the Northwest" when she played opposite Eugene O'Brien.

What Newspaper Editors Say

Press of the Country Warns Against Investing in Unknown, "Fly-By-Night" Radio Companies

ANY phase of industry that grows to huge proportions in a short time, is bound, according to the sentiment of the press of the country, to attract undesirables. Such a thing, newspaper editors go on to say, is what might happen—in some cases has happened—to radio.

They warn prospective radio equipment buyers against the mushroom manufacturer, he who springs into being with the rise of the sun and melts into invisibility with the coming of darkness. They tell the people to deal with recognized, established organizations, those that can be trusted, those that know radio, and that in reality have been the very foundation stones of radio development in this country.

The *New York Evening Mail* has picked up its war-club against all who would fraudulently sell equipment, and editorially it is hammering repeatedly in this vein. This newspaper tells of an individual it has heard about who is privately selling vacuum tubes, which it calls "bootleg."

It goes on to say in this regard:

SH-H-H-H-H-H! Has the vacuum tube bootlegger buttonholed you? Watch for him in the alleys and dark corners. He will find you. "Own a radio?" he will whisper. If you say yes, he will pull a small tube out of his pocket, look about cautiously, and hand it to you and say: "Best vacuum tube on the market. You can have it for $3.50. Smuggled in from North Borneo by a friend of mine. Honest."

The bootleg vacuum tube is being manufactured "somewhere in the United States." It has been said that it functions beautifully, although its parentage is very doubtful at this time. No doubt the vacuum tube bootlegger is enjoying brisk business.

The same newspaper in the same issue warns the people against investing without fully investigating, in fly-by-night radio companies that have recently been organized. It says:

Newest Hobby

There is a new indoor sport. It is that of forming radio companies. Each week develops a new group. Ninety per cent. of them have the popular Delaware Charter.

It has been said that when Greek meets Greek they start a restaurant. Nowadays, when promoter meets promoter they start a radio corporation. During the past week the writer saw several notices of incorporations that mentioned such ambitious figures as ten, fifteen or twenty millions. What is ten or fifteen millions? Nothing in the life of a good promoter.

Tons and tons of stock promotion literature are being dropped in the mail daily. Shares are selling for a few cents, so that "nobody can afford to miss this golden opportunity."

The editor warns his readers to investigate the claims of some of these new corporations very carefully before investing money in any of the stock.

Some people get unduly excited when they see a few patent papers. The patent is the most important weapon of the promoter. It gives him something convincing to talk about. And, then, so many people believe that a patent, simply because it is a patent, must be a very valuable thing. It is interesting to know that 75 per cent. of the patent claims allowed by the United States patent office cover worthless devices. The patent office has no control over this matter.

If you have money to invest in radio, proceed cautiously. If you are not sure, ask a friend who knows something about radio to help you reach a decision.

A Thorny Path

Calling the path of radio a thorny one and philosophically musing that the development of invention is not without attending evils, the *Bridgeport, (Conn.) Post* harkens to the trials of Fulton's steamboat which to many was a "smoking terror." The newspaper says editorially:

The path of science is a thorny one, and the development of inventions is not without evils. Fulton's steamboat was a "smoking terror," the railroad for years was bitterly fought by rustics because the trains scared the cows; the automobile was hooted and jeered at, and condemned because it scared the horses and crept up on unsuspecting pedestrians. But how indispensable all of them are today! The development of the radio telephone has been marked by various difficulties and objections, most of which are technical and confined to the users of the radio, but one instance of an effect elsewhere is seen in Hartford, where the Southern New England Telephone Company has been bothered by the theft of telephone receivers and mouthpieces. The thievery is laid to youthful radio experimenters, who lack the resources to buy apparatus, but not the ingenuity to acquire them otherwise. The situation has resulted in some inconvenience to users of public telephones in the capital city.

What the Hartford wireless amateurs need is more education,—scientific, as well as moral. For the joke of it all is, that a regular telephone receiver is useless for wireless work, being attuned to a current much stronger than that which actuates the receiver in a wireless outfit. Bridgeport wireless amateurs are too well aware of this fact, we are sure, to be even tempted. They wouldn't yield to the temptation, in any case.

All of the newspaper editors look kindly upon radio and every editorial is constructive in its application. They contend that all that radio is and hopes to be will rest just as it has in the past, with the established, recognized, "on the level," companies.

The united opinion is that if any major evils grow out of the radio situation they will lie entirely within the possibility of everyone wanting to "crowd the air." They are simply reflecting the attitude of the public in general and the Simon-pure amateur in particular in expressing pleasure at the announced governmental regulation for the control of the air.

The *New York Herald* wants proper protection for users. "Radio provides so much entertainment and pleasure to so many persons, old and young," that paper says, "that its development must be encouraged in every way and one of these ways is to protect the art from abuse by ignorant persons."

Looking into the future *The Champaign News-Gazette* says: "So far the wireless sends only sound and electric waves. Next discovery will be a way to send sight waves through the air. Then you'll look into a glass on your wireless receiver and see what's happening thousands of miles away."

"We greet with pleasure every new success," says *The Brooklyn Eagle*, "and the impression that radio telephony has come to stay is fast becoming universal."

Not Entirely Free

"We may retain the phrase 'free as air' in which there will always be truth," says *The New York Tribune*, "but we must realize that use of the air for some purposes can no longer be entirely free."

The Desert News of *Salt Lake* also believes that individual wireless phones will be worked out. "What man can imagine he can do," it cites, and "therefore while the project may seem visionary, calling it perfectly hopeless seems like taking a chance on being regarded as antique and reactionary by a generation that is to come."

With proper development of the radio phone *The Lincoln Star* believes that "communities and people will be knitted more closely together than ever before and the line which separates rural and urban districts will be wiped out entirely."

Battling With The Bahama Pirates

G. N. Robinson, Wireless Operator Aboard the "Joachim," Tells of His Experience Back in 1911, When that Vessel Went Aground During a Storm

ANY wireless operator can give you a definition of the word "adventure" that can be found in no dictionary. Some time within the life story of the majority of that small group of hardy young Americans a page of the ship's log must tell the story of a successful—or perhaps it was not successful — battle against unequal odds, and in the face of despair.

So that after all the story of the adventure of G. N. Robinson, when he was radio operator on the *Joachim*, just eleven years ago, is only one of a long list; each one filled with thrills and excitement.

Robinson has always liked that voyage on the Hamburg-American Line vessel which ended with a wreck off the shores of an island in the West Indies, an adventure with pirates and a Christmas and New Year's on a vessel that was stranded more than a thousand miles away from home.

"I would not have missed it for anything on earth," he has said repeatedly, "but I was not exactly eager to repeat the experience—at least, not right away."

Among the passengers on the *Joachim* when it left its pier in New York was William Jennings Bryan, at that time Secretary of State. He was bound for Panama. Robinson took extra precautions in seeing that the apparatus was in good condition because he knew that with the Secretary of State on board the traffic his ship would have to carry might be unusually heavy.

No sooner had the vessel left the harbor than the big spreader with its four wires crashed to the deck, barely missing one of the passengers. It took two hours and the assistance of the chief officer and ten deck hands to untangle the wires, splice the leads in several places and improvise a bridle.

"In those days" Robinson said, "the greater part of wireless communication took place between land stations and the ships off shore yet it was customary for the old station at 42 Broadway, New York City, to communicate with craft one or two thousand miles away."

It was on the third day out that Robinson began to experience trouble with static. So marked was the static that he could not even hear the high power station at Key West, Florida, but later in the day he succeeded in working the

steamship *Zacapa*, one of the United Fruit Company's boats and he gave her most of his traffic.

The *Joachim* was due to sight Watling Island, San Salvador, that night, the 21st of November, 1911. When Watling Island failed to make its appearance, however, Captain Fey ordered that the vessel steam at one-half speed and that a sharp lookout be kept. At four o'clock that morning, Robinson was aroused from his slumber by a terrific impact as though the vessel had been struck a blow and he no sooner was on his feet than he heard the Captain pounding on his door and calling him to stand by. The vessel was aground. The Captain ordered Robinson to call for help. Robinson despaired of picking up anyone. The nearest station was Guantanamo, five hundred miles away in one direction, and in the other direction, Key West, three hundred miles more distant than Guantanamo. New York, thought Robinson, was out of the question.

He started his motor and sent out the SOS call for about two minutes. He feared that the crystal of his set was out of adjustment from the shock when the vessel went aground. His fears were multiplied when he realized that he had a patched-up aerial. He repeated several times the message given him by Captain Fey and then signed off and he could hardly control his relief when, his motor having stopped, he heard Operator Charley Haynes in New York City giving him an O.K. It was through Haynes that the Navy Department and the Revenue Cutter Service were advised of the vessel's plight and the dispatching of relief was a matter of minutes.

Robinson always had admired, he says, the calm bearing of William Jennings Bryan during the possible peril. Bryan was even cheerful, he says, and most of his time was occupied by cheering up the other passengers. Robinson recalls that he wrote a letter to his brother which was transmitted to Key West. He was ordered to leave the *Joachim* in the first boat when the transfer of passengers began, in order that he might tell the full story to the operator of the rescuing ship. This was shortly after the *Seguranca* had appeared to start the work of rescue. When the small boat reached the *Seguranca* and Robinson had told his story to Operator Bernstein, to be relayed to New York, he returned to the stranded boat along with other members of the crew.

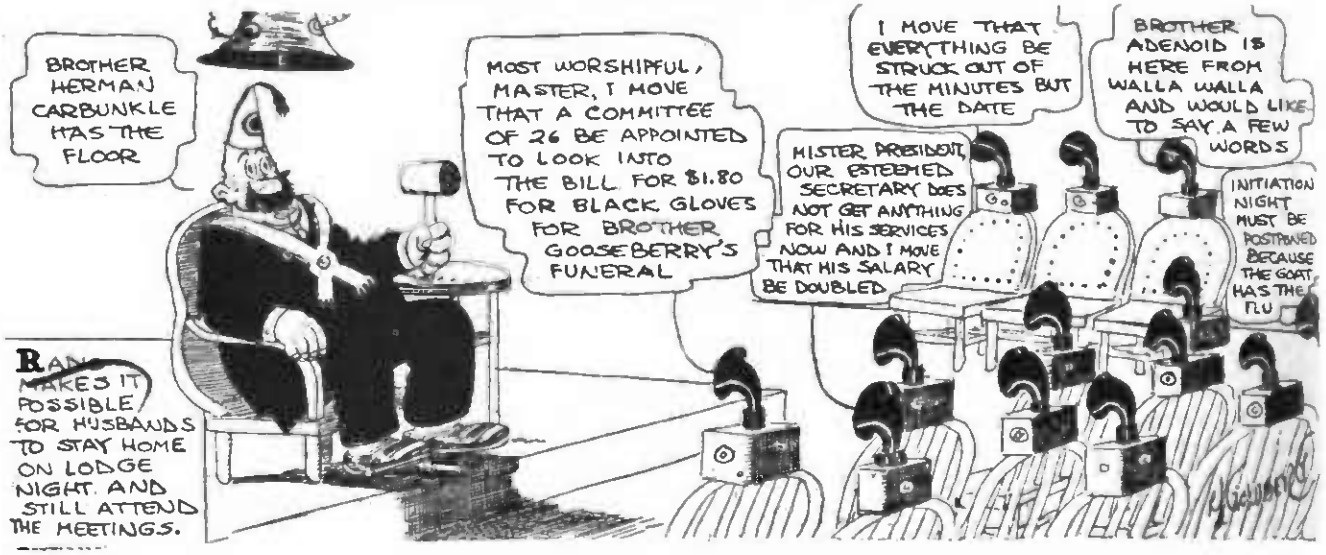
The adventure was not to be closed even with the rescue of the passengers and the transfer of the baggage to another vessel. A group of natives, known as "Bahama pirates" tried to board the stranded boat and steal part of the cargo. Several shots had to be fired in an attempt to frighten the natives, but they persisted in advancing. The arrival of the United States cruiser, *North Carolina*, and the revenue cutter, *Algonquin*, frightened the would-be pirates, but the natives even overcame their fear of these two government boats and returned to the vicinity of the stranded *Joachim*.

A case of explosives was hurled overboard with some more less valuable cargo. One of the natives, anxious to open the case, struck it with an axe and the explosion that resulted sent many of the pirates into the land from which no traveler has ever returned.

For three days the *Joachim* was unable to move because of the rough sea but at last the waters became calm. However, the vessel was not floated until the middle of January and a few weeks later it started for New York under its own steam. A severe storm was encountered and the journey was very rough but the vessel came through safely and Robinson says that the good old skyline of little old New York was the best little sight he had ever seen.

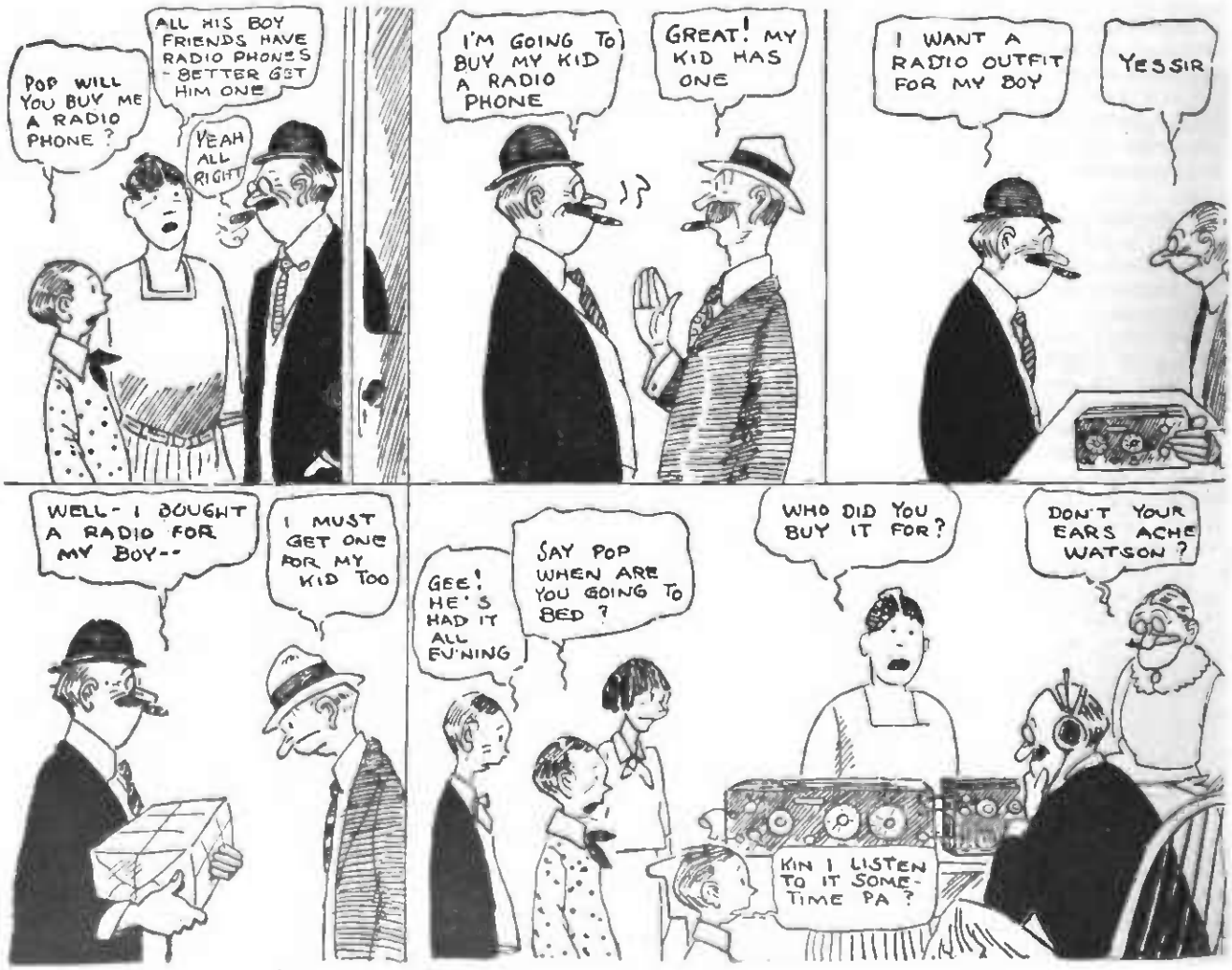
There Is No Height to Which the Cartoonist's

THE LODGE MEETING OF THE FUTURE



—N. Y. Mail

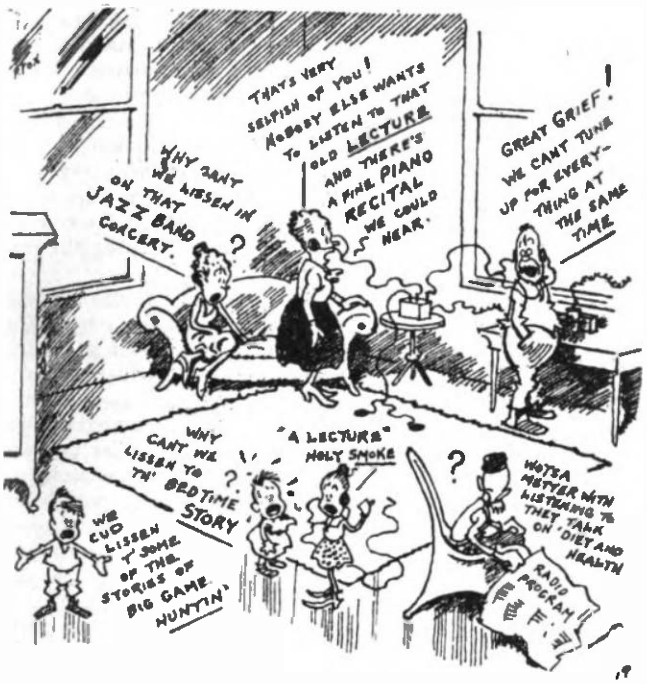
IT HAPPENS IN THE BEST REGULATED FAMILIES



—Providence Journal

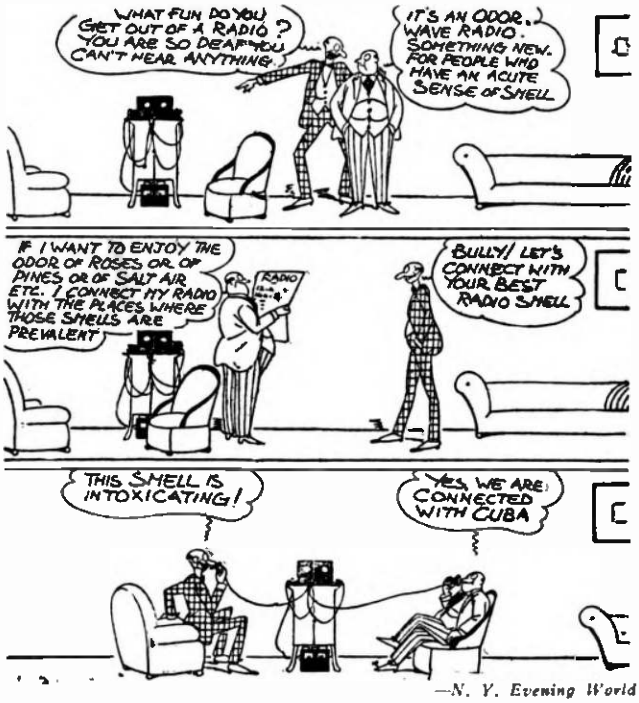
Imagination Will Not Soar---Radio Gets Its Share

MORE FAMILY STRIFE



—N. Y. Globe

CAN YOU BEAT IT?

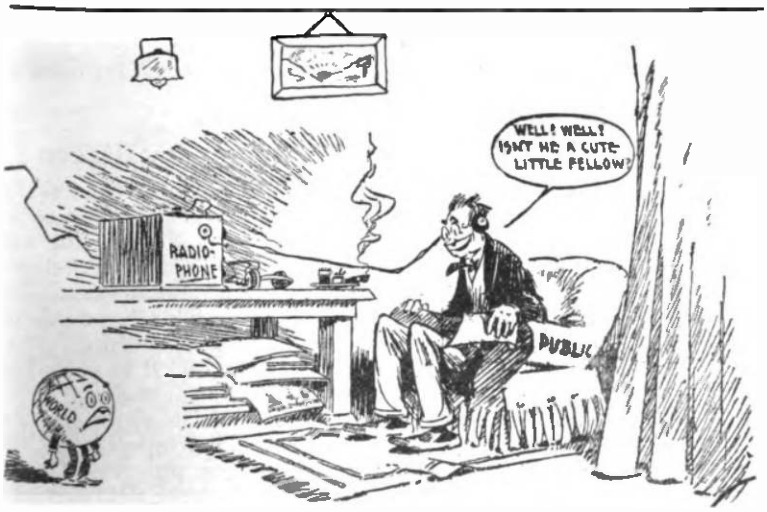


—N. Y. Evening World

FRECKLES AND HIS FRIENDS

—Camden Courier

GETTING SMALLER EVERY DAY



—Chicago News

HOME TEAM PLAYS OUTA' TOWN

—Hammond (Ind.) Times

River Steamer Uses Radio

THE *"Island Queen"* an Ohio River steamer equipped with one of the first wireless outfits on a river steamboat, was utilized by the Junior Chamber of Commerce of Cincinnati for the organization's second annual boat ride.

Doomed to Refusal

THE growing popularity and use of the radiophone has brought added troubles to the White House. President Harding has been literally deluged with requests from all parts of the country and all kinds of organizations to deliver to them, speeches or messages by radiophone. He has been beseeched to do everything from opening church bazaars to addressing a few words to national conventions of various kinds. The President, however, has decided to play no favorites by refusing to start any such practice. For that reason, all such invitations are doomed in advance to refusal at the White House.

Radio Pal On 3,000-Mile Hike

A NOVEL method of testing the reaction of people throughout the country to radio broadcasting has been undertaken by Jean Murray Bang, a young writer who is starting on a 3,000 mile hike from New York to the Pacific coast. Mrs. Bang and her husband plan to carry a small portable receiving set with them, and to listen in on many curious happenings on the way.

Hunt Thieves By Radio

DETAILS of a daring $2000 daylight robbery in the store of the Central Lock and Electric Company, Philadelphia, were broadcasted by radio by the proprietor, Earl E. Saeger.

"Such occurrences should be given the greatest possible publicity," Saeger said. "The thieves leisurely opened packages, rifled drawers and tore the place inside out—and they got away with their booty."

New Jersey Police Equipped with Machine Gun and Radio Outfit

Principal Broadcasting Stations

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

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

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

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

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

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

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

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

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

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

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

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

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

WOC—Palmer School of Chiropractic, Davenport, Ia.

WLB—University of Minnesota, Minneapolis, Minn.

Stations Broadcasting Music and Speech on 360 Meters

Additional list to those previously published in THE WIRELESS AGE

KDPT	Southern Electrical Co.	San Diego, Calif.
KGG	Hallock & Watson Radio Service	Portland, Ore.
KHD	C. F. Aldrich Marble & Ornnita Co.	Colorado Springs, Colo.
KNI	T. W. Smith	Eureka, Calif.
KNN	Bullock's	Los Angeles, Calif.
KNT	North Coast Products Co.	Aberdeen, Wash.
KOJ	University of Nevada	Reno, Nev.
KPO	Hale Brothers	San Francisco, Calif.
KQY	Stubbs Electric Co.	Portland, Oreg.
KRE	Maxwell Electric Co.	Berkeley, Calif.
KSC	O. A. Hale & Co.	San Jose, Calif.
KSD	Post Dispatch	St. Louis, Mo.
KSL	The Emporium	San Francisco, Calif.
KSS	Prest & Dean Radio Research Lab.	Long Beach, Calif.
KTW	First Presbyterian Church	Seattle, Wash.
KUS	City Dye Works & Laundry Co.	Los Angeles, Calif.
KUY	Coast Radio Co.	Del Monte, Calif.
KWH	Los Angeles Examiner	Los Angeles, Calif.
KXD	Herald Publishing Co.	Modesto, Calif.
HXB	Braun Corporation	Los Angeles, Calif.
KYF	Thearle Music Co.	San Diego, Calif.
KYG	Willard P. Hawley, Jr.	Portland, Oreg.
KZC	Public Market & Market Stores Co.	Seattle, Wash.
KZI	Irving S. Cooper	Los Angeles, Calif.
KZM	Preston D. Allen	Oakland, Calif.
KZN	The Deseret News	Salt Lake City, Utah
WAAB	Times Picayune	New Orleans, La.
WAAE	St. Louis Chamber of Commerce	St. Louis, Mo.
WAAF	Union Stock Yards & Transit Co.	Chicago, Ill.
WAAG	Elliott Electric Co.	Shreveport, La.
WAAH	Commonwealth Electric Co.	St. Paul, Minn.
WAAJ	Eastern Radio Institute	Boston, Mass.
WAAK	Gimbel Brothers	Milwaukee, Wisc.
WAAL	Minnesota Tribune Co. & Anderson-Bemish Co.	Minneapolis, Minn.
WAAM	I. H. Nelson Co.	Newark, N. J.
WAAN	University of Missouri	Columbia, Mo.
WAAO	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.
WAH	Midland Refining Co.	El Dorado, Kans.
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 Institute	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
WBAM	I. B. Rennyson	New Orleans, La.
WBAN	Wireless Phone Corp.	Paterson, N. J.
WBAO	James Millikin University	Decatur, Ill.
WBAP	Wortham-Carter Publishing Co.	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 Telephone & Telegraph Co.	New York, N. Y.
WBAZ	Times Dispatch Publishing Co.	Richmond, Va.
WBL	T. & H Radio Co.	Anthony, Kans.
WBS	D. W. May (Inc.)	Newark, N. J.
WBT	Southern Radio Corp.	Charlotte, N. C.
WCE	Findley Electric Co.	Minneapolis, Minn.
WCK	Stix-Baer-Fuller	St. Louis, Mo.
WCM	University of Texas	Austin, Tex.
WCN	Clark University	Worcester, Mass.
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	Hurlburt-Still Electrical Co.	Houston, Tex.
WEW	St. Louis University	St. Louis, Mo.
WFY	Courado Co.	Wichita, Kans.
WFI	Strawbridge & Clothier	Philadelphia, Pa.

May Revise Fire Code

WARNING that the fire insurance regulations governing the installation of radio apparatus are to be changed, has been served in a statement issued by the Bureau of Standards of the Department of Commerce.

The statement calls attention to the forthcoming revision of the regulations in connection with the "hooking-up" of radio equipment and warns that the users of the radio telephone may without notice find the rates on their properties raised or insurance altogether refused them.

There is in prospect a revision of the National Electrical (Fire) Code, and in connection with this revision a change in Rule 86 of the Code which hitherto has governed radio installations has been decided upon. The actual change is now under consideration by the National Board of Fire Underwriters.

The Bureau of Standards, which has become a clearing house for radio activities, inventions and improvements, of a technical character, has prepared a circular containing tentative insurance requirements which have been suggested for adoption. It will probably be several months before the definite requirements are decided upon.

He's Hundred Years Old, But Wants Radio

THOMAS JOSEPH WEST, of Wheatley Hills, L. I., who celebrated his hundreth birthday recently, is planning to install a radio outfit. He considers the radio telephone the greatest of modern inventions.

Coney Island Novelty

LUNA PARK, Coney Island, New York, has a receiving station on the battleship *Recruit,* which formerly stood in Union Square. This land dreadnought has been reassembled and placed at Luna, where it is called the Radio Ship. In addition to the receiving station there will be demonstrations aboard the ship of E. F. Glavin's radio controlled torpedo automobile, in charge of the inventor.

Radio Supplants Pigeon

RADIO telephony has practically eliminated the homing pigeon as a message carrier. During the war both the army and the navy developed the breed to the highest degree. The war left the navy with hundreds of pigeons for which it had no use.

Recently it was decided to get rid of the surplus birds, but not a single bid was received. Officials expressed the opinion that the development of the radio telephone has progressed sufficiently to monopolize the field occupied by the pigeons.

Dear Mr. and Mrs. Radio:

"Just a Line to Tell You——"

What Are Your Thoughts as You Listen In? No Two Impressions Are Alike Anymore Than the Impressions Left by Two Fingerprints of Different Persons. Letters are Pouring in From the Radio Fans and a Few of the Thousands are Printed Below

"S.S. W. B. KEANE," SAVANNAH, GA.

Am taking this opportunity to express my sincere thanks for the very pleasant evening afforded us by your radiophone concert.

It is not a report of distance heard, that I have to report, but the fact that it was the right thing at the right time. You see we left New York City to go to Greeneville to get water, then proceeded to sea, but after taking water, the Captain decided it was too hazy to go out and so we tied up at the coal companies dock for the night.

That place is so far from civilization that there was not much use going ashore, so after tuning at random for a while, waiting for N A A, you commenced your concert and it was a most welcome surprise, to say the least.

The reception was made with a Marconi 106-B tuner and carborundum crystal, but we enjoyed it as much as if the performance were taking place right in the shack.

GEORGE EYTH, *Radio Operator*

NEW YORK CITY

Please keep up the stories of the operas. I may have missed some, but if you have not already given them, I hope you will let us hear the stories of the rest of the Puccini operas, also Il Trovatore and Traviata. Would it be possible to give us the Gilbert and Sullivan light operas and others of the same type, such as Robin Hood, Erminie and The Gondoliers?

I do not want to hear any of the modern musical comedies reproduced, but the Mikado, Iolanthe and the rest of the Gilbert and Sullivans will give us delightful evenings. I should not think that the heavy German operas were susceptible of such treatment.

FLOYD R. DU BOIS

NEW CANAAN, CONN.

We have listened to your concerts with a great deal of real enjoyment. When I say "we" I mean the whole darned family, Mr. and Mrs., and the little Darns. The only objection I have to your concerts is that if I have been out for the evening and come home in time I sit up so late listening in.

And believe me, I am interested when I do that. I do not know who the operators are who broadcast but I suggest that if they ever run out of work that they go on the stage. I enjoy them as much as the concert.

There is a great deal of interest being taken in wireless in this section. Not only the boys but men of fifty are putting them in..

WALTER K. GOODHUE

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

MACHIAS, MAINE.

I listened in last night and thought that you might like to know that you were heard in Machias. This town is in the eastern part of Maine and is about 30 miles from the Canadian border. The voice was distorted at times but the music came in very well. I think that with a better tuner the voice would have been good at all times. I was using one bulb for receiving at the time in connection with a home made short-wave set.

CHARLES E. HALEY.

ASHLAND, KENTUCKY.

Last night at about 8:30 I heard your station with such clarity it could be heard 200 feet from the phones. I never expect to hear anything to compare with it for loudness and clearness. I had a large crowd listening in on it and it certainly has popularized radio in this town of 8,000 people.

EDMUND THOMAS.

NORTH SYDNEY, N. S.

The evening was particularly good when selections including Mendelsohn's "Spring Song," Rubinstein's "Romance," "The Lost Chord," and one of Beethoven's Masterpieces were transmitted.

When Miss Potter the pianist called out "How do you do everybody" and "Hello Fellows!" her voice was transmitted perfectly and was far clearer than your announcer's voice at this distance. This work was all done on one tube as only on Sunday evenings, when the nearby cable station is slack, can I use my two step amplifier.

In those few opportunities, your concerts are loud enough to use the loud speaker. I have been getting these concerts now for the past couple of months. They rate 100 per cent. with me.

ARNOLD EDWARD,
President, Cape Breton Amateur Radio Association.

DETROIT, MICHIGAN.

I have been getting your broadcasting with fine strength in signals and very good values; the speaking voice is better than music.

Thursday night I will be listening in at eleven p. m. with a little bit different hook-up (I cannot say in advance that it will be better), and I wish you could give me a piano solo because your methods of putting it out is giving better values and signal strength to me here than I have heard from such a distance.

I will have an important Washington official present with the object of acquainting him with the need of broadening the field of general use of radio. I enjoyed your acknowledgment of letters and noted your comment on mine.

HENRY B. JOY.

When Ether Waves Run Wild

Choosing a Radio Editor in the Office of The Daily Blah

Quite A Task

By Henn Lee

IT was 9 A. M. Toward the editor's front office trooped the various sub-editors for the daily conference. The staff met each morning to discuss general office routine. Usually the meetings lasted only five minutes.

"I think we ought to have a wireless editor," began the city editor, in a tone that implied he expected opposition. "This here radio thing has grown pretty big. What do you say, Bill?" addressing the editor. (In a small town they call each other by their first names.)

"I think so too, Joe," replied Bill. "I don't know what it's all about, but I think we ought to have one, just the same."

"Who'll we get?"

"Oh, let one of the boys on the staff handle it. Find one that knows something about wireless."

Bald Jack, the grizzly managing editor, had been listening intently, his lean face cocked on one side like a wampus feline listening for the call of its mate.

"I think I could get one of my children to fill the job," he suggested.

"Which one?" spoke up the dapper young telegraph editor who was always kidding Bald Jack about the numerical abundance of his offspring, "or will you have to select him at random, not knowing them apart?"

"Anyone of them will do," retorted Baldy. "Even my youngest."

"What's his name?" querried the telegraph editor sarcastically.

"Why--why--er--let's see. Clarence, Sid, Edgar, Henry, Alan, Jim, George, John—let's see it must be Sid. Yes, yes, it is Sid."

"I think we had better get one of the boys on the staff to handle it" broke in the editor, "you find out who knows anything about wireless, Joe. Meeting's over."

They broke up, and the city editor went back to his desk, scratching his neck perplexedly. It was a habit with him.

He cast his newsy eyes over the assortment of reporters in the city room.

His glance rested on the star reporter and he called that individual. The star got up, being careful, however, to rescue his inseparable cigar stub from the desk ledge. He ambled over.

"What do you know about wireless?" asked the city editor.

"I've had no experience," replied the star. "Once I bought some stock on a tip. The tip wasn't so good. So the next day I hustled over to the brokerage office to order the stock sold. It was raining fiercely that day and the wind was blowing something awful. I noticed the broker was excited. I told him to sell my stock, but he only threw his hands above his head madly, and yelled that the wires were down and that they were wire-less! So he couldn't sell my stock and I had to eat over at Max's for a week."

"You don't qualify," decided the city editor. "Your experience was thorough as far as it went, but it didn't go far enough. Say Rosy!" he called to a tall, good looking chap who was passing.

Rosy was the artist. He was a good natured, ruddy-faced Irishman named Kelly. Besides being really one of the best sketch artists in the business, he knew a news item, and during spare time he often wrote for the paper.

"Yes," answered Rosy, pulling up short like a carriage horse.

"What do you know about wireless?" asked the city editor.

"I know what an antenna is," replied Rosy cheerfully, "but that is about all."

"A what?" asked the city editor. "How do you come to know that?"

"Well, you see it was this way," said Rosy stroking his chin. "I went to New York once on a visit. I wanted to sketch a bird's eye view of the city, and decided that the roof of an uptown hotel would be as good a place as any to see it from. So a party of us went up. There was an antenna on the roof, and Violet, who was along with the party, knew something about wireless, and explained it to us. It was attached to a water tank or something."

"I thought about making you Radio Editor," said Joe, "but after that enlightening description of an antenna I've decided to give you a late assignment. Clara Belle Woods, the actress, will be in town tonight. Meet her in the lobby of the hotel at six o'clock and get a sketch and an interview. Oh, Cy!"

"Cy," he said when the youngest reporter reached him, "we have to have a Radio Editor, and I'm thinking about letting you stop writing about government securities and giving you a chance at radio. Know anything about it? Billy over there can take over the government security stories. It's not such a stiff assignment."

Now Cy was a wide-awake youngster, whose future promised much, but he confessed that while he was very friendly with Sadie O'Grady, he didn't even have a speaking acquaintance with Radi O'Grady.

The crowning virtue of city editors

NOTHING BUT SILENCE

—Dayton (O.) News.

And There's Humor in the Air

is persistence and Joe was the most persistently efficient city editor I've ever met. Do you know how he finally got a Radio Editor? No? Well, sir, I wish you did, so you could let me know. I never have been able to find out, but *The Daily Blah* has one and he's living up to the good reputation to the rest of the *Blah* staff.

Airedale terrier in Lexington, Ky., heard his owner at Pittsburgh, Pa., call him by radio.—Headline.

Probably the same dog we've seen listening for his master's voice all these years.

* * *

A Radio Ballad

In the *Wilkesbarre* (Pa) *Leader*

Sadie O'Grady and Timothy Brady
  Sure were an up-to-date pair;
She was a pretty and witty young lady,
  He was a lad debonair.
They were a couple of radio sharks,
  So when they'd part for a while
Tim would express his concluding remarks
  After this manner and style:

"Sadie O'Grady, Oh
  Ring me by radio,
  Call me up often, my own;
You are my lady, Oh
Sadie O'Grady, Oh
  Ring me by radiophone!"

But Sadie would say,
  "Sure your nerve you are bringing
  To ask me to call you. For shame!
If anyone's gonna be radio-ringing
  It's you should be doing the same!
I'll be at home in the evening, my dear.
  Patiently lingering there;
You can be sure I'll be waiting to hear
  When you call up through the air;

Timothy Brady, Oh
  Ring up your Sadie; Oh
  Call me by radio often, my own!
Bright days or shady, Oh
  I'll be your lady O,
If you'll just call me, Oh
  Timothy Brady O,
  Call me by radiophone!"

Sweet Radiogrady

By NEAL R. O'HARA

RADIO NOTES

Clarence Glickstein of Perth Amboy writes in to say that he is using a wrecked flivver as an aerial and getting good results. The flivver landed in a tree top by accident and Mr. Glickstein was quick to act and string wires with good effect. The reports that his radioford now has range of 180 miles, without gasoline. It catches every vibration between Pittsburgh and Newark, even including rough roads and detours.

In Brooklyn, 218 home brewers have converted their stills into radio outfits. They are trying to catch Milwaukee.

WHAT TO HEAR TODAY

F O B (Detroit)—8:00 a. m. fight returns from Chicago Grand Opera Company. 8:30 a. m., sermon, "Where Do Buttons Come From?" by Rev. Jasper G. Hoodick of Ocean view, Kan. 8:45 a. m., bedtime story for night watchman.

HOW TO KEEP A COOK IN THE COUNTRY

—*N. Y. Globe.*

Wise Crack-Les

Readers are urged to send in their Wise Crack-les on Radio. Let 'em come, all you humorists.

It is going to be embarrassing if the collection agencies start a broadcasting station on a popular wave length. Imagine this:—"If John Smith doesn't pay up we are going to announce his address!"—*N. Y. Telegram.*

* * *

Mr. and Mrs. Wayne Radio of Chicago have taken apartments in the Hotel Browning. Mrs. Radio before her marriage last week was Miss Margurite Rudd of Big Rapids, and Mr. Radio was formerly of Ironwood.—*Grand Rapids News.*

* * *

Bed-time stories and sermons are being sent out by radio. Be careful you don't get them mixed.—*Lawrence, (Mass.) Eagle.*

* * *

New Yorkers are more interested in the length of a crime wave than an ether wave.

* * *

Nice things about broadcasting political speeches by radio is you don't have to listen to them.—*Harrisburg (Pa.) Patriot.*

* * *

Radio fan claiming he uses his hair for an aerial is probably talking through his hat.—*Valparaiso (Ind.) Messenger.*

* * *

The humorist who said that with all the static in the air this summer, the most popular call would be BVD is no mean student of human nature.

* * *

Sir:

I wish to sell my radio set. What would you suggest? MAX.

A.—Take the box, remove all the trimmings, cut a hole in one side, put in two boxes of polish, two brushes, one yard cloth. You will then have a first-class shoe-shine box.—*Phillips in N. Y. Globe.*

WORLD WIDE WIRELESS

Paris Police Plan Extensive Use of Radio

WIRELESS telephony and airplanes gave Paris the quietest May Day in history, enabling police groups to be shifted quickly to points wherever manifestations seemed to be concentrating. As a result, only a few insignificant street fights followed the annual labor reunion in the Federation's Headquarters, with no serious injuries.

Throughout the afternoon three airplanes hovered over the city and its suburbs, in wireless telephone and telegraph communication with the Prefecture of Police and the Place de la Republique, whence police maneuvers always are directed.

For several weeks Chief of Police Leuillier has been experimenting with the use of wireless. Today he expressed the fullest confidence that in less than a month every station would be equipped with the necessary sending and receiving apparatus, while automobile patrols, similarly equipped would visit the more populous districts day and night. It is estimated that this will enable the city materially to decrease the present police force.

World Radio Meeting Planned

PLANS are being made for a meeting this summer, probably in July, of the International Union for Scientific Radio Telegraphy, which will bring together at Brussels, leading radio experts of the nations of the world. Scientific questions and co-operation between the research activities of different countries will be considered.

Dr. L. W. Austin, head of the United States Naval radio research section and vice-president of the International union, will be one of the American delegates.

Directs Bread Deliveries

THE General Baking Company has equipped its delivery trucks and wagons with radio receiving sets and deliveries of late orders are made in accordance with instructions transmitted by radiophone from its offices.

Navy's Radio Repair Ship Sails

THE *Gold Star*, the Navy's first radio repair ship, steamed out of Hampton Roads, Norfolk, Va., April 10, for the Pacific Coast, where she will furnish supplies and transportation to the Navy's eight radio stations and two radio compass stations in Alaska.

Named for the mothers of the men lost in the service during the World War, she is equipped with all sorts of radio apparatus, spare parts, and supplies, and carries a crew of expert repair and equipment men, capable of erecting a complete station or adjusting a small receiving set. The *Gold Star*, formerly a Shipping Board vessel, is

May 1 in Paris is usually marked by riots, but this year the Paris police controlled the situation with the help of radiophone-equipped motor trucks

a 7,420-ton ship, carrying a complement of 300 officers and men, under the command of Lt. Commander J. C. Katterfield.

The Navy is operating traffic stations in Alaska at St. George, St. Paul, Dutch Harbor, Kodiak, Seward, Cordova, Juneau and Ketchikan. Two compass stations are also located at Cape Hinchinbrook and Soapstone Point. These stations form a chain of communications in Alaska and adjacent waters with trans-Pacific stations, besides serving as a relief in the event of a break in the cable to the west. The stations are all difficult to reach except between April and October, and few commercial vessels touch at the stations, so the Navy has put the *Gold Star* into service to supply the men stationed there with food, clothing and relief, and to make necessary repairs. This will require frequent trips from Seattle north nearly to the Arctic Circle.

Radio Soon to Link Continents

HIGH-POWER wireless stations of the Radio Corporation of America will be completed this year at Bogota Bay, Colombia, and in Cuba, and the great Buenos Aires station will be in operation in mid-1923, says E. J. Nally, President of the company, who returned a few days ago from conferences in Europe at which a working agreement was reached among the great wireless companies of England, France, Germany and America.

From any part of the United States wireless messages may be relayed speedily to Buenos Aires, South Africa, Java, Calcutta or Melbourne, when the radio building programs of the great American and European countries are completed. At present France has a powerful station connected with the American-built Lafayette towers near Bordeaux, but this will be superseded by the end of this year by the Port Jefferson station of the Radio Corporation, which will be the most powerful station in the world. The station under construction at Ste. Assise, will be second.

The British wireless chain connecting England with the Empire will have one station comparatively close to Argentina, and that will be the station at Bathurst, in Gambia, on the extreme western point of Africa, where the continents of Africa and South America make their closest approach.

"The stations of the Radio Corporation at Cuba and Colombia are practically completed," said Mr. Nally, "and are waiting on the completion of all the towers at Port Jefferson before going into service. That will take place in December. Relaying from New York to Cuba, to Bogota and then to Buenos Aires will be possible, but will be used only as an auxiliary system. When the Buenos Aires plant is completed it will send to and receive from the Port Jefferson station direct."

Two More Lives Saved by Radio

TWO men recently left Gaviota, Cal., near Los Angeles, in a skiff, which upset in a heavy sea when some distance off shore. The boat drifted out to sea before they were rescued by the S. S. Humboldt, which had been advised of the mishap by radio.

World Development of Wireless

THE Commercial Radio International Committee composed of the representatives of the Radio Corporation of America, Compagnie Generale de Telegraphie sans Fil, Gesellschaft fur Drahtlose Telegraphie and Marconi's Wireless Telegraph Co., Ltd., has completed its Conference. A number of important questions dealing with the development in different parts of the world of wireless telegraphic and wireless telephonic communication were considered and satisfactorily settled.

As a result of the agreement between the four companies, a number of new international wireless telegraph services will be opened in the early future. A very considerable development of communications generally has been discussed and agreed upon.

Broadcasting in England

THE General Post Office authorities have authorized the use of wavelengths between 350 and 425 meters for broadcasting in England.

Probably for the first time in history a wireless aerial was installed at a place of worship in that country on April 27th. This was done by permission of the Postmaster-General, to the Guild-house, in Eccleston Square, S.W., for the purpose of demonstrations which accompanied a lecture on Wireless Telegraphy and Telephony, given there by A. O. Gibbon, of the Engineer-in-Chief's Office, G.P.O., in aid of the funds for the League of Arts.

Loud-speaking telephones and a new method of amplification being employed, the audience was enabled to hear various items of news, music and spoken verse transmitted from the various stations around London—a typical demonstration of "broadcasting," proposals for which are now approved by the authorities.

Radio Fog Signal Requested for Nantucket Light

A REQUEST for a radio fog signal station on the Nantucket lightship similar to the stations already established on the Fire Island and Ambrose Channel lightships has been sent by H. H. Raymond, president of the American Steamship Owners' Association, to Commissioner G. R. Putnam, of the Bureau of Lighthouses, in Washington.

Mr. Raymond pointed out that the stations on the Fire Island and Ambrose Channel lightships have proved useful and that such a station would be of even greater value on the Nantucket ship, located far out and directly in the route of incoming trans-Atlantic liners. With the equipment recommended masters of ships would be enabled to verify their positions by radio much earlier than is now possible.

Radio to Aid Australian Bushmen

PLANS have been formed at Melbourne, Australia, to furnish bushmen with wireless telephone instruments enabling them to summon medical aid, which it is proposed to send by aeroplane from commercial flying centers.

By this means it is hoped to save a large number of the lives that are lost every year owing to the weary journeys by camel and horse which the bushmen in the "Never Never" land have to undertake before doctors can be reached.

Results of the races at Bowie, Md., were flashed by radio from the judge's stand to racing fans in all parts of the East

According to the Melbourne "Herald" there are more than 1,000 people scattered over the Oodnadata Alice Springs section, an area equal to that of Great Britain, without means of obtaining immediate medical aid.

Wireless Prevents Congestion in French Ports

FRANCE has established wireless telegraph posts at Rouen and on pilot boats on the Seine which will be used to transmit messages relating to maritime affairs and the promotion of port services, according to the Department of Commerce. The pilot boats, it is reported by Consul M. B. Kirk, of Rouen, will transmit by wireless the arrival of all vessels coming up the Seine on every tide to the postoffice and the postoffice will instruct the pilot vessels where to place the ships on their arrival.

Short Wave Directional Wireless

IMPORTANT research has been carried on in England in connection with directional transmission on very short wavelengths and in a paper given before the Institute of Electrical Engineers, London, on Wednesday, May 3rd, C. S. Franklin, an experimental engineer of Marconi's Wireless Telegraph Company, disclosed some hitherto unpublished information on this subject.

Employing a wavelength of only fifteen metres, duplex wireless telephony has been carried on between London and Birmingham, which has been audible only at the specially designed stations carrying on the experiments.

Another result of this research has been the evolution of a "wireless lighthouse," which may mean much for the safety of navigation. A wireless beam, radiated by a revolving transmitter, can be made to indicate to a ship its exact position with respect to the "wireless lighthouse."

The apparatus concerned was demonstrated with a transmitter using a wavelength of only one metre.

Radio Fog Signal Stations Planned for the Gulf

THE establishment of radio fog signals near the mouth of the Mississippi River and at the entrance to all important harbors along the Gulf coast has the full support of E. S. Lanphier, superintendent of the Lighthouse Service of the Eighth District, who states that such signal stations would be of invaluable aid to navigation in the Gulf of Mexico and of great service to vessels approaching the mouth of the river in foggy weather.

Navy Demands Radio on all Flying Boats

THE Navy Department protested to Secretary of Commerce Hoover against the failure of seaplanes flying off Florida to carry either radio or homing pigeons, both of which are used by the navy.

At the Department of Commerce it was said by Supervising Inspector-General George Uhler, of the Steamboat Inspection Service, that the radio law applied only to vessels of fifteen tons or over and carrying more than fifty passengers.

The wrecking of two planes off Florida, the recent loss of five lives and the accident which caused the seaplane Santa Maria to be lost the greater part of two days have brought a realization of the need for compulsory laws when owners of planes will not provide safeguards.

Radio Phones Used on Milwaukee Road

RADIO telephone equipment has been installed on two limited trains on the Milwaukee road for the convenience of passengers, E. G. Hayden, general passenger agent, announced.

The apparatus is on the Pioneer Limited, passing through Milwaukee at 8:45 p. m. en route for Minneapolis from Chicago, and train No. 4, passing through Milwaukee at 6:20 a. m. for Chicago.

The Milwaukee line is the second in the country to adopt the use of the wireless telephone. The Lackawanna has also installed the apparatus on several trains.

High Power Russian Station

F. NIKOLAIEFF, assistant commissioner of posts and telegraphs of the Russian Soviet Government, announces that the Government radio station at Bogorodisk, near Moscow, is nearing completion and will soon be in operation. Its towers are more than 900 feet high and will have a strength of 500 kilowatts. Russia now has 38 sending stations and 290 receiving stations.

17,500 New Radio Companies

MORE than 17,500 incorporations of radio companies have been filed in twenty states since January first, according to an estimate gathered from various state capitals. These are mostly small manufacturing companies with a total capitalization of about $90,000,000.

New Radio Sets on 60 Submarines

EQUIPMENT to extend the radio communication scope of sixty submarines from about fifty to 500 miles has been purchased by the Navy Department, it was learned today, with savings in engineering maintenance funds made by engineering personnel afloat.

Big Lake Steam Fleet To Have Radio Service

SEVENTEEN ships of the Hutchinson Steamship line, Cleveland, are to be equipped with radio. The equipping of the whole fleet at one time will be the biggest radio job ever undertaken, it is said. The work is to be done in time for the coming season's business, according to present plans.

The Radio Corporation of America is fitting the big passenger ship *Seaudbee*, of the Cleveland & Buffalo Transit Company, Cleveland, the largest fresh water passenger vessel in the world, with 200-watt radio telephone sets for the use of passengers.

The Army Radio Net

ON April 1, the Army Signal Corps took over the transmission of communications to practically every part of the United States proper for the Government. There are thirty-two stations operating within the Army net. Within two months it is planned to double the number of stations making

C. J. Munday at Tiverton, Devonshire, England, lets his family listen in on the music of Faust broadcasted from the Hague, Holland

it possible to communicate by radio with any Army post in the continental limits of the country. Even the smallest posts and such field parties as carry radio apparatus will be in touch with the whole army. By the first of June the Coast Artillery posts will be coupled up with the net of the Signal Corps.

There are sixteen stations in Alaska, which are linked in with the Army radio by means of the Army cable to Alaska from San Fransisco, incidentally the only cable owned by this Government.

Linemen Use Radio Receivers to Detect Leaks

IN many parts of the country the men responsible for the upkeep of high-tension power lines are being equipped with small portable receiving sets for detecting and tracing leaks in the systems. One company reports a great saving having been affected by means of this method of supervision of its lines.

Vessel Position Reports by R. C. A.

ARRANGEMENTS were recently made by the Radio Corporation of America whereby the noon positions of all vessels communicating with their coast stations are telephoned to steamship owners or agents and also reported to six newspapers of New York and Philadelphia.

Twelve-Tube French Receiver

A TWELVE-TUBE receiving set at Paris, with one-meter loop antenna, has been used in recent radio experiments. Experts have found that, with this instrument, they could detect low power transmissions up to 5000 miles away under ordinary conditions.

United Fruit Granted Wireless Permit in Nicaragua

JOHN B. WILSON, representing the Tropical Radio Telegraph Co. (United Fruit Company) has been granted a concession to establish commercial wireless stations at Managua, Bluefields, San Juan del Nort and Cabo Gracios de Dios, all in Nicaragua.

Coming Radio Shows

A RADIO show will be staged at The Emporium, San Francisco, Calif., in conjunction with the Shriners' Convention, June 12 to 17.

A radio exposition, under the auspices of the Springfield Daily Union, will be held at the Auditorum, Springfield, Mass., June 19, 20 and 21.

A radio exposition will be held in Dreamland Pavilion, 7th Avenue and Union Street, Seattle, Washington, June 5 to 10, under the auspices of the Seattle Radio Association. Mayor Hugh M. Caldwell will proclaim "radio week" throughout Seattle during the show. The headquarters of the show management is at 301 Seaboard Bank Bldg. J. W. Bollong and Lt.-Governor William J. Coyle are in charge of the exposition.

A national radio exposition will be held in the Lighter Building, Chicago, Ill., June 26 to July 1, inclusive. The committee in charge of the prizes is composed of J. C. Hail of the Chicago City Hall radio station; Professor R. E. Hughes, Evanston High School; and F. D. Pearne, Lane Technical High School. Several contests have been arranged for the students of Chicago and also for young men outside of the schools. Prizes have been offered for the best sets of all types, best regenerative detector and amplifier, smallest practicable receiving set, loud speaker equipment and greatest radio novelty. All of these devices must have been made by the students.

The Radio Exposition at Boston

A Large Number of Exhibitors, Many Interesting Special Features and Good Public Attendance Made the Affair Successful

THE Boston Radio Exposition was held in Mechanics Hall, Boston, May 3 to 6, inclusive. The Exposition was formally opened by the Mayor of the City of Boston who addressed those present by means of the internal broadcasting station. The Lt.-Governor of Massachusetts delivered an address in a similar manner on the second day of the show.

During the Exposition a comprehensive series of lectures was given daily from noon up to the closing hour. The speakers and their subjects were as follows: G. W. Pickard, "Crystal Detectors and Fading Phenomenon:" Harold J. Power, "Radio Broadcasting From the Standpoint of the Novice:" Oscar C. Roos, "New System of Receiver Design," and "How to Choose a Receiving Condenser;" George H. Clarke of the Radio Corporation of America, "Radio in Boston Twenty Years Ago;" and "Views of Radio Central and Riverhead," "Receiving Conditions in Venezuela," and "Directional Reception;" Sewall Cabot described the "Choralcilo;" W. C. White, General Electric Company, "Practical Points in Connection with Vacuum Tube Design;" W. A. Priess, "The Design of Condensers;" Professor Vanevor Bush, Massachusetts Institute of Technology, "The Electrical Theory Popularized." Communications were read from Dr. Lee DeForest and Dr. A. N. Goldsmith.

The internal broadcasting station of Leon W. Bishop which employed a loop as a transmitting antenna, was an interesting feature of the exposition. Music and speech was broadcasted during the show by this station, and provided a local source of speech and music for all exhibitors of receiving equipment.

This station with 7 watts in the loop, was heard as far away as Lebanon, N. H., a distance of 125 miles. Music from this interior broadcasting station was also reported from a number of other towns and cities, an average distance of 25 miles. Within a radius of four miles signals were received in all directions with equal success, but over greater distances the reception was apparently better in the plane of the loop, namely, North and South. This transmitter, which was built by Mr. Bishop, employed two Radiotrons-U.V. 202 with a plate voltage of 350. The Colpitts circuit was used and the set operated on 275 meters. The loop was about two feet square and two turns of wire were used on it. A magnetic modulator was used in series with the loop.

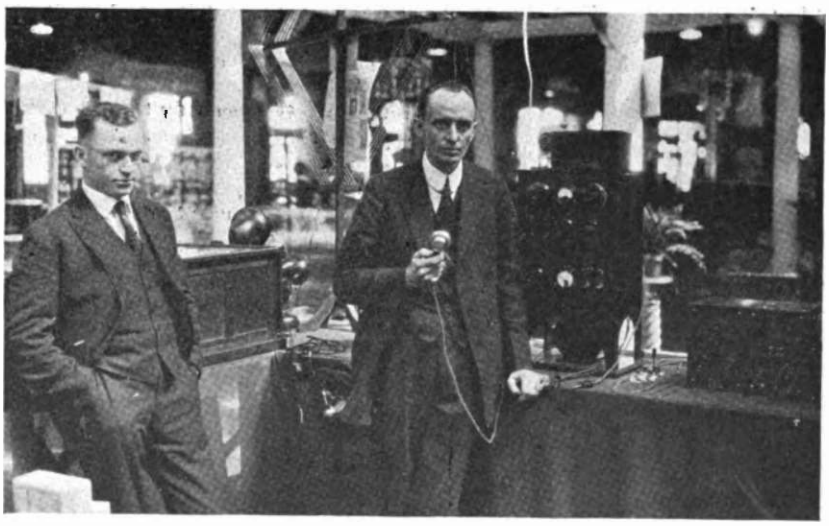
O. C. Roos, I.R.E., Technical Director of the Boston Radio Exposition

There were a number of booths which were fitted up especially on an educational basis, particularly to interest the adult novice. In one of these a trans-Atlantic receiver composed of separate units so as to show more clearly the parts comprising it, was in continuous operation. An automobile of the Locomobile Company was fitted up with a condenser antenna, consisting of a strip of copper netting, eight feet long and three feet wide attached to the inside of the top of the car, the metal atop of the car served as a counterpoise. Five stages of radio frequency, a detector and two stages of audio frequency amplification brought up signals to an intensity sufficient to operate a loud speaker. The car was run about the streets of Boston during the Exposition, and several interesting facts were brought out, in that it was noted that at street intersections intensity of the signals from WGI station was doubled. In passing through the narrow streets, with buildings on either side, it was noted that the signals practically disappeared. The amplifier used in this test was designed by W. A. Priess and is of special design, in that the same tubes contained in it are used for both radio and audio frequency amplification.

A daily newspaper, "The Radiogram" was published at the Exposition during the week, for the purpose of recording all the worth-while news and developments.

There were 118 exhibitors at the Exposition, most of them jobbers and dealers of the Boston and New England district.

Probably the most interesting feature of the Exposition was the Continental Code Speed Contest. The preliminary trials were held on Friday, May 5, and resulted in the elimination of all but three out of twenty applicants. The finals were held on the next night and according to the judges of the contest, the World's record was broken when Theodore R. McElroy of Sommerville, Mass. copied 50½ words per minute. The matter was transmitted by means of a Wheatstone transmitter furnished through the courtesy of W. A. Winterbottom of the Radio Corporation of America.



Broadcasting station of the Boston Exposition. This station, owned and operated by Leon W. Bishop, with 7 watts in the loop was heard at Lebanon, N. H., a distance of 125 miles

The speed in reception was carefully checked. The transmitter itself was driven by a direct current motor through a friction wheel. The signals were recorded, as a check, on a directly driven tape recorder which was marked off every minute by hand, insuring a perfect check on the number of words transmitted per minute. C. E. Kolster, Radio Inspector, First District, had general supervision of the contest on the night of the finals, and together with Miss Edith E. Rotch, the well-known operator and examiner for the Postal Telegraph Company of Boston, who acted as judge. In addition D. P. Wilson of the United Fruit Company, Boston, and O. C. Roos, Technical Director of the Exposition, acted as supervisors.

Mr. Vetromile, a Somerville amateur was second in the finals with forty words and no errors. He was a beginner and pupil in Continental code of Mr. McElroy one year ago.

Those principally responsible for the success of the Exposition were S. H. Fairbanks, who was the promoter and acted as general manager; Oscar C. Roos, the technical director who arranged the technical details; and Chester I. Campbell, advisory director.

There was a large public attendance at all sessions and the Exposition is reported as having been entirely successful from a financial standpoint, although no definite figures are available.

* *

Receives 56½ Words a Minute

A NEW world's record for reception of Continental code was established by Theodore R. McElroy at the New York Radio Show, Seventy-first Regiment Armory, May 24th. The event was originally arranged to include R. G. Seutter, 1921 champion, Jose M. Seron, this year's champion of the Executive Radio Council's Show, Pennsylvania Hotel, and Mr. McElroy, who was the champion of the recent Boston Show. Owing to illness, Mr. Seron was unable to take part in the contest and J. C. Smyth of the Western Union took his place.

Mr. Seutter and Mr. Smyth both dropped out at a speed of 46 words per minute, due to errors, this resulting in the winning of the contest by Mr. McElroy with perfect copy at the above speed.

After the contest, which was held in the presence of the judges and newspaper representatives, Mr. McElroy gave a demonstration of his receiving ability against time and established a new world's record by taking 56½ words a minute with only one error.

The contest was under the direction of Arthur Batcheller, Chief Radio Inspector of the Second District, J. Andrew White, Editor of THE WIRELESS AGE, and R. L. Duncan, Director of the Radio Institute of America. The apparatus used in this contest was especially designed for the purpose by engineers of the Radio Institute of America and consisted of a vacuum tube oscillating at an audio frequency. The circuit ran through a Wheatstone transmitter and the dots and dashes were formed by means of spring contacts which closed the circuit according to the perforations of the tape which, by the way, was punched under the jurisdiction of the judges in the same room in which the contest was held.

Assistant Radio Inspectors, Beane and Lee, acted as assistant judges of the contest. Very careful check was made and the record is an official one.

S. H. Fairbanks, general manager Boston Exposition (left), presenting a silver cup to Theodore R. McElroy (right), of Somerville, Mass., who won the Code Speed Contest at the show at a speed of 50½ words per minute

A World Record

After the scheduled code speed contest at the Radio Show, Seventy-first Regiment Armory, New York City, May 24th, Theodore R. McElroy—who won the main contest—gave a demonstration of his receiving ability against time and established a world's record by taking 56½ words per minute with only one error. Mr. McElroy, at the Boston Radio Show just previous to the New York Show, set up what was then a high mark of 50½ words per minute. The new record is therefore six words better than the previous world's record created at Boston.

Grain Quotations by Radiophone

By Robert H. Moulton

THE Chicago Board of Trade is using the radiophone to send out its quotations and general market news at half hour intervals during each daily session. The immediate effect of such epoch marking innovation in the dissemination of such information has been to bring the Chicago market even closer than ever to producers, dealers, and handlers of grain. Plans are now under way to so improve this service that eventually, it is believed, it will be entirely practicable for any grain man or farmer, wherever located, to obtain at any moment the latest market news and prices and to keep in constant touch with the various factors that influence the effect of supply and demand upon values of grain and allied products.

The broadcasting of market reports by radiophone was inaugurated by the Board of Trade early in March, making use of the KYW radio station of the Westinghouse Electric & Mfg. Co., the aerials being on the roof of one of the large downtown buildings in Chicago. A wave-length of 360 meters is used and information is broadcasted

Transmitting department of the Chicago Board of Trade Station, KYW

Receiving department to check up transmission and receive information from other stations

approximately 500 miles in all directions from Chicago. So far 807 receiving stations have reported reception of the information sent out. Work is under way at the present time to practically double the power of station KYW, increasing the range to approximately a 1,500-mile radius.

Transmission is accomplished by means of a private wire connected directly to the radiophone, so that when the operator on the trading floor of the Board of Trade speaks the set is operated direct. Opening quotations and news is sent out at 9:35 a. m., five minutes after the opening of the daily session; again at 10 a. m., and each half hour thereafter until the close at 1:15 p. m. Weather forecasts and statistical information of interest to farmers and grain men is broadcasted as received, while general market reports and up-to-the-minute news bulletins are sent out at 2:15 and 4:15 p.m.

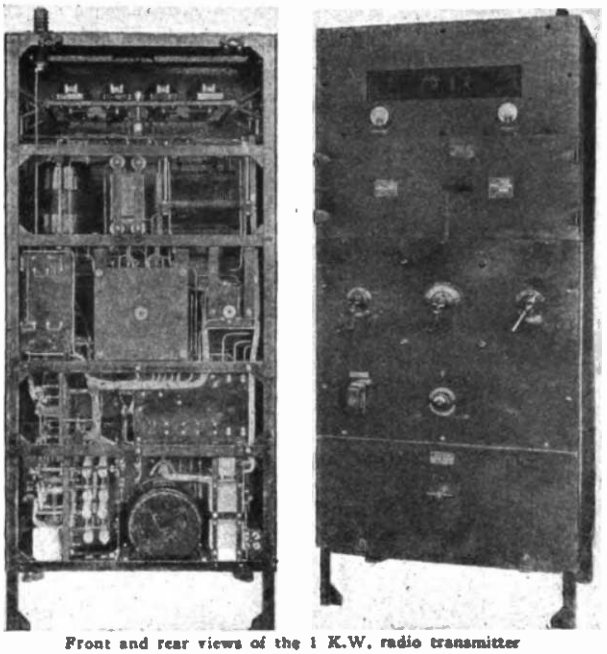
Two New Types of Tube Transmitters

TWO new types of tube transmitters, one of 1,000 watts and the other of 200 watts output capacity, manufactured for the Radio Corporation of America by the General Electric Company, are now being installed on many vessels on both coasts and also on the Great Lakes. Both types, which are the latest development in equipment of this kind, can be used for telegraphy by means of C.W. or I.C.W., and also for voice communication.

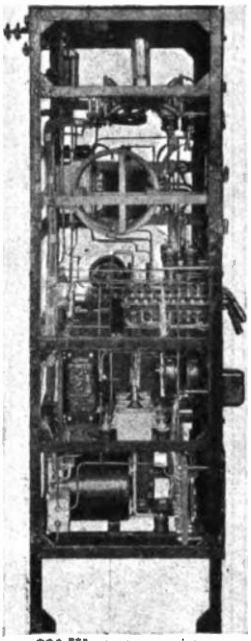
The 200-watt model employs a number of Radiotrons, U.V. 203, as oscillators and modulators, and has control switches for voice, C.W. or I.C.W. When using C.W. or I.C.W. all tubes are used, of course, as oscillators. This type of transmitter is rated at 200 watts when used for telegraphy, or at 100 watts when used for voice communication. This rating is based on the power output of the antenna. The larger model, employing four Radiotrons UV 204, gives 1 K.W. output to the antenna when used for telegraphy, and 500 watts of modulated energy when used for voice communication.

Both models have remote control apparatus and are equipped with motor-driven choppers for I.C.W., and with wavelength changing switches for the following wavelengths: 300, 450, 600, 750, 800, 1,000 and 2,000 meters.

The normal daylight range of the 200-watt model for voice is 50 to 75 miles, for I.C.W. 75 to 100 miles and for C.W. 300 to 400 miles. The normal daylight range of the 1,000-watt model for voice is 150 to 200 miles, for I.C.W. 200 to 300 miles, and for C.W. 800 to 1,200 miles. These figures are based upon tests made overland, the receiver consisting of a detector and two-stage audio frequency amplifier.



Front and rear views of the 1 K.W. radio transmitter



200-Watt transmitter rear view

Music via a Lamp Socket

A DEMONSTRATION of the efficacy of the electric lighting system as a source of news, music, lectures and speech was given in the office of the Chief Signal Officer of the United States Army on the afternoon of March 24. The performance was witnessed by Major General George O. Squier, Dr. Louis H. Cohen, a noted electrical engineer of the Signal Corps; R. D. Duncan, Jr., chief radio engineer, and S. Isler, assistant radio engineer, of the radio research laboratory of the Signal Corps, located at the Bureau of Standards, and other spectators.

Major-General George O. Squier demonstrating the use of an electric lamp as a source of power for a radio receiving set

The circuit used in bringing music out of a lamp socket consists of standard radio equipment at both ends of the circuit. Two condensers are inserted between the two sides of the circuit and the centre points are connected together and also to the antenna post of the transmitter and the receiver. The ground is used in the regular way. This allows the high-frequency radio currents to pass from both sides of the line to ground, through the receiver, while the low frequency current follows the metallic path of the circuit.

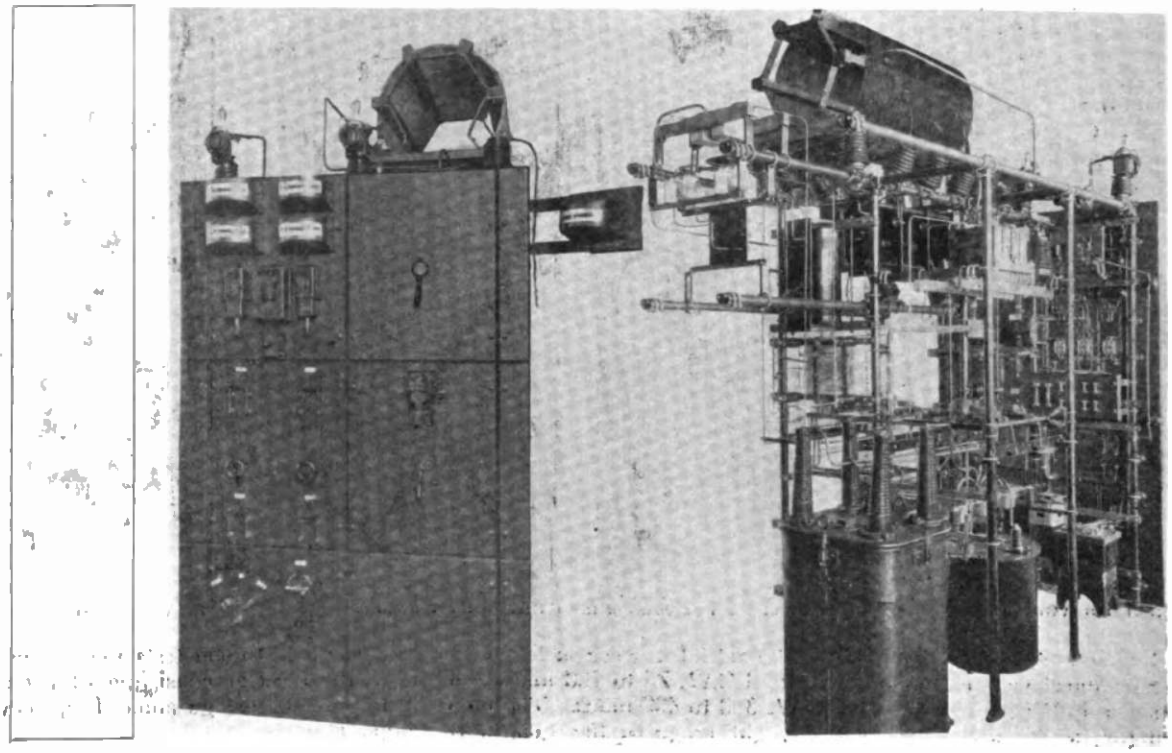
A 2 K.W. Vacuum Tube Set for Panama

A 2 K.W. tube transmitter built recently by the General Electric Company for the Radio Corporation of America is now installed and in operation at Almirante, Panama. Not only is this transmitter unusually powerful for a tube transmitter, but it was designed and built in record time, being finished, tested, and ready for shipment three months after receipt of the order.

The ripple in the output of the rectifying system is smoothed out by means of a suitable filter system. The radio frequency power is generated by a system consisting of two 1 K.W. Radiotrons with the necessary grid and plate coils, together with an antenna loading coil. Provision is made for controlling the power by a power change switch which alters the voltage on the primary of the plate transformer. The filaments of all tubes, Kenetrons and Radiotrons are operated on A.C. through transformers, which step the supply voltage down to the operating voltages of the filaments.

The set is equipped with a wave changing switch which, by a single operation, changes the transmitted wave to any one of three lengths—600, 1000 and 3000 meters. The switch automatically selects predetermined points on the loading, plate and grid coils. Provision is also made for transmitting on interrupted continuous (ICW) as well as on continuous waves (CW). This is accomplished by means of a motor-driven interrupter in the grid circuit of the Radiotron tubes, which starts and stops oscillations in the antenna at audio frequency, approximately 1000 interruptions per second.

The rating of the transmitter is based on the power input of the antenna circuit, instead of on the output of the power equipment as is usual with spark transmitters. The rating of the tube transmitter is the product of the antenna resistance times the antenna current squared, equal to two kilowatts. While it cannot be predicted exactly what the range of the set will be, it is expected that it will equal, if not exceed, the range of a 50 K.W. spark transmitter. As an example of its initial effectiveness, the set is now carrying on reliable and satisfactory communication with New Orleans, La., twenty-four hours a day.



Front and rear view of the 2 K.W. radio telegraph transmitter for C.W. and I.C.W. communication. Wavelength 600 to 3,000 meters

The set consists of equipment for supplying direct current at 12,500 volts for the plate supply of the Radiotron tubes, and for converting this power into radio frequency. Power is supplied to the transmitter at 440 volts, single phase, 60 cycles, and stepped up to high voltage by means of a transformer, the output of which is fed into the rectifying system.

The rectifying system consists of two 2 K.W. Kenetron tubes which supply 12,500 volts D.C. to the plate circuits of the Radiotron generators.

Novel Battery Tester

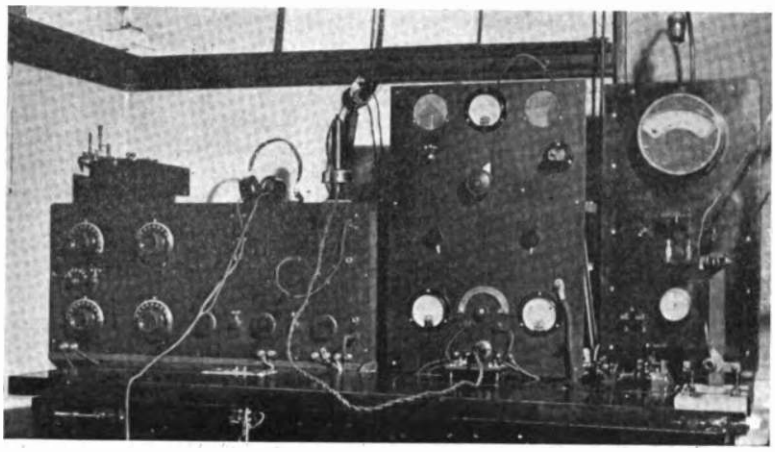
AMONG new and useful devices is a novel and exceedingly simple battery tester, a hydrometer, which can be read in semi-darkness. It is only six and one-half inches long, and consists of a bulb, a filling nozzle of rubber and a glass tube. Inside the tube are three colored balls—red, white and green—made of materials whose specific gravities dif-

fer. And that is all the simplest tester possible.

The inscription on its container tells how to use the device; this reads: "Floats all three, battery is charged fully,
Sinks the white, charge still right.
Sinks the green, charge is lean.
Sinks the red, charge is dead."

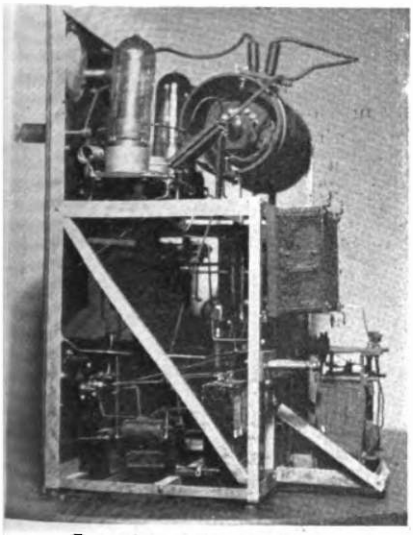
1600-Mile Amateur Radiophone

THE 100-watt C.W. transmitter which has been used at the station of Louis Falconi, Roswell, N. Mex., 5ZA, during the past few months, has made some remarkable records for amateur transmission, having been reported from points in every State in the country, Canada, Mexico, Honolulu, and by ships on both the Atlantic and Pacific oceans.



The complete installation at 5ZA, showing the receiver, transmitter and current control panel

This transmitter was built to take four 50-watt tubes and one 5-watt speech amplifier. For C.W. all power tubes are connected as oscillators; for phone, two as modulators and two as oscillators, with a 5-watt speech amplifier. The circuit has a common plate-antenna coil and a separate grid coil which is variable in coupling to the plate antenna coil and is adjustable in inductance. By making the grid coil adjustable in coupling and inductance, variable condensers can be eliminated and the set that much simplified! The Heising method of modulation is used. The set is designed so that almost any wave from 200 to 400 meters can be instantly used and the results seem to be equally efficient on all waves. The



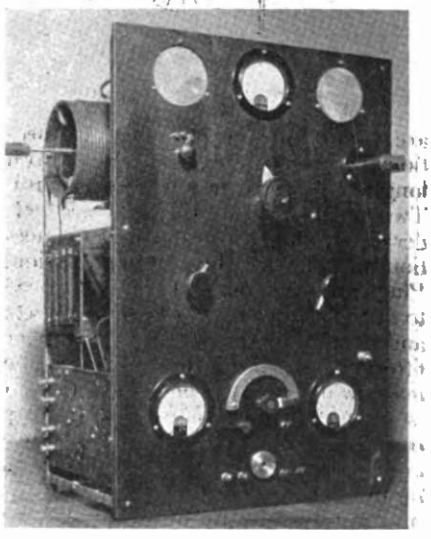
Rear view of the transmitter

only disadvantage experienced with a C.W. transmitter is the trouble in raising the station desired, unless that station happens to be right on the wave being used. With the set at 5ZA, however, which can be instantly tuned to any wave, it is only necessary to estimate the wave the station you want is listening on, change the set to that wave and call. After the station has answered the wavelength can be changed to the usual working wave.

To date only two 50-watt tubes have been used. With both power tubes as oscillators, the antenna current is 4¼ amperes on 200 meters and 5 amperes on 375 meters, using 1000 volts D.C. on the plates, the space current being 225 milliamperes. When using the phone, with one power tube as a modulator and one as an oscillator, the radiation is 3½ amperes without speech and 4 amperes when the microphone is spoken into. The plate current is 150 milliamperes without speech and goes to 250 milliamperes with speech. All reports indicate that the modulation is fairly complete and the speech clear.

The set is mounted as a unit on an aluminum frame, with a front panel of bakelite, 18 x 24 inches. The photos illustrate the method of construction. Everything is mounted on the framework except the motor-generators, key and microphone. The unit is rigid and easily moved about.

Referring to the front view of the set, at top center is the antenna current meter, 0 to 5 thermo amperes. Below the meter is the change-over switch, to change from C.W to phone. This knob controls a double switch, a SPDT and a SPST switch, the blades being connected by a fibre strip, allowing one control for both. When thrown to left, the modulator tube grid is connected to the modulation system and a high frequency choke is placed between the plates of the two tubes. When thrown to the right, the modulator tube grid is connected with the oscillator tube grid and the high frequency choke shorted, thus allowing both tubes to act as oscillators in parallel. The two small knobs in the center of the panel are connected to two rheostats, one in the primary of the filament lighting transformer and one in the filament circuit of the speech amplifier. Thus all the power tubes are controlled together and the speech amplifier separately. The filament voltmeter is in the lower left corner, and the plate milliampere meter on the right. Between the two meters is an adjustable unit of the grid leak resistance for exact adjustments. When not in use it is shorted as shown in the photo. Immediately under the variable leak is the microphone jack and also the binding post for the key and the storage battery. The microphone jack is so arranged that upon insertion of the plug, the microphone is connected and the filament of the speech amplifier tube lighted, so that the speech amplifier lights up only when the plug is in the jack. The large post in the upper right hand corner is for the aerial connection. The small three-point switch at the left throws the voltmeter from power filaments to amplifier tube filament,

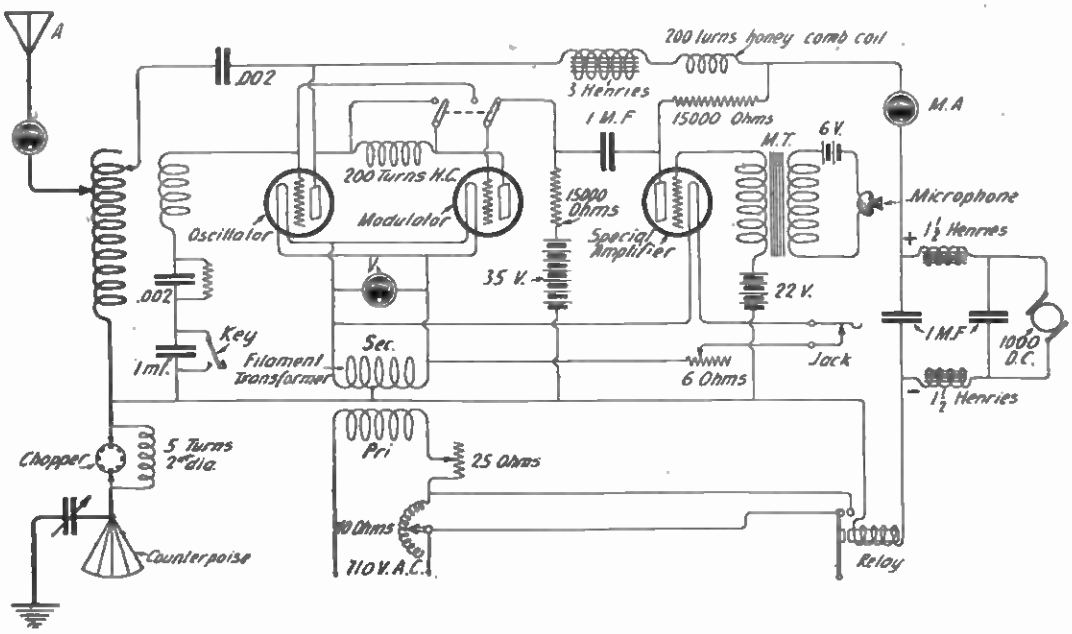


Front view of the transmitter

the center contact being dead so that the higher voltage of the power tubes will not be thrown on the speech amplifier filament while changing the meter from one to the other. As will be noticed in the photo, windows are cut in the panel and copper screening placed over them. In the left side,

of the photo can be seen part of the inductance with the grid control handle. Below the inductance are the resistances for the speech amplifier and below them is a small panel on which is mounted the speech amplifier tube, coupling condenser and modulation transformer. The binding posts are connected to the biasing batteries for modulator and speech amplifier tube grids.

Referring to the back view of the set, the inductance is plainly seen at the top. The large coil is on a tube 5½ inches in diameter. It is threaded five turns to the inch and 40 turns of No. 8 hard drawn bare copper wire



Circuit diagram of the C.W. transmitter at 5ZA

are wound on the tube. For connections, lengths of the same wire ½ inch long are soldered to every other turn. Two such rows of contacts are soldered on, one for the antenna connection and one for the plate connection. Plugs are made out of brass rod, bored to fit the short lengths of wire contacts and handles of bakelite or hard rubber fitted so that the adjustments can be made while power is on. The grid coil is on a four-inch tube and has fifty turns of No. 14 S.C.C. copper wire tapped every ten turns and the taps brought to a switch fitted to the end of the tube. The switch shaft is made very long so as to project from the side of the set, thus allowing the same handle to adjust the coupling and also the inductance of the grid coil, making it unnecessary to reach inside the set to adjust the grid coil inductance. The grid coil slides on two brass rods attached to the big coil. The rheostat under the inductance is in the primary of the filament transformer. The filament transformer, which is under the rheostat, is homemade, with sufficient capacity to light four 50-watt tubes and also the amplifier tube. The socket assembly is also homemade and has places for four power tubes on a single bakelite base, with inter-grid chokes and protective gaps built in. Details as to the rest of the apparatus can be obtained from the diagram.

When first placed in operation, trouble was experienced with flickering of the filament voltage due to the voltage drop on the power line when the generators took power. Unfortunately the power line was not of sufficient capacity for the work and thus caused the flicker. That made the note very bad, giving it a squealing effect. The hook-up shows how this trouble was cured. A relay was connected in the negative lead of the 1,000-volt D.C. line and arranged so that every time the relay closes, a small resistance in the primary of the filament transformer is cut out, thus allowing the filament voltage to rise every time the key is closed and juice flows from the high voltage generator. By making the resistance variable, any drop can be taken care of in that manner, a heavy drop requiring a greater resistance, of course, than a slight drop. By proper adjustment, however, an absolutely steady filament voltage can be obtained.

Another arrangement used, which is unique, but very satisfactory, is the method of connecting the chopper. It is placed in the ground lead and a small inductance shunted around the chopper. The chopper then alters the wave by a few meters so many times per revolution and any note can be obtained. This method of chopper modulation has proven quite effective and has good carrying qualities.

The power for the set is furnished by two generator sets, each giving 500 volts and 400 milliamperes. Allowing 100 milliamperes per tube, it is seen that the power unit is just large enough to feed four 50-watt tubes for C.W.

Although using only two 50-watt tubes to date, the results have been remarkable, both with speech and C.W. The speech amplifier, however, has just recently been installed and the results reported on the voice operations were made during a few short periods of operation. On March 2, 3, 4, 5 and 8th, the following stations were worked by voice only and no trouble experienced, the stations reporting signals as of good audibility and modulation O. K.

	Miles
March 2nd—	
9 BHE—Glen Ellyn, Ill.	1,000
6 AWP—Santa Ana, Calif.	700
9 AIG—Sioux Falls, S. D.	800
9 TI—Milbank, S. D.	900
5 XB—State College, Texas	450
5 MT—Laredo, Texas	800
9 PI—Eureka, S. D.	900
9 AVZ—Pierre, S. D.	850
5 XD—State College, N. M.	250
March 3rd—	
5 XB—State College, Texas	450
9 AEQ—Shenandoah, Iowa	700
9 AAS—Owensboro, Ky.	975
9 SI—Milton, Iowa	750
9 DZJ—Great Bend, Kans.	400
9 ZAF—Denver, Colo.	450
5 ZE—Houston, Texas	250
5 XD—State College, N. M.	250
March 4th—	
9 SI—Milton, Iowa	750
9 AAY—Chicago, Ill.	1,450
9 AKR—Lanark, Ill.	1,000
6 ZZ—Douglas, Ariz.	300
6 ZG—Los Angeles, Cal.	750
9 ZJ—Indianapolis, Ind.	1,050
March 5th—	
9 WU—Ellendale, N. D.	975
9 AAS—Owensboro, Ky.	975
6 ZZ—Douglas, Ariz.	300
March 8th—	
5 ZAE—Waco, Texas	400
5 HK—Oklahoma City	500

In the case of the above stations two-way communication was carried on and in most cases 5ZA was the station called.

Using straight C.W. two-way communication has been carried on with

the following stations: 2ZL, XF1, NMW, 8VY, 7XF, 4FT, 8ZG, 8ZZ, 8XV, 8XH, and others closer. The foregoing are all over 1,000 miles distant from 5ZA. The voice has been reported as follows—a few maximum distances only being given:

	Miles
Stenen, Saskatchawan, Canada.....	1,400
8 YR—Miami Univ., Oxford, Ohio	1,150
8 BYN—Detroit, Mich.	1,275

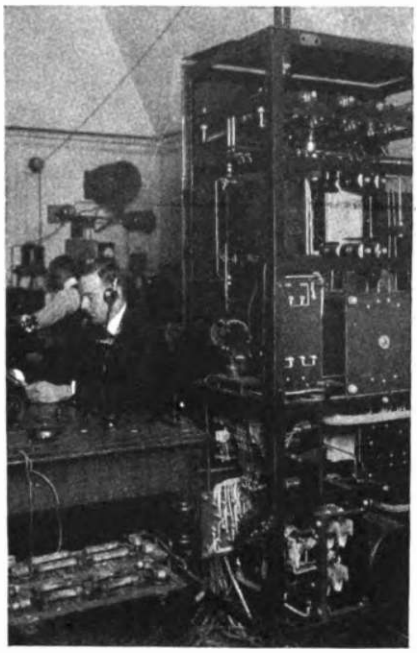
The voice of 5ZA has been heard in 25 States, Canada and Mexico. The C.W. has been heard in all States, Canada, Mexico, Hawaii and on both oceans.

On April 22, at 12.30 A. M., Mountain time, Station 5ZA and the experimental station of the Navy Department, at Washington, D. C., NOF, carried on two-way communication by voice. The reception at 5ZA was perfect and the same seemed to be the case at NOF, as no difficulty was experienced in understanding the speech from 5ZA. The distance between the two points is approximately 1,600 miles and the two-way voice communication on the 22nd undoubtedly establishes a record for amateur power and wavelengths such as were used by both stations.

The Post Office Radiophone System

AIMING to popularize and expand the service of the United States Post Office Department in distributing market and weather information by wireless transmission to the agricultural interests, which departure was introduced April 15, 1921, radio-telephony is to displace radio-telegraphy as the broadcasting vehicle.

Congress is being urged to establish a "Bureau of Communication" in the United States Post Office Department, appropriating $500,000 for its establishment and maintenance, in which event radio-telephony will be the vehicle for spreading Government information of a varying assortment. The Post Office Department will draw upon the different Government bureaus for information that will not only serve the interests of the farmer, but this Federal agency will lend itself to the dissemination of facts of benefit to the miner, rancher, fruit-grower, forester, and lumberman. The general public also will find much of this information valuable and of an entertaining nature.



The medium of scattering market, weather, and other Government news is to be enlarged so that the isolated as well as the frequented points of the United States may be reached. There are at present eight radio stations, originally established in conjunction with the transportation of mail by airplane, employed as distributing agencies of market and weather reports. They are located at Washington, District of Columbia; Cincinnati, Ohio; Omaha and North Platte, Nebraska; Rock Springs, Wyoming; Elko and Reno, Nevada. Stations will also be located in Georgia, Texas, California, Montana, Illinois, and one point in the New England States.

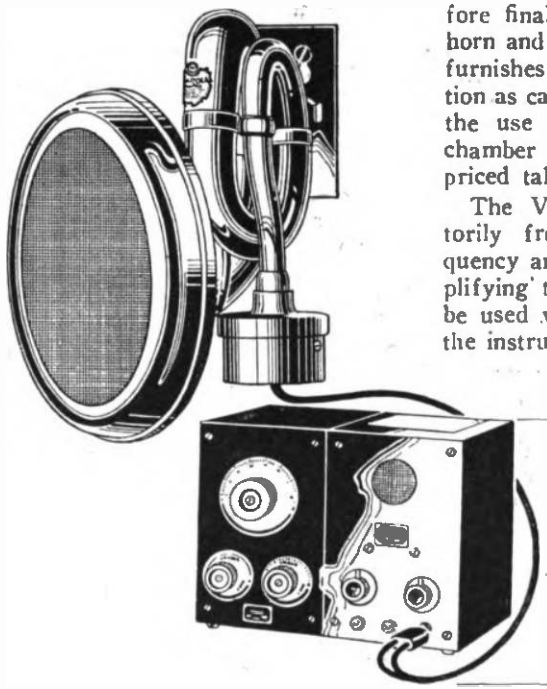
The Vocarola for Radiophone Reception

ANOTHER step in the advancement in radio reception has been made with the advent of the Vocarola, which has been brought out by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

The Vocarola is a reproducing apparatus which serves the purpose of a sound chamber. Through the use of the new apparatus, receptions of programs broadcasted by radio telephone will be made comparatively easy and is especially serviceable where several persons are listening at one time.

The Vocarola consists of a specially designed metal horn attached to the mechanism of a single Baldwin telephone receiver. The standard Baldwin mica diaphragm has been replaced by a special metal diaphragm which will stand practically any amount of abuse without damage. A large amount of experimental work was carried on by Westinghouse radio engineers before final decision was made on the horn and it is believed that the design furnishes as fine a quality of reproduction as can be obtained except through the use of a very elaborate sound chamber such as is found in high-priced talking machines.

The Vocarola will work satisfactorily from a two-stage audio-frequency amplifier and, using good amplifying tubes, 150 to 200 volts may be used without danger of damaging the instrument.



View of the Vocarola which gives excellent results operating on two steps of audio frequency amplification

A Selective Receiving Antenna

HAROLD H. BEVERAGE has recently described a receiving antenna which is very efficient in its operation and is also highly selective.

A horizonal, preferably a periodic, antenna is used extending in a direction parallel to the direction of transmission of the signals which are to be received. This antenna is constructed with distributed capacity, inductance and resistance of such values that the currents produced therein by the desired signals increase progressively from the end of the antenna nearest the transmitting station and acquiring maximum strength at the end farthest from the transmitting station.

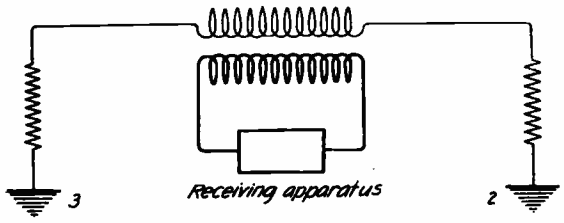


Fig. 1

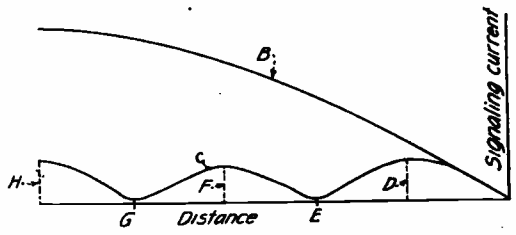


Fig. 2

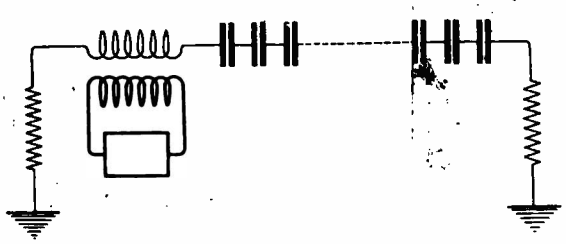


Fig. 3

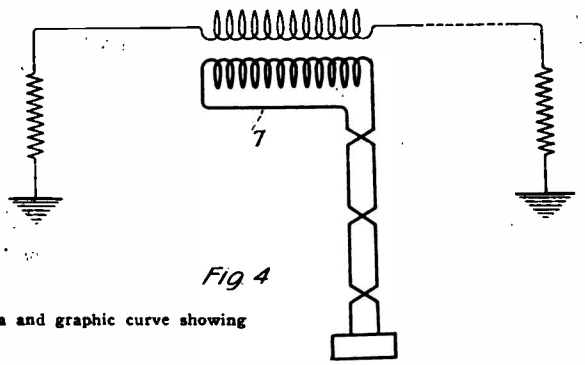


Fig. 4

Diagrammatic circuit of the selective receiving antenna and graphic curve showing characteristics

Consider first a simple horizontal receiving antenna as indicated in figure 1, which extends from the receiving station toward the transmitting station A from which the desired signals are coming and which is grounded at both ends. The operation of such an antenna in receiving signals may be explained as follows:

Assume that the signal waves in space are traveling from station A in the direction of the antenna; then at the end 2 of the antenna a small current will be induced which will be propagated as a wave along the antenna toward the end 3. If the velocity of this small current wave in the antenna is equal to the velocity of the signal wave in space, this current wave will grow as it approaches the end 3 by continuously absorbing small additional amounts of energy from the ether waves since the two waves are traveling along in phase with each other. From this analysis it appears that, if the constants of the antenna are such that the current wave travels at the same velocity as the ether wave, the longer the antenna the greater the current which will be received. There will, of course, be a maximum length beyond which nothing will be gained because of the losses in the antenna. The lower these losses the greater the length of antenna which can be used to advantage. If, however, the velocity of the current wave in the antenna is not quite the same as that of the ether wave, then for a certain distance the two waves will add, but a point will finally be reached where one wave will be so far in advance of the other that the two will be in phase opposition Interference will then occur and the current wave will decrease to zero and a new wave will start and build up. Under these conditions the strength of the signal which will be received at the end 2 of the antenna will be weak, and as the receiving apparatus is moved along the antenna in the direction in which the waves are moving, the signal strength will gradually increase to a maximum, then decrease to a minimum, and increase again to a second maximum having the same strength as the first maximum. The distance along the antenna between maximum and minimum will depend upon the relative difference in the velocity of the electric wave on the antenna and the ether wave surrounding it in space. If the velocities differ very little a long receiving antenna can be used to advantage, but if the velocities are considerably different there may be no advantage in using a greater length of antenna than that which will give the first maximum for the desired signal frequency. This length should preferably be at least as great as a half wave length of the signal waves which are to be received.

Figure 2 illustrates the variation in current strength in the antenna under the two different conditions of operation which have been described. In this figure the ordinates represent signal strength and the abscissae represent distance along the antenna. Curve B shows the increase in current strength along the length of the antenna when the current wave and the ether wave travel at the same velocity. This shows that the current along the length of the antenna increases quite rapidly at first, then more slowly and finally the current curve flattens out when the end of the antenna farthest from the transmitting station is reached. It is assumed that the distance represented by this curve is the maximum length of the antenna which can be used to advantage, and this maximum length may be equal to several wavelengths. Curve C shows the variation in current strength along the length of the antenna for one case when the current wave and the ether wave travel at different velocities. Here the current increases until a maximum is reached at the point D. and then decreases to a minimum at point E. It increases to a second maximum at point F and decreases again to

a minimum at point G. It increases again to a third maximum at point H. Since these maximum points are all of the same value it is apparent that nothing will be gained in signal strength by using a greater length of antenna than that represented by distance O—D. In either case, however, the receiving apparatus may be located at the end 3 of the antenna farthest from the transmitting stations and the best results possible with that particular length of antenna will be obtained.

For signaling waves traveling in the opposite direction, the currents will build up in the same manner. If there is no reflection from the ends the same antenna may be employed for receiving signals from opposite directions by installing receiving apparatus at both ends. Reflection may be avoided by grounding the ends through the non-inductive resistance (5) of a value equal to the surge impedance of the antenna, represented by $\sqrt{\frac{L}{C}}$; where L and C are the inductance and capacity of the antenna per unit length. In case the antenna has fairly high attenuation the losses therein may be so great that the use of means for preventing reflection may be unnecessary; in other words, the losses in the antenna may be so high that any wave which might be reflected will be practically damped out before it reaches the receiving apparatus. In certain cases where a line of low impedance is used the natural resistance at the grounding point may be sufficient to practically eliminate reflection. In some cases also, the ground resistance may be sufficient to largely reduce reflection and the losses may then be sufficient to damp out the small amplitude waves which are reflected.

In accordance with theoretical considerations, if an antenna were to be freely suspended and if the surface of the earth constituted a perfectly conducting parallel plane, current waves would travel through the antenna conductor at a velocity equal to the velocity of light. In practice this theoretical condition may be difficult to obtain because of ground resistance and because of the necessity of providing supports for the antenna. The effect of these supports may be to add shunt capacity to the antenna without causing any compensating change in the other line constants. The effect of the excess shunt capacity may be neutralized for continuous waves of a particular frequency by inserting condensers in series with the antenna, which neutralize part of the series inductance and increase the wave velocity. Such series condensers should be inserted in the antenna at suitable intervals (in no case more than $\frac{1}{\pi}$ wavelength apart) to give substantially the effect of distributed series capacity for the frequency which is to be received. By choosing proper values for the condensers the wave velocity, on the line for continuous waves of any specified frequency, may be made equal to or greater than the velocity of light. Figure 3 illustrates an antenna, which is provided with series condensers for this purpose.

In some cases it may not be convenient to locate a receiving station at a point along the length of the antenna. In such a case I have found that a transmission line running in a different direction from the main antenna may be employed between the antenna and receiving station. Figure 4 shows such an arrangement. The transmission line 7 in this case is transposed at suitable intervals in order to neutralize the effect of currents received thereon. The directivity of the receiving system will be unchanged by the use of this transmission line irrespective of its direction.

It will be recalled that the antenna used by P. F. Godley at Ardrossan, Scotland, last December, in the reception of trans-Atlantic amateur signals, was one designed by Mr. Beverage. It was 1,300 feet long (two 200 meter wave lengths), and was grounded at the southwestern end, nearest the ocean, through a non-inductive resistance of 200 to 400 ohms and at the other end, where the receiving set was located, it was grounded through a coil having an inductance of 0.1 millihenry.

Compensation for Aerial Wavelength Changes

H. J. ROUND of London, describes a method whereby the wavelength of an aerial may be kept constant automatically. He combines an aerial or a circuit whose period varies with that of the aerial and a closed oscillatory circuit which has a period dependent on that of the primary circuit with a small rotating field motor comprising two windings and connects one winding in the closed circuit and the other winding in the aerial circuit or circuit whose period varies with that of the aerial.

If the aerial is exactly in tune with the closed circuit, then there will be no rotating field produced by the two windings at right angles, but if the aerial increases its wavelength, the phase of the aerial current will tend to produce a rotating field in one direction, whereas if the aerial decreases its wavelength, the rotating field will be in the other direction.

The rotation of the shaft of the armature of the rotating field motor can be utilized to control a variometer, a variable condenser, or other means for varying the period of the aerial and is connected with the rotor so that when the aerial increases its wavelength, the variometer decreases it until there is no longer any rotating field and vice versa, so that the wavelength of the aerial is kept practically constant.

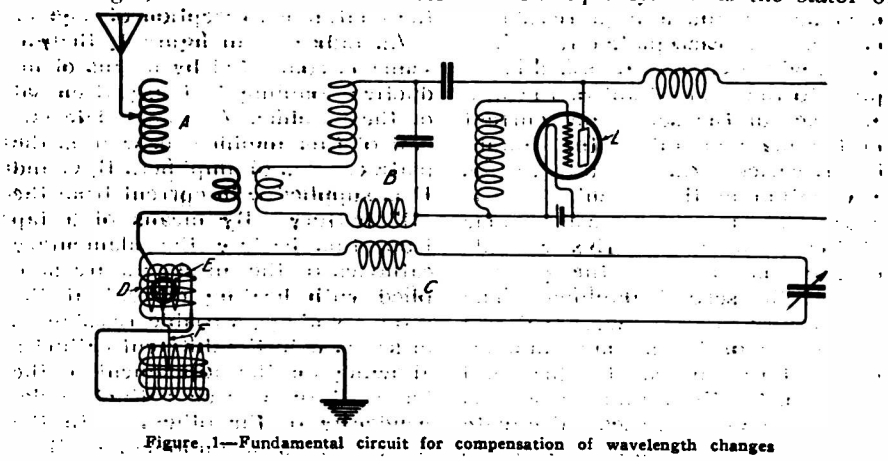


Figure 1—Fundamental circuit for compensation of wavelength changes

Referring to the diagrams A is an aerial circuit which may get its natural period changed by external causes, B is an oscillatory circuit employing tubes. C is an oscillatory circuit coupled to B and tuned to the same frequency. D is the stator of an asynchronous motor of which E is the rotor, D comprising two windings at right angles, one in the aerial circuit and the other in the circuit C.

No rotating field is produced in E if both A and C are in tune with B, but if A varies either to a shorter or longer wavelength, a rotating field is

set up in one direction or another and E moves accordingly. On the shaft of E is a variometer F in series with the aerial. This variometer is connected so as to increase or decrease the impedance with the rotation of E so as to counterbalance and annul the rotating field by bringing A and B to the same period, the system then coming to rest.

This arrangement will use up a large amount of high frequency power and it is of advantage to interpose between E and F some form of relay which can be operated with small amounts of energy. Such an arrangement is illustrated in figure 2.

It is also of advantage, when using this arrangement, to employ an independent drive, as illustrated in figure 2; that is, to supply the grid control of the power valves L from a separate or master oscillator M, as with a coupled circuit some slight changes of wavelength and phase are always caused when the aerial circuit has its tune changed and this cannot occur with the independent drive.

When using the "independent drive," arrangements have to be made by trial to set the phases right so that no rotating field is produced when the aerial setting is correct. This can be done on the tuning condenser of circuit C, which will be then coupled to the independent drive instead of to the circuit B.

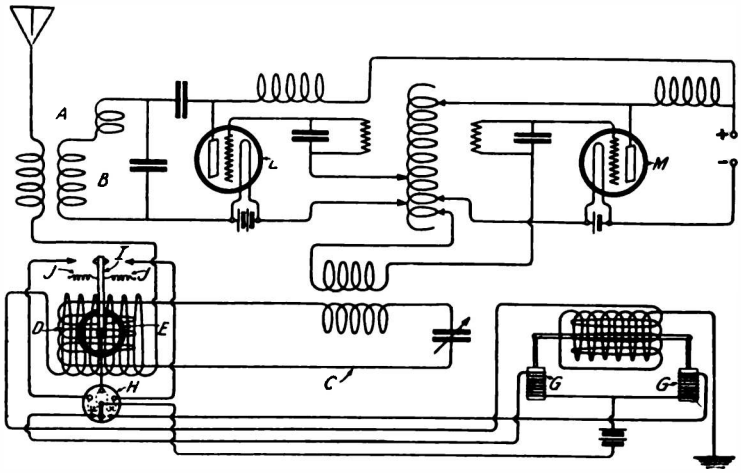


Figure 2—Connections showing relay interposed between motor and variometer

Figure 2 also shows an arrangement in which a relay is interposed between the motor and the variometer. The latter is actuated by solenoids G, G, controlled by a relay H actuated by a contact arm I which is mounted on the shaft of the rotor E and controlled by springs J, J.

The relay H instead of working a variometer may be caused to add or subtract small inductances until the relay contacts fall back.

A High Amplification Circuit

A CIRCUIT developed by Chester W. Rice to produce a high degree of amplification and at the same time help eliminate static has recently been described.

He employs a plurality of vacuum tube amplifiers, preferably of the high vacuum or pliotron type connected in cascade. The plate circuits of all of these amplifiers are supplied with current from a common source and a high resistance is inserted in each plate circuit. The signal which is to be amplified is applied to the grid circuit of the first amplifier of the series and current in the plate circuit of that amplifier is varied. As a result there is a variation in the potential difference between the cathode and anode of the amplifier and this variable potential is applied to the grid circuit of the second amplifier. The variable potential between cathode and anode of the second amplifier is in turn applied to the grid circuit of the third amplifier and so on throughout the series. The plate circuit of the last amplifier includes a telephone receiver for detecting the received signals.

In order to overcome the effect of strays upon the receiving apparatus, the operating characteristic of one of the amplifiers of the series is adjusted in such a way that the amplified current produced by stray impulses in one direction cannot exceed that produced by the signaling impulses. Adjustment is also made on the next amplifier of the series in such a way that the amplified current produced by stray impulses in the opposite direction cannot exceed that produced by the signaling impulses. As a result stray impulses have no greater effect upon the receiving apparatus than the signaling impulses and hence do not prevent the continuous reception of signals.

As indicated in figure 1, the antenna is connected by means of inductive coupling to the grid circuit of the amplifier A. The plate circuit of this amplifier as well as the plate circuits of amplifiers B, C and D is supplied with current from the "B" battery. By means of a tap from this battery the filamentary cathodes of the amplifiers are supplied with heating current at the proper voltage, variable resistances in series with the different cathodes allowing for the adjustment of the temperature of each cathode independently of the others. In the plate circuits of amplifiers A, B, C and D, a high resistance is inserted. When current is received in the antenna the potential of the grid of amplifier A is varied and the current through the amplifier varies accordingly. As a result, the potential of the anode of the amplifier varies with respect to the cathode and this variable potential is applied to the grid of amplifier B by means of the condenser 1. The resulting variable potential of the anode of amplifier B is applied to the grid of amplifier C by means of condenser 2 and the variable potential of the anode of amplifier 5 is applied to the grid of amplifier C by means of the condenser B. While four amplifiers are shown thus connected in series, as many amplifiers as desired or as may be necessary to secure the desired degree of amplification may be thus connected. In the present case the variable potential of the anode of amplifier D is applied by means of the condenser 4 to the telephone receiver. In case the signals to be received are transmitted by means of continuous waves, local oscillations for receiving by the heterodyne method may be produced by the vacuum tube generator E connected as shown so as to impress local oscillations upon the circuit which includes the telephone.

In order that the grids of the amplifiers may normally be maintained at the same potential as the cathodes, high resistance connections may be employed between the cathodes and grids. If by reason of the operating characteristic of the particular amplifiers employed, it is desired to maintain their grids normally at different potentials from that of the cathodes, batteries of the

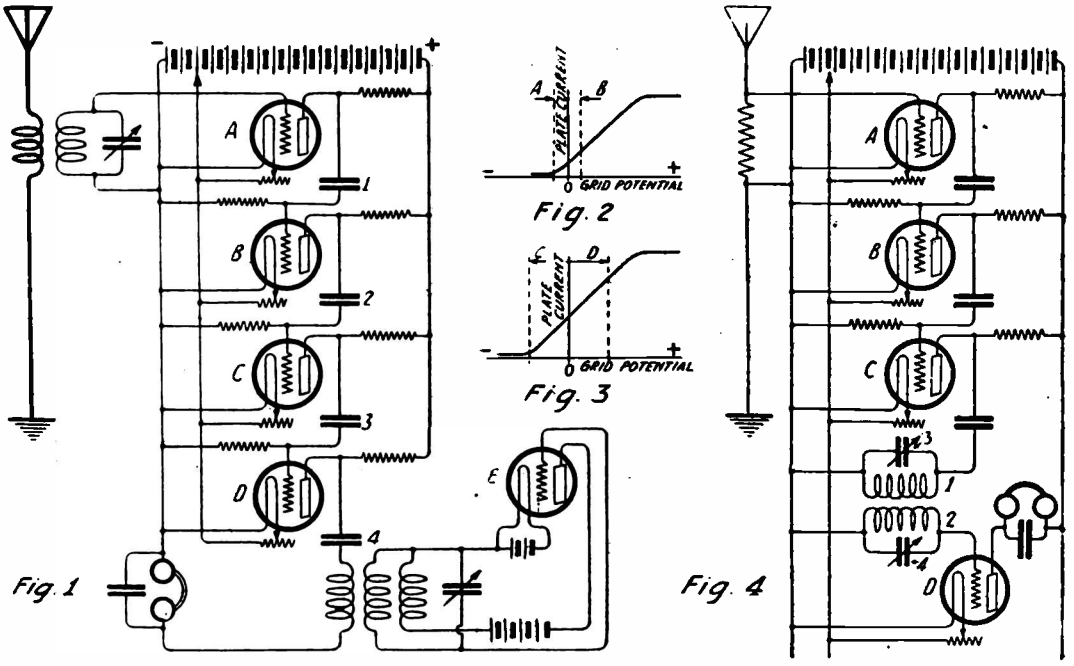
desired strength and polarity may be inserted in these connections between grid and cathode.

When the current received by the antenna makes the grid of amplifier A more positive the current through the amplifier will increase and the anode of the amplifier will become less positive. As a result there will be a decrease in the current through amplifier B and the anode of this amplifier will become more positive. This will produce an increase in the current through amplifier C and make its anode less positive, thereby causing a decrease in the current through amplifier D. Thus a positive impulse applied to the grid of amplifier A produces a greatly amplified negative impulse of the same shape across amplifier A which is transmitted to the grid of amplifier B where it produces an amplified positive impulse of the same shape across amplifier B. This positive impulse applied to the grid of amplifier C produces an amplified negative impulse of the same shape across amplifier C and this negative impulse applied to the grid of amplifier D produces an amplified positive impulse across amplifier D and at the terminals of the receiver.

It has been found that a one hundred fold amplification in each amplifier may readily be obtained with the system which has been described, that is, from the first three amplifiers connected in series a million fold amplification may be secured. The amplifiers should preferably be high resistance tubes, that is tubes in which the anode and cathode are at some distance from each other and a fine grid is placed close to the filament. With such tubes the plate resistances may be of the order of one million ohms as the currents required for operation are very small. The last amplifier D should preferably be a low resistance low amplification or high current tube as considerable current is required for the operation of the receiving apparatus. In other words this amplifier should have its cathode and anode close together with a relatively coarse grid between them. The resistance in this plate circuit may be of a few thousand ohms.

It will be found desirable to make the condensers connecting the first amplifiers of the series of small capacity so that they will permit the passage of the high frequency components of the current, but will offer a high impedance to the audio frequency components. The last condensers of the series should have a higher capacity so that they will allow the audio frequency components of the current produced to pass through without offering a high impedance to their flow. Under these conditions this system has the important property of acting as detector and amplifier simultaneously: that is, there will be a gradual transition from pure radio to practically pure audio between the first and last amplifiers.

Figures 2 and 3 show two typical operating characteristics of amplifiers of the type described. From these characteristics it will be seen that when the grid potential becomes sufficiently negative the current in the plate circuit becomes practically zero, that is any further change in the grid potential in the negative direction produces no change in the current in the plate circuit. On the other hand, when the grid potential reaches a certain positive value any further change in that direction produces no change in the current. These critical grid potentials, beyond which no change in plate current occurs, depend upon the structure of the tube and upon the heating current in the cathode. By taking advantage of this feature in the operation of the amplifier it is possible to overcome the overpowering effect upon the signals of static or "strays" in the following manner. Assume that figure 2 represents the characteristic of amplifier C and that the received signals have been amplified to such an extent that they cause the grid potential to vary between the values represented by the lines A and B. The entire range of change in grid potential produced by signaling impulses will then be effective in varying the plate current. If now a "stray" is received upon the antenna of greater intensity than the signal a negative grid potential produced thereby of greater value than that of the signal will have no effect upon the plate current of amplifier C although a greater positive impulse will increase the current beyond the value which corresponds to potential B. A greater current through amplifier C, however, means a more negative potential upon the grid of amplifier D. Assume now that figure 3 represents the operating characteristic of



Circuit diagrams and graphs of a system used to secure high amplification and reduction of static interference

amplifier D and that the signals which are received and amplified by amplifier C cause the grid potential to vary between the values represented by the lines C and B. The stray impulse which was amplified by amplifier C is now in the negative direction and hence has no more effect upon the current in amplifier D than the signals. Thus it will be apparent that by operating the amplifiers in this way current produced by stray impulses will be limited so that it will be of no greater value than the current produced by the signals and hence these stray impulses will not interfere with the reception of the desired signals.

The amplifiers are shown as working on the lower part of their current curves and with grid potential normally zero with respect to the cathode but they may be adjusted to work upon the upper part of their current curves by proper adjustment of the relation between the grid potential-plate current characteristic and the normal grid potential. Irrespective of the position of the current curve with respect to the vertical line representing zero grid potential the amplifier may be adjusted by varying the normal grid potential so that a change of the signaling current in one direction will reduce the plate current to its minimum possible value or increase it to its maximum value. The position of the current curves with respect to the line representing normal grid potential may also be varied by varying the current through the cathode, the latter being the most convenient method. In practice it is found convenient to adjust the system at first so that the amplifiers will operate at a region near the central point of the ascending portion of the current curve, and then pick up the station from which messages are to be received. Under these conditions the stray and other extraneous noises may be so loud as to make the reception of the signals difficult or even impossible. The position of the current curves may then be shifted either by variation of the normal grid potential or of the filament current. The magnitude of the foreign sounds will then be observed to decrease whereas the signal may not be appreciably affected. A point may finally be reached where all foreign noises are reduced in amplitude to a value corresponding to that of the signals and the signals will then be easily readable. The system illustrated in figure 4 indicates a connection which will be found especially suitable for the elimination of strays. In this case the antenna is rendered aperiodic by inserting therein a resistance having a value equal to the square root of $\frac{L}{C}$ where L and C represent the inductance and capacity, respectively, of the antenna. In this way a reflection of any impulses received on the antenna is prevented and all impulses received thereby are amplified. In order to select from the amplified impulses those corresponding to the signals which it is desired to receive the connection between amplifier C and amplifier D is tuned by means of the inductance 1 and condenser 3 to the frequency of the signals to be received. The grid circuit of amplifier D is tuned in a similar manner by means of inductance 2 and condenser 4 and the connection between the amplifiers is completed by coupling inductances 1 and 2. The receivers in this case are shown as inserted directly in the plate circuit of amplifier D although it will be understood, of course, that this plate circuit may also be tuned if desired and the receiver may be connected thereto as indicated in figure 1.

A Compact Receiver

R. C. CLINKER of Rugby, England, has developed a novel receiver which is completely enclosed in a small case. The antenna is also contained in the carrying case.

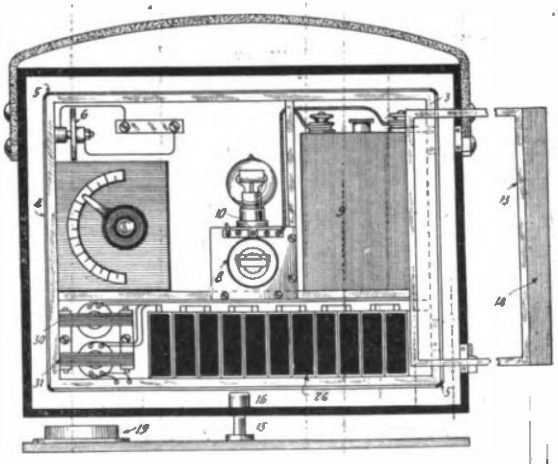


Figure 1—The arrangement of the set in the containing case

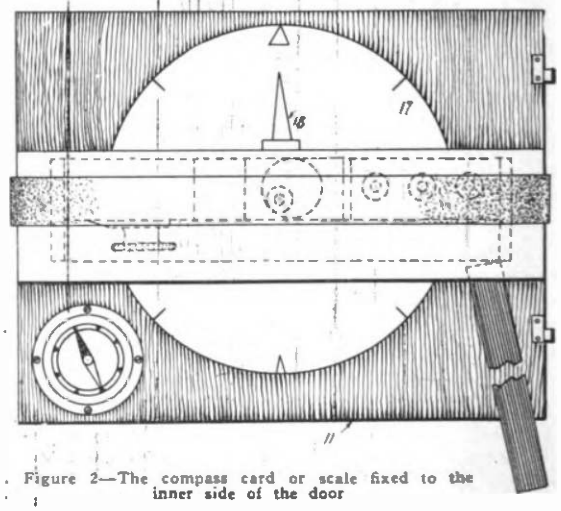


Figure 2—The compass card or scale fixed to the inner side of the door

As indicated in the drawing, the containing casing is provided with a carrying handle. Mounted within the casing is a frame 3 about which the receiving coil 4 is wound, in one layer. The coil is supported on corner pieces 5 so that an air space is left between the frame and the coil. Mounted within the coil is a variable condenser connected in parallel to the coil. A condenser 6 is connected to the grid of a detecting vacuum tube. Underneath the detecting tube is mounted an amplifying tube 8 which is arranged with its axis at right angles to the detecting tube and which projects outwardly in such a manner that the cover of the casing will not close as long as the amplifier is in position. Storage battery 9 supplies current for the heating of the filaments of the vacuum tubes 7 and 8, the connections being made through the socket 10, the plug of which is provided with a handle of such length that if it is left in the circuit the door or lid of the case cannot be closed. This provides a convenient method of insuring that the filament will not be left connected to the storage battery when the apparatus is not in use. Another battery 26 supplies current for the plate circuits of the tubes 7 and 8. Transformers 30 and 31 are used as indicators, the former for connecting the detector to the amplifier and the latter for connecting the plate circuit of the amplifier to the telephone. The frame 13 hinged to the frame 3 carries a coil 14 which is connected in series with the plate circuit of the detector. By adjusting the position of the coil 14 relatively to the coil 3 a variable coupling between the coils may be obtained. The casing may

be rotatably mounted upon a pin 15 which can conveniently be secured to the door and enters a socket 16 secured to the casing directly under its center of gravity. When it is desired to operate the apparatus the door may be removed from its hinges and the casing mounted on the door in the manner indicated so that the receiving coil may be conviently rotated to any desired direction. A compass card or scale 17 may be fixed to the inner side of the door and the cooperating pointer 18 secured to the casing. For convenience the pointer may be detachable or hinged to the casing. A magnetic needle 19 may also be mounted on the cover, so as to enable the latter to be adjusted until the north of the scale 17 is pointed to the north. The telephones 23 may be carried inside the casing and connected in circuit by means of the jacks.

The receiving coil 4 is tuned to the frequency of the incoming waves by a condenser 20 and is connected through condenser 6 provided with a resistance leak 21 to the grid of the detector 7 whose plate 22 is fed from the battery 16 through the transformer 30 and the coil 14. The filaments of tubes 7 and 8 are heated by current from the battery 9. The secondary of transformer 30 is connected to the grid of tube 8, in the plate circuit of which is the primary of the telephone transformer 31. A cell of battery 24 may be inserted in the grid circuit of the valve 8 to maintain the grid negative with respect to the filament. A condenser 25 may be provided to allow high frequency current to be shunted around the primary of transformer 30 when the tube 7 produces oscillations.

To receive signals condenser 20 is adjusted until the natural frequency of coil 4 and condenser 20 corresponds to that of the received waves. The coupling between the coils 4 and 14 is then adjusted by the turning of the latter upon its hinges. The line of direction along which the signals travel is found by turning the casing on its pivot 15 until the signals have no effect upon the instrument, in which position the pointer 18 would indicate the direction desired.

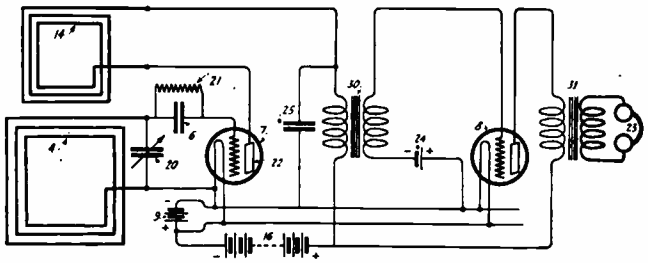


Figure 3—Hook-up of the compact portable receiver

Improved Loop Aerial System

A RECEIVING tube, when directly connected across the tuning condenser of a coil or loop aerial has a voltage impressed on the grid in two ways: (1) The coil circuit, with tuning condenser, is in tune with the incoming wave, and (2) the coil acting as a capacity area, one end being at or nearer ground potential than the other, as the filament battery is connected to one end of the coil and the small grid to the other, thus giving through the battery a relatively large capacity to earth as compared to the very slight capacity to earth through the small grid. As the coil is rotated, the impressed voltage in case 1 varies in amplitude from zero to maximum, according to the sine law, and is the useful voltage for receiving, or direction finding work. The induced voltage in case 2 is detrimental, as its amplitude is constant regardless of the position of the coil with respect to the approaching wave, and thus it is present at the position of zero induced voltage in case 1, which distorts and obscures the working point of zero induced voltage of case 1. Induced voltages from motors, ignition systems, etc., come under case 2. Mr. F. W. Dunmore describes a method for greatly reducing the effects of this electrical dissymmetry or antenna or capacity effect to ground as mentioned in case 2 above, the object being to give a quieter, sharper, and less distorted minimum, thereby improving the operation of the coil as an interference preventer and its accuracy as a direction finder.

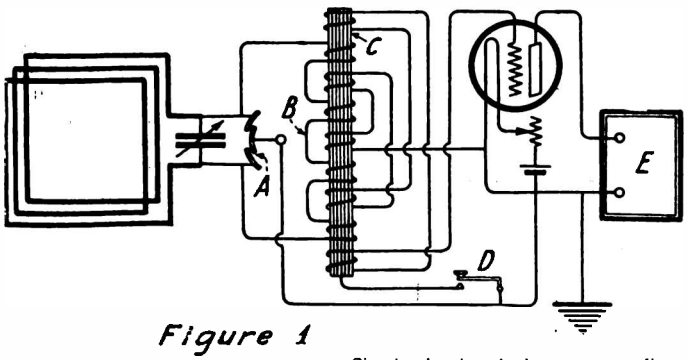


Figure 1

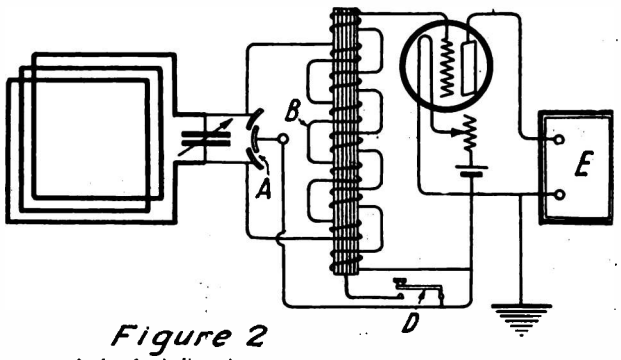


Figure 2

Circuit showing the iron core coupling and two methods of winding the same

Figure 1 represents the receiving circuit showing the iron core coupling coil and method of winding same. Figure 2 shows a modification in the method of winding this coil. (A) is a balancing condenser or mesny compensator which may be used for balancing what little dissymmetry in capacity to earth is not taken care of by the coupling coil. (B) is a suitable primary coil wound in one or more sections as shown and connected across the coil and tuning condenser. This coil and shunt condenser is resonant well away from the working wave lengths. The coil (B) is wound on an iron core consisting of iron laminations about .001 inch thick. A suitable secondary coil (C) is wound in one or more sections on the core between the primary sections as shown. In figure 2 (X) is a modified method of winding this coil. The iron core may be grounded by switch (D). (E) is an amplifier and accompanying apparatus. The core serves a two-fold purpose; first, to couple the coil aerial to the detector and distribute the capacity effect more evenly to earth; and second, to partially by-pass to earth through the core disturbing influences such as motor and ignition noises.

A Duplex Radio System

DR. A. N. GOLDSMITH and Julius Weinberger have developed a receiving system which can be used in close proximity to a transmitting station and which is capable of receiving signals from a distant station at the same time that signals are being sent from the transmitting station.

In duplex radio telegraphy or telephony, the object sought is the simultaneous reception and transmission of messages. In most cases it has been customary to accomplish this by having two separate stations; a transmitting station and a receiving station separated by many miles and usually connected by wire lines. This procedure has been necessary in order to prevent the transmitted signals from interfering with the reception of the desired signals.

Figure 1 shows diagrammatically one way in which the duplex system is put into effect; figures 2 and 3 show different types of receiving coils which may be used; figure 4 shows diagrammatically a circuit arrangement which may be employed in connecting the duplex system to a wire line, and figure 5 shows an arrangement which may be used for overcoming the effect of electromagnetic induction as well as electrostatic.

Figure 1 shows the transmitting antenna and the coil employed for reception. This coil is connected to the filament and grid of a vacuum tube. A tuning condenser may be used for tuning the receiving circuit to the frequency of the signals to be received. The plate circuit of the tube comprises the filament "B" battery, telephone receivers and the plate. The grid is connected to one end of the coil and the filament is connected to the junction point of the two halves of the coil. This point is connected to earth.

The mode of operation of this system may be explained as follows: The exposure of the two halves of the coil may be represented by the condenser A shown in dotted lines. It will be apparent that, for currents flowing through these condensers and the two halves of the coil to ground, the magnetic fields of the two halves are in opposition and the two halves of coil act as inductances in parallel. The inductance of the coil for such currents then is $\frac{L-M}{2}$ where L is the inductance of each half of the coil and M is the mutual inductance between the two halves. If M is made equal or very nearly equal to L then the coil becomes a non-inductive path to ground for capacitively induced currents; consequently no potential difference can build up across its terminals and no interference will result in the receiving set from the local antenna.

While the capacitive induction from the local antenna will be balanced in this manner, a totally different behavior occurs toward the signals to be received. In the case of the local antenna we deal with a stationary electric field, inasmuch as radiation commences only outside of the quarter wavelength zone; in the case of the distant antenna, a traveling electromagnetic wave cuts across the coil. The receiving circuit then has induced in it an electromotive force which is equal to the resultant of the electromotive forces induced in the various portions of the coil. In each element of the coil there will be produced an electromotive force which varies in amplitude and phase from that induced in every other element. Some of these electromotive forces will partially neutralize each other, but the resultant electromotive force will cause a current to flow in the receiving circuit. In practice it is found that the neutralization will be minimized by making the coil of large dimensions in the direction of the wave and that the larger the dimensions of the coil both in a horizontal and vertical direction the stronger the signals will be.

It is apparent from the above explanation that the induction from the local transmitting antenna, that is, induction due to a stationary electric field, will be balanced out, but the

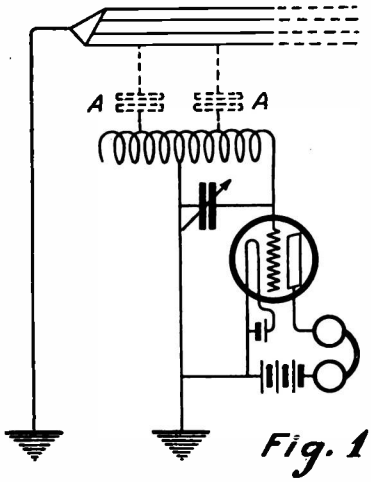


Fig. 1

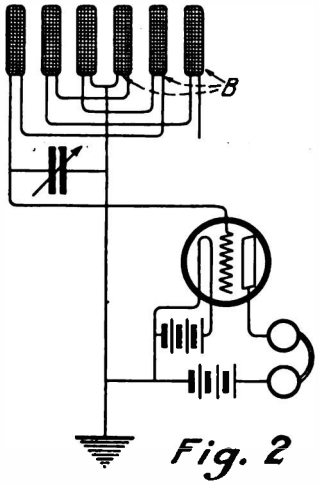


Fig. 2

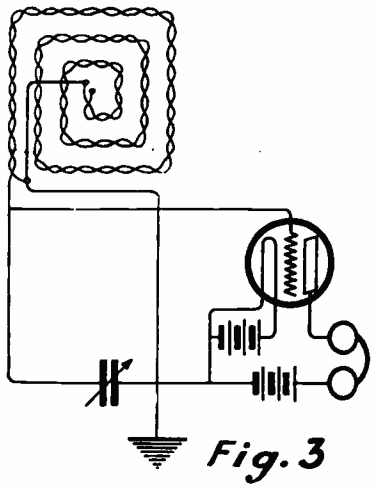


Fig. 3

Figure 1—Transmitting antenna and the coil used for reception. Figure 2—Pancake or spiral coils connected in series to obtain capacitive transposition
Figure 3—Receiving coil of two twisted wires to secure capacitive transposition

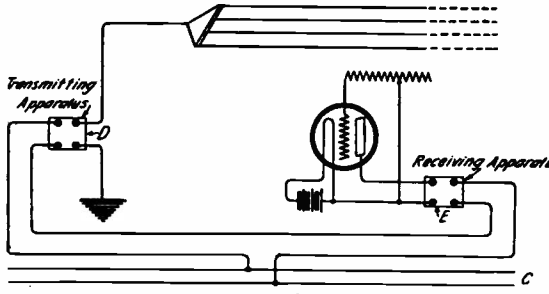


Fig. 4

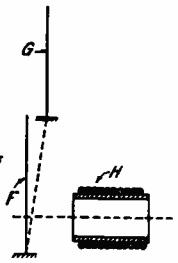


Fig. 5

Figure 4—Receiving and transmitting apparatus connected to wire line

induction from the distant antenna due to the traveling electromagnetic waves will not.

In figure 2 is shown an efficient way of obtaining a perfect equalization of the exposure of the two halves of the coil. In this case a plurality of unit coils B are employed, each of the type known as "pancakes" or "spirals." These are multi-layer solenoids with one or only a few turns parallel to the axis of the solenoid. The coils are connected in series as shown, by which a thorough capacitive transposition is obtained.

Another method is to make the receiving coil of a pair of wires twisted together as indicated in figure 3, and use only one of these wires for reception. It is apparent that the transposition of the two halves of the winding will be brought about in this way even more effectively than by the form shown in figure 2.

Figure 4 indicates diagrammatically the manner in which the receiving and transmitting apparatus may be connected to a wire line to connect a subscriber's telephone, for example, to the duplex system.

While the effect of electrostatic induction will in most cases be much more troublesome than that due to the magnetic field from the feed wires of the antenna, if the latter is strong enough to cause trouble, the receiving coil may be placed in such a position relative to the feed wire that the magnetic induction due to the local antenna is a minimum while that due to the distant station is a maximum.

This manner of locating the receiving coil is indicated in figure 5 in which F indicates the feed wire of the local antenna, H the receiving coil and G the distant transmitting antenna.

An Interesting Heterodyne Receiver

ALL connections which have previously been used for producing the heterodyne effect have employed the same fundamental principle that is, a portion of the amplified energy in the plate circuit of the tube has been fed back to the grid circuit by some form of coupling so as to make the system self-exciting.

W. C. White employs a materially different principle. He claims that under certain conditions with apparatus of this type the current in the grid circuit may have a dropping characteristic, that is, as the voltage impressed upon the grid increases the current in the grid circuit will decrease. With the proper conditions for operation a circuit having current characteristic of the type described may be so organized that oscillations will be produced therein, the essential condition for the production of oscillations being that the circuit shall contain capacity and inductance and that the resistance of the circuit shall be less than $2\sqrt{\frac{L}{C}}$ where L represents the inductance and C the capacity of the circuit. The connections necessary to render the grid circuit resonant are provided and thus cause the production of oscillations therein. While the current in the grid circuit is in all cases comparatively small and hence the amplitude of the oscillations produced will be small, the amplifying effect of the apparatus will cause oscillations of much greater amplitude to be produced in the plate circuit. The maintenance of the oscillations, however, will be entirely independent of any coupling between the two circuits.

Applying the idea to a radio receiving system of the heterodyne type, White produces in the grid circuit, oscillations of slightly different frequency from those which are to be received. The received oscillations may also be impressed upon the grid circuit, and the two sets of oscillations be combined in that circuit to produce "beats." These beats will be reproduced in the plate circuit of the tube and produce an audible response in the telephone receiver which is included in the plate circuit.

In the system illustrated in figure 1 a vacuum tube is shown. The grid circuit includes an inductance (A) and a variable capacity (B). A battery (C) is provided for applying to the grid a potential at which the operation of the tube may be suitable for the desired purpose.

Referring now to figure 2 the curve (A) indicates the current in the grid circuit with varying voltages on the grid. The abscissae of the curve represent voltage and the ordinates current. It will be noted that over a considerable range of voltage when the grid voltage is negative the current in the grid circuit decreases with an increase of the negative grid voltage. That is, at the point (B) on the current curve which represents a very small negative voltage the current in the grid circuit is greater than at the point (C), which represents a much larger negative grid voltage. This characteristic of the current curve is probably due to the effect of slight traces of residual gas in the tube and the consequent positive ionization. The greater the negative grid voltage the lower the plate current and therefore the lower the amount of positive ionization in the tube due to residual gas therein. As a result, therefore, the grid current will decrease by reason of the smaller number of positive ions which may reach the grid.

If the battery (C) is of such potential that the grid current will fall upon some portion of the current curve between the points (B) and (C), oscillations will be produced in the grid circuit. The frequency of the oscillations produced may be readily varied by adjusting the condenser (B). Inductances (D) and (E) should be employed in series with battery (C) of such value that there will be no damping of the oscillating circuit due to the connection of the battery across the circuit. With the tube producing oscillations of the desired frequency, oscillations received upon the antenna may be impressed upon the inductance (A) by means of the primary coil which is included in the antenna circuit. The received oscillations will combine in the grid circuit with the locally produced oscillations and produce beats. In other words, the potential of the grid will oscillate and the amplitude of the oscillations will vary at a frequency corresponding with the beat frequency produced. As a result a beat current will be produced in the plate circuit of the tube, energy for which is supplied by the direct current generator, and the beats in the plate current may be detected by the telephone receiver. The telephone receiver may, if desired, be shunted by a capacity for by-passing the radio frequency component of the current in the plate circuit.

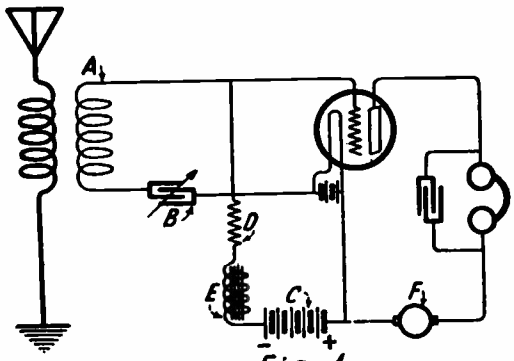


Fig 1

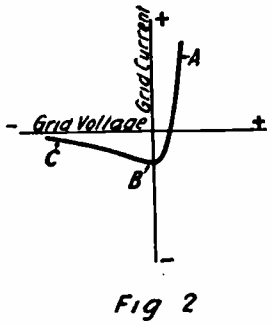


Fig 2

Hook-up of the heterodyne receiver and current curve in the grid circuit under varying voltages

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

A Simple Set for Broadcast Reception

By George R. Troxell

FIRST PRIZE $10.00

WITH the increasing use of radio as a means of broadcasting entertainment and information the average citizen desires to know how he may take advantage of the opportunity now available. Since his knowledge of radio is very limited, it is obvious that a set to meet his needs must be simple in operation, sensitive to do good work, and possess a fair degree of selectivity. As his interest probably will not extend beyond the reception of phone stations, the set should be designed primarily to cover only the band of wavelengths used by such stations.

There are any number of sets designed for the beginner that do very good work, but aside from being costly they are not constructed so that other apparatus can be added to increase their range and efficiency. This is a desirable feature, as the beginner will wish to add to his set as his knowledge and interest increases.

With the above facts in mind, we shall confine ourselves to a set of the single circuit type with crystal detector and so designed that additional apparatus may be used without changing the original set. Such a set which is simple in operation can be constructed at small cost. It is selective enough to tune in the phone stations and to exclude undesirable signals.

Figure 1 shows the circuit used. L is a cardboard tube about 3 inches in diameter and of equal length. It should be thoroughly dried in an oven, then given a coat of shellac and again baked. While still warm it is tightly wound with fifty turns of No. 24 D.C.C. magnet wire. A tap is taken from the 20th turn and at every ten turns thereafter, making five taps in all which will require four switch points as the first is connected to the antenna binding post. A convenient way of taking off a tap is to tie a loop of about six inches at the proper turn. S is an assembled switch arm of 1 inch radius. C is a panel-mount type of variable condenser of .0005 mfd. capacity. It should be equipped with pointer and 180 degree scale. D is any good type of crystal detector that is of easy and stable adjustment, the dust proof type being the best. P is the headset which should be of 2000 or 3000 ohms resistance.

There are six binding posts of the "hole" type. No. 1 is for the antenna, No. 2 for the ground and Nos. 5 and 6 for the phones. Nos. 3 and 4 which lead from the detector will be explained later. All the above articles can be obtained from any radio dealer.

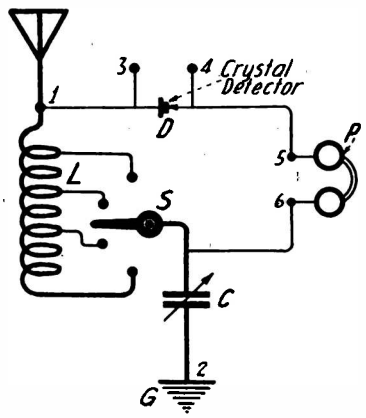


Fig. 1

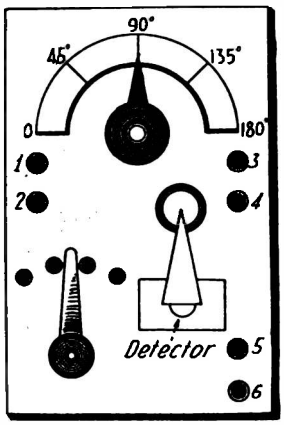


Fig. 2

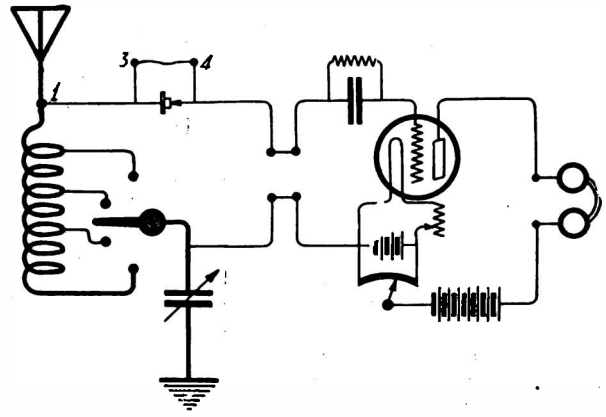


Fig 3

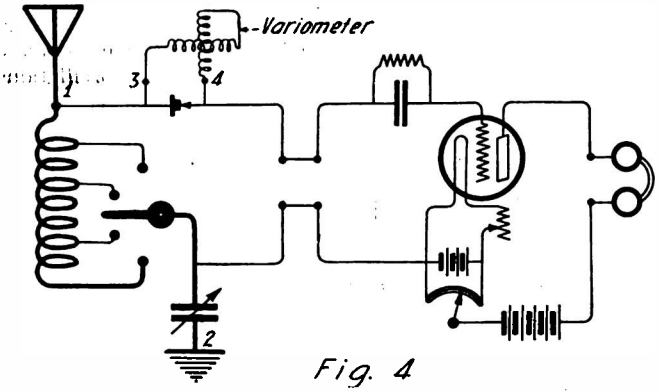


Fig. 4

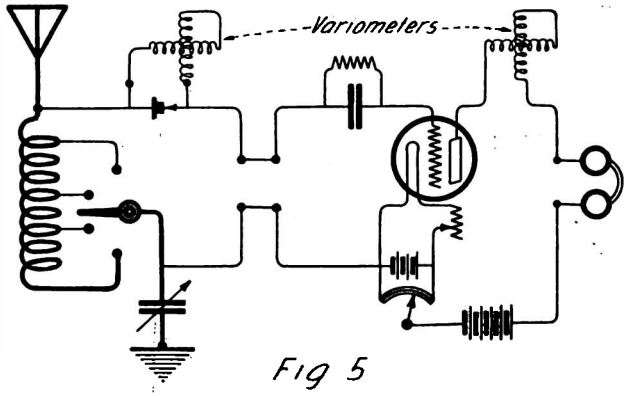


Fig 5

Various hook-ups of a simple broadcast radiophone receiving set using crystal or tube

The receivers to be efficient and of neat appearance should have the parts mounted on an insulated panel and should be enclosed in a box or cabinet. A suitable panel can be made of 3-16 inch sheet bakelite. A small case, such as is sold in stationery stores for filing letters, makes a fine cabinet. They are equipped with hinged covers and have a handsome appearance. The dimensions are optional with the builder as long as it is large enough to contain all the apparatus. One measuring 5x7 x6 inches in depth outside measurement will do nicely. The panel should be cut to fit inside the box. Figure 2 shows how the instruments are mounted on the panel and how the complete set looks when viewed from the top. All interior connections which should be soldered must be made before the panel is fastened.

It is desirable that the panel be placed deep enough in the box to allow the cover to close. Two blocks of wood glued to the sides of the box serve as supports for screwing down the panel. The cardboard tube should be fastened to the bottom of the case by screws or other means. Holes or slots are cut in the sides to allow wires to enter. This permits the cover being replaced while the set is in use. If desirable a larger box may be used and by building in a partition a place is provided for phones. To make the set portable a handle can be placed on the cover and small catches on the side to fasten the cover.

A little practice will enable the novice to adjust the detector to the highest degree of sensitivity. The tuning is done mostly with the condenser and a little experience will soon determine the adjustment required to get the correct values of capacity and inductance.

Many factors enter into the distance over which such an instrument will function, but probably the most important is the antenna system. Briefly stated, the better the antenna the greater the range of reception. How elaborate an antenna the beginner will use will largely depend on the neighborhood in which he resides. Using a small indoor antenna the writer has clearly heard music and voice from a phone station at a distance of twenty-five miles during daylight. With a good antenna several times the distance can be covered. After the beginner realizes the possibilities of broadcast reception he will wish to hear more distant stations or to bring in the near ones more loudly. By connecting a jumper wire across binding posts 3 and 4 the crystal detector is shorted and a vacuum tube detector with a control unit may be connected as shown in figure 3. This gives a more sensitive and dependable set. Also a variometer may be connected to the posts and a wider band of wave lengths can be covered. The set can also be more sharply tuned by using a variometer. Figure 4 gives the hook-up of such a set.

Placing a variometer in the plate circuit as shown in figure 5 results in a tuned plate regenerative set. Too much regeneration distorts voice and music, but very good results can be obtained by careful adjustment.

A Home-Made Broadcasting Receiver

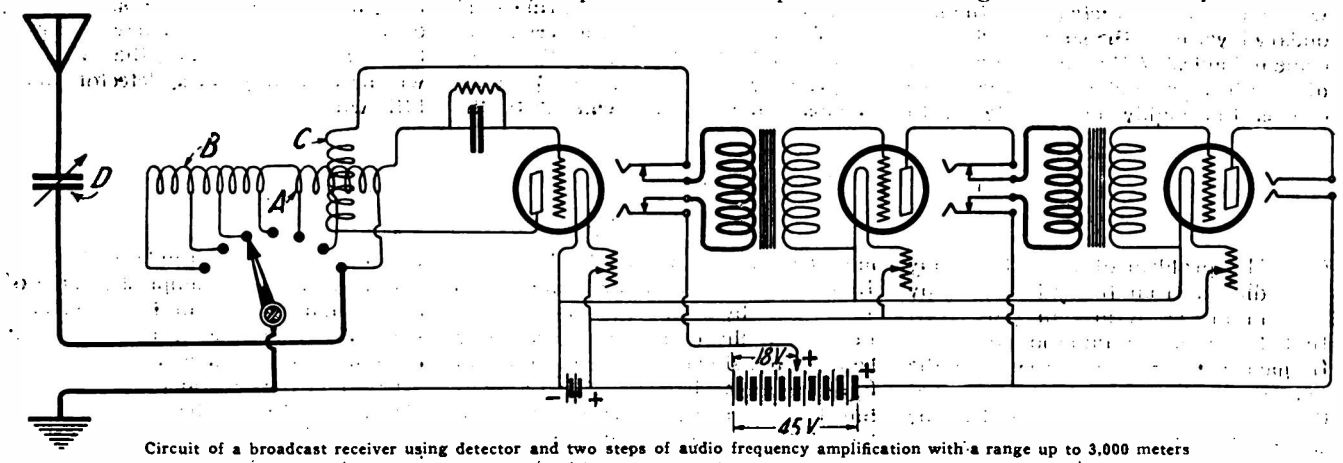
By Paul M. Wright

SECOND PRIZE $5.00

THIS receiver which I will describe has been used for a period of eight months in my station and has proven entirely satisfactory. Located as it is, rather distantly from the Eastern phone stations, I have no trouble in picking up: KDKA, NOF, WBL, WHA, WOC and a host of others, many of them coming in so well as to be read on detector alone. In addition to extreme simplicity of tuning, the set will respond up to 3,000 meters and hence will pick up Arlington time, Navy arcs and other sets operating on the above wave lengths. A single wire aerial 100 feet long is used with the above set. There is no body capacity effect, which makes the set especially valuable for C.W. and phone work. The cost is very moderate when one considers the results obtained through the use of this set, and it can be assembled in a very short time.

The following is a list of material used: 1 variometer; 1 fixed condenser .0165 mfd.; 1 variable condenser .0005 mfd.; 2 knobs and dials 3 inches for condenser and variometer; 1 UV200 detector tube; 2 UV201 amplifier tubes; 1 pair Baldwin C phones; 3 phone jacks, 1 two-circuit, 1 open-circuit, 1 closed-circuit; 3 VT tube sockets; 2 blocks B battery; 2 amplifying transformers; 3 rheostats; 300 feet wire 20/38 Litzendraht; 1 inductance form 4x4 inches; 1 grid condenser and leak; 10 switch points; 1 inductance switch lever; 1 plug for phones; 1 panel 6x21 inches. This material will total about $75.00 for the complete set, but if you are located close to a number of the large broadcasting stations one or both of the amplifiers may be dispensed with if desired and it will be found that the receiver is still very efficient.

To tune the set simply set the inductance switch on one of the contacts, then turn the condenser slowly until the signal is heard and adjust the tickler dial for maximum signal strength. For phone work it will be found better to reverse this method and, setting the condenser, slowly rotate the tickler dial until the carrier wave is heard then carefully tune, using both dials until maximum signal is heard. It may be necessary to slightly lower the detector filament to clear the speech after the final tuning is accomplished.



Circuit of a broadcast receiver using detector and two steps of audio frequency amplification with a range up to 3,000 meters

Local Broadcasting Receiver

By Richard Carlisle

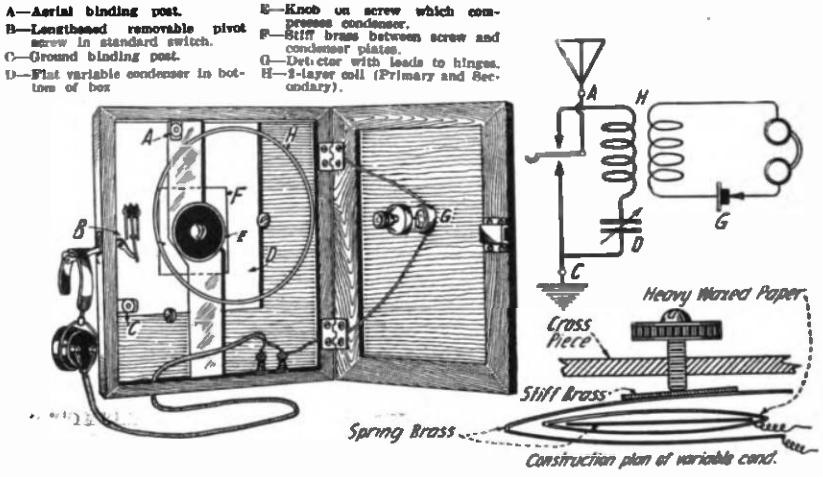
THIRD PRIZE $3.00

THERE are several features in this receiving set which will appeal to every one, but it is designed particularly for use in a home in which there is no other radio apparatus. The owner can screw this set to his wall somewhere and listen in to local broadcasting and he will not have to keep bothering with it, as the tuning is semi-permanent and when the detector has been adjusted the box may be closed and locked.

The series variable condenser is an ingenious design. One spring brass plate is bent double and between the two leaves thus formed is placed another plate, 4x5 inches, covered with one layer of heavy waxed paper. Leads are soldered to a corner of each plate. The whole is then wrapped in more waxed paper and secured with adhesive tape. On the top, under the tape, is secured a piece of stiff brass about one-quarter the size of the whole. A machine screw with a knob on the outer end passes through the wooden cross-piece and screws down on the stiff plate on top. The plates are loosely wrapped, and as they are compressed the capacity of the condenser is increased and the wavelength of the primary circuit is accordingly varied.

The coils of the set consist of two layers of No. 24 wire on a cardboard tube 3½ inches in diameter. The first layer, of thirty turns, is the primary; the secondary has about twenty turns, the exact amount being determined by experiment. When the set is nearly complete the local broadcasting station is tuned in on the primary circuit, and wire added or subtracted from the secondary layer until the speech and music come in loudest. After the final amount of wire has been determined the whole coil is thoroughly impregnated with shellac and strapped to the wooden cross-piece with adhesive tape.

The regular land line telephone hook is used, the switch being connected so that when the receivers are hung up, the aerial is disconnected from the set and connected to the ground; when the receivers are taken up the set is connected ready to receive. Except when used with a particularly large, high aerial, this obviates the need of an outside lightning switch.



A crystal receiver mounted and made up to resemble a land line telephone box

The detector is the vertical type with the glass cover and the universal joint mounting. The original base is removed and it is mounted on the cover of the box, giving greater accessibility than if it were inside the box. A very short cat-whisker, using radiocite mineral, is the combination requiring least adjustment. The detector leads are connected to the hinges on the door. If properly mounted, when the door is closed the detector will fit to the right of the wooden cross-piece and within the coil—see X on the diagram. It is necessary to have the cross-piece cut out as indicated in order that the detector may pass in. The telephone cord passes out through a slot in the bottom of the box.

Now, if the coil has been placed correctly, remove the phones from the head-band, place them one on each side in the bottom of the box, fit the head-hand (which must be a single strip) around the coil, wind up the slack in the telephone cord and place it inside the box, unscrew the pivot screw retaining the hook and place that inside underneath the coil, and close the door. You now have a complete portable set, strong, fool-proof, and ready for instant setting-up. The hardest part is perhaps the securing of a telephone box; but once you have obtained one, or if handy with tools have made a box just about that size, the total cost will be that of phones, detector and a little wire.

Principles of Radio Telephony

By A. Machson

THE problem of radio telephony differs from that of telegraphy in one very important particular. In both cases the radiation of radio frequency waves is essential. In the case of radio telegraphy in order that the receiver be actuated so that the ear can hear the signal, it is only necessary that the transmitted radio waves be interrupted at an audible rate, say 500 to 1,000 times each second. In the case of telephony, however, the transmitted radio waves must be moulded to conform to the actual speech waves, in order that the ear shall hear the signal as recognizable speech. It is at once clear that the problem of telephony is ever so much more complex than that of telegraphy. In figure 1 are seen the radio waves as emitted by a wireless transmitter. For telegraphy these waves need only be interrupted periodically as shown in figure 2, to be heard at the receiver, but for telephony these waves must be re-shaped according to the complex speech envelope shown in figure 3 in order to be heard as articulate and intelligible speech.

The modification of the emitted radio waves according to speech is called "modulation." The methods by which this modulation is effected are numerous. But since the ultimate result is the same regardless of which system of modulation is employed, we will, in outlining the fundamental principles, consider the simplest system of modulation. Later in the discussion we will take up in detail one of the most important systems.

Consider the microphone transmitter placed directly in the antenna, as in figure 4. The action of the transmitter in this case may be described as follows: The diaphragm of the microphone, when no speech is impressed, is motionless. In this condition the microphone has its normal resistance and the antenna current will have a definite normal value. Now assume that the microphone is spoken into. The microphone diaphragm upon which the speech waves are impressed, follows

every variation of speech and moves back and forth in unison with the speech waves. In this way the resistance of the microphone varies also with the speech. Since the microphone resistance is in the antenna, variations in its resistance will produce corresponding variations in the antenna current. A rise in the microphone resistance will produce a fall in the amplitude of the antenna current, and a fall in the microphone resistance will produce a rise in the amplitude of the antenna current. In other words a speech wave of the form of figure 5a will result from corresponding movements of the diaphragm, which produces corresponding variations in antenna resistance that results in a radiated current of the form of figure 5b. This radiated current has a varying amplitude, conforming identically with the speech wave of figure 5a. In this manner the modification or modulation of the radio frequency wave in accordance with speech is effected.

Since modulation is effected by varying the amplitude of the radiated wave, the greatest or best effect will be obtained when a given speech intensity produces the maximum change in the amplitude of the radiated current. When this maximum change in amplitude is obtained we say that we have "complete modulation." This is the aim of all systems of radio telephony.

Let us see what change in antenna current amplitude is required for complete modulation. In the first place what must be the value of the microphone resistance to secure most favorable output? This can be demonstrated in a simple and elementary manner as follows. Suppose the antenna resistance is 12 ohms total, including coil. Suppose the microphone resistance is only 1 ohm, normally. Then normally the total antenna resistance will be 13 ohms. Now assume that the microphone resistance varies the maximum possible, namely from 1 to zero. It cannot become lower than zero. Hence the antenna resistance varies from 13 ohms to 12 ohms, thus producing only about 8 per cent. variation in the resistance. Hence the antenna current amplitude will also only vary by 8 per cent., which is very small. Thus we see that if the microphone resistance is very low compared to the antenna resistance, there will hardly be any variation in the current amplitude and hence very small modulation. On the other hand suppose the microphone resistance is 48 ohms, normally thus making a total resistance in antenna of 60 ohms. In this case most of the antenna energy will be consumed by the microphone as heat, leaving only a very small percentage to be radiated. Thus if the antenna resistance is very small compared to the microphone resistance, even if complete modulation is had, there will be so little energy left for radiation, since the high resistance microphone absorbs most of it, that very little effect will be produced. The microphone resistance must not be too low or too high compared to the antenna resistance. Experiment and mathematical analysis show that maximum results will be obtained if the microphone has a normal resistance equal to that of the antenna.

In discussing the question of what change is required in antenna current amplitude for maximum or complete modulation, we will therefore assume that the microphone resistance equals the antenna resistance, and call this resistance R. The total antenna resistance is therefore 2R, and the antenna current will be some value (i), when the set is not modulating. Assume now that the set is modulating. Complete modulation requires maximum possible change in antenna current, and this can only be accomplished if a maximum change takes place in the microphone resistance R. For maximum change the microphone resistance R at the most can decrease to zero and increase to maximum. In the first case when the microphone resistance decreases from R to zero, the total antenna resistance will decrease from 2R to R, hence the antenna current will rise to twice its normal value, namely, from (i) to (2i). In the second case when the microphone resistance increases from R to maximum, the antenna current must decrease to zero. For complete modulation, then, the amplitude of the antenna current must drop to zero from its normal value and rise to twice its normal value, as in figure 6.

It is obvious that this change in microphone resistance to zero and maximum, to secure complete modulation, is not possible. The best that can happen is that the resistance of the microphone alternates between some value less than R, but not zero, and some value greater than R but not maximum. Hence, modulation with this system can never be complete. In general practice engineers are content to secure, with this system, a percentage of modulation between 50 per

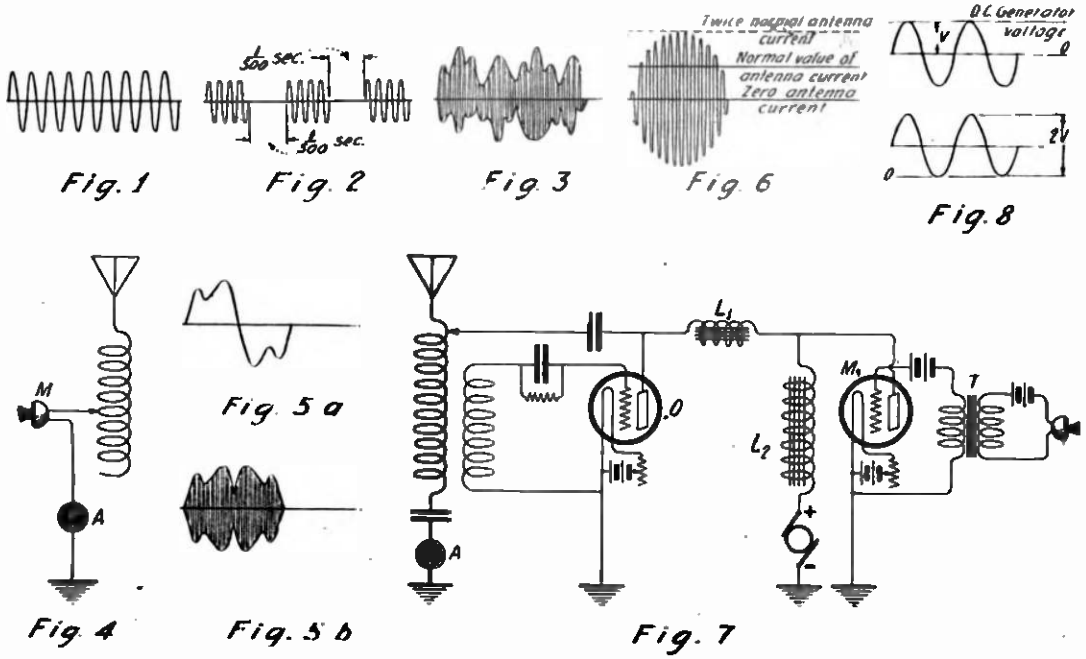


Fig. 1 Fig. 2 Fig. 3 Fig. 6 Fig. 8

Fig. 4 Fig. 5 a Fig. 5 b Fig. 7

Diagrammatic details illustrating some phases of radio telephone operation

cent. and 75 per cent. Naturally, for a given power of the radio-frequency transmitter complete modulation will result in a much greater range than incomplete modulation. Consequently other methods of modulation have been developed which are capable of giving complete modulation. Regardless of what the system of modulation is, the principle of radio telephony is always the same. Namely, speech is transmitted by the radiophone by modifying or varying the amplitude of the radiated wave in such a manner that the amplitude variations coincide and are proportional to the speech variations.

There are two serious disadvantages in any system of radio telephony which modulates incompletely The first is that since the variation in antenna current amplitude is not its maximum, the possible available full power of the set is not utilized, resulting in diminished transmission range. The second disadvantage is that if there is any distortion of speech in the set, this distortion will be comparatively greater when modulation is incomplete than when it is complete. The desirability, therefore, of systems which modulate completely becomes evident.

One of the best circuits in this connection is the Heising modulation system. This is probably the most common circuit of all. Its operation is well worth mastering and we will consider it in detail. The circuit connections for this system are shown in figure 7. The circuit applies solely to tube sets, and requires an oscillator tube O, and a modulator tube M, both tubes being of equal power. If there are more oscillator tubes in parallel, then an equal number of modulator tubes must be supplied.

It will be noted that the modulator tube and oscillator tube are fed by the same plate generator through two choke coils L1 and L2. L1 is a radio-frequency choke coil and L2 is an audio frequency choke coil, both of very high inductances. Since the radio-frequency choke coil is connected between the plate of the oscillator valve and the plate of the modulator valve. it will be understood that no radio-frequency currents from the oscillator circuit can pass over into the modulator circuit, due to the choking action of L1, which is used precisely for this purpose. The reactance of this choke coil is generally very much higher than the resistance of the plate circuit of the modulator tube.

The function of the audio-frequency coil L2 is to assist in the modulating action of the system. This is accomplished in the following way. When the microphone is spoken into the speech voltage generated across the secondary of the telephone transformer T is impressed on the grid of the modulator tube. Since this voltage is alternating, the resistance of the plate circuit of the modulator tube will vary correspondingly. Thus when the voltage is positive the resistance decreases, and when negative it increases. Consequently the plate current into the modulator tube will vary. However, the presence of the high reactance choke coil L2 prevents much change in the total plate current supply. Hence any variation in the modulator plate current must be accompanied by an opposite variation in the plate current of the oscillator tube. Suppose the speech voltage makes the grid of the modulator highly positive. As a result the modulator plate circuit resistance decreases and the plate current into the modulator tube must decrease. Since the total plate current supply is kept approximately constant by the choke coils, this increase in modulator plate current must be accompanied by an equivalent decrease in the oscillator plate current. The opposite takes place when the modulator grid becomes highly negative. Now experiment actually shows that there is a slight variation in the plate current supply when speech is applied. This small audio-frequency variation when it takes place in the audio choke coil L2 results in the generation of a very high audio-frequency potential across the terminals of L2, corresponding to the speech. The speech voltage generated in the plate circuit across L2 is equal to

$$\text{Voltage} = 2\pi fLi$$

where f is the frequency of the speech, and L the inductance of L2 and i the variation in current through L2. Hence we see that even though i the current variation may be very small, by making the inductance of L2 very high the audio-voltage generated across L2 can also be made very high. This audio-voltage across the choke coil L2 is impressed on the plate of the oscillator tube; i. e., super-imposed on the D.C. voltage of the oscillator tube. Hence, the resultant voltage on the oscillator plate will vary with the speech voltage. But the output of the oscillator tube is proportional to the voltage of the oscillator plate. Hence the output will be proportional to the speech voltage and a wave modulated according to the original impressed speech will be radiated.

This modulation system is capable of giving complete modulation. Complete modulation requires that maximum change takes place in the antenna current amplitude. In order to accomplish this, the normal antenna current amplitude must be reduced to zero. This means that the plate voltage must drop from normal to zero. Hence the maximum amplitude of the speech voltage applied to the oscillator plate must be equal to the plate D.C. voltage supplied by the generator. When this is the case, shown in figure 8, the plate voltage on the oscillator tube is reduced to zero on the negative cycle of the speech wave, since the resultant plate voltage equals the sum of the D.C. plus the A.C. speech voltages. On the positive cycle the plate voltage rises to twice the D.C. value of voltage for complete modulation. This voltage of the speech can be secured by properly designing the telephone transformer T so that enough voltage is applied to the modulator grid to produce enough change in the modulator plate resistance, and by designing the choke coil L2 so that the resultant change in current through it will produce the necessary audio-voltage amplitude across L2. In other words, unlike the system of the microphone in the antenna, there is nothing inherent in this system which prevents complete modulation from being obtained.

Regeneration Systems

By Ralph R. Batcher

THIS is a mystic word to amateurs and thought by many to cover all of the phenomena that are observed in vacuum tube circuits. The principle of regeneration is simple and distinct—a fact which can hardly be said of all the methods required to produce it.

It is well known that a vacuum tube detector is more sensitive than a mineral detector because most of the energy supplied to the telephone receivers comes from the detector circuit itself. It is somewhat similar to money put into the bank which is later withdrawn with the interest that has accumulated. More is withdrawn than put in. Thus in a similar way, in connection with a receiver using a vacuum tube detector, the output is more than the radio frequency input. with the surplus energy coming from the plate circuit battery. Thus it is the same as getting from 200 per cent. to 1,000 per cent. interest on the energy supplied by the antenna. Of course, the bank — which is the plate circuit

battery — doing this kind of business, will become bankrupt after a while, but fortunately the battery is easily restored by putting other dry cells in the plate circuit or recharging the old ones if storage cells are used.

For many years amateurs were content by getting this amount of interest on their investment of incoming energy, but now with the use of regenerative receivers they want to get compound interest. This is what is done by regeneration. With one of a number of coupling schemes part of the energy from the telephone receiver circuit is sent back through the tube again, resulting in still larger currents in the plate circuit — the circuit in which the telephone receivers are located — part of which, of course, goes back through the tube again. The plate current then increases until some factor in the circuit limits the output and the action becomes steady. This limiting factor may be the vacuum tube itself, the resistance of the associate circuits or the telephone receivers. The result is that the signal is amplified many times the normal amount and much greater distances are attained. Inaudible signals without regeneration sometimes become very strong with regenerative circuits.

An additional feature in regenerative receivers is that tuning is very much sharper. The reason for part of this is that the decrement of the receiver is lowered. When a certain transmitting set is heard on a wide range of wavelengths it is ordinarily set down as having a broad wave. However, the decrement of the receiving set itself is often to blame as it is the combined effect of both the sending and receiving decrements that determine the apparent broadness of the wave. Less interference is ordinarily encountered when using regenerative receivers.

The only thing necessary to add to a vacuum tube circuit to produce regeneration is some device that will return some of the energy from the output or plate circuits to the input or grid circuit. This may be done with either inductive, capacitive or resistance coupling between the grid and plate circuits. It is necessary with any system to provide a fine adjustment of the coupling so that the regeneration is not overdone to cause distorted signals with an unnatural tone.

Two things must be considered: The polarity of the currents so applied back on the grid at each instant must be the same as that due to the incoming signal currents, and the amount of coupling must be less than that necessary to produce stable and continuous oscillations (singing) which would continue after the signal wave had stopped.

One of the best-known methods to obtain regeneration utilizes the inductive feed-back circuit. This scheme is shown in figure 1. The oscillations in the plate circuit for the most part have the same frequency as the group frequency of the transmitting set if the valve is adjusted properly. The coil L_3 is in series with the telephone receivers and induces a current to either the antenna or secondary circuits as may be desired. Another variation of this system is to omit the grid condenser and to adjust the valve so that no rectification takes place in the first tube. In this case high frequency currents are induced back. Another valve is then used to detect these oscillations that has a grid condenser in its circuit.

Another method of inductive feedback is shown in figure 2. Here the telephone receivers are so connected that they form part of both plate and grid circuits, acting as an impedance coupling or a one-to-one transformer. This method of securing regeneration does not permit any control by the operator and unless additional features are added other methods are better suited to amateur needs.

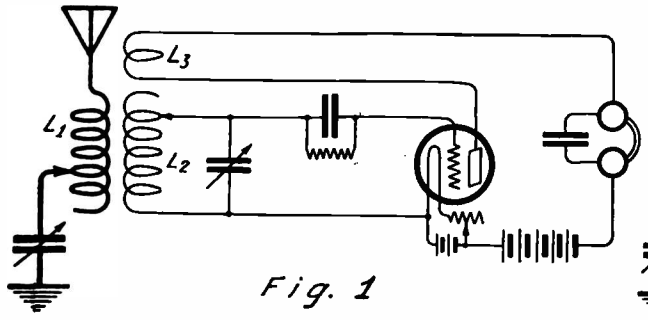


Fig. 1

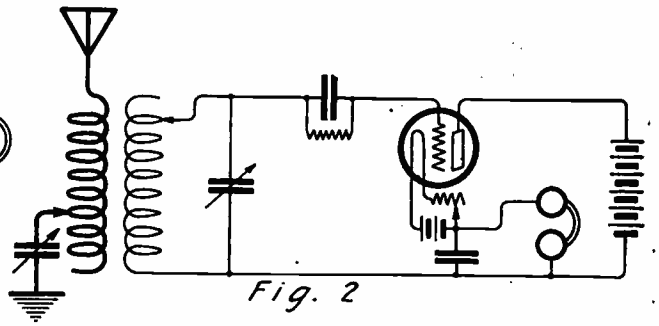


Fig. 2

Inductive feed-back circuits

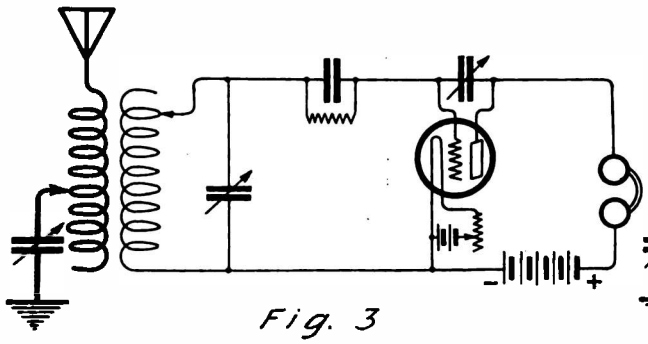


Fig. 3

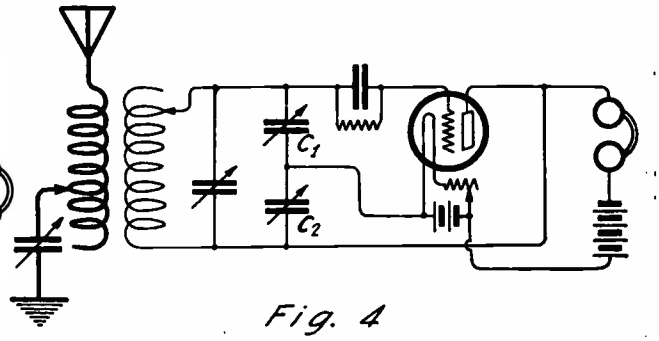


Fig. 4

Capacitive coupling feed-back circuits

A capacitive coupling method is shown in figure 3, where a variable condenser is connected across the grid and the plate of the valve. The size of this condenser depends largely upon the range of wavelengths desired. A condenser having a maximum capacitance of .0004 mfd. will be suitable for a receiver up to 3,600 meters wavelength. It should have a very low minimum capacity or else provision must be made to disconnect both sides from the circuit when regeneration is not required. This condenser will affect the wavelength — especially on short-wave receivers — so that retuning is necessary each time the coupling is varied. This effect brings it into disfavor with many experimenters for short-wave receivers.

Another type of capacitive coupling is shown in figure 4. In this circuit two condensers are connected in se-

ries across the plate and grid of the valve and the midpoint between them is connected to the filament. Sometimes both condensers are mounted on the same shaft and operated by one knob. In this case the capacity of one condenser may be increased while the capacity of the other is decreased at the same rate. The plates of these condensers are preferably designed so that the capacity across the pair remains as nearly constant as possible with whatever adjustment each individual condenser has. In this way the regeneration adjustment does not detune the circuit as much. The minimum wavelength, however, is increased since the effect is the same as if a single fixed condenser is placed across the tuning condenser in the secondary circuit.

Condenser C_1 may be fixed and the coupling controlled by varying the bridging condenser across the plate circuit. When the latter condenser is at its maximum capacity the regeneration is at a minimum. It may have a maximum capacity of .001 to .002 mfd. for wavelengths up to 3,500 meters.

It is generally conceded that for short-wave receivers the tuned plate system of regeneration is best suited to the needs of the average experimenter. This system is shown by a representative circuit in figure 5. The variable inductance is used to tune the plate circuit to the frequency of the incoming waves. Ordinarily the capacitance of the receiver cord will act as a condenser shunting the high impedance telephone receivers or often a small fixed or variable condenser is added at that place. The inductance is preferably of the variometer type. Tuning the plate circuit to the incoming waves is in itself instrumental in increasing the strength of the signals barring any regenerative effects. When a potential is applied to the grid by an incoming wave the plate current suddenly increases or decreases as in the case of any vacuum tube receiver circuit. This change in plate current will induce a potential across the inductance L which will oppose the potential of the plate battery. This will have the effect of momentarily changing the potential on the grid since the grid is located in the electrostatic field between the plate and filament within the tube. This variation of grid potential acts to produce regeneration in the same way as with other systems. In building this circuit the inductances should be somewhat larger than the secondary of the tuner —if tuning is aided in the secondary circuit with the aid of a variable condenser across the tuner — since the capacity in the plate circuit is much smaller.

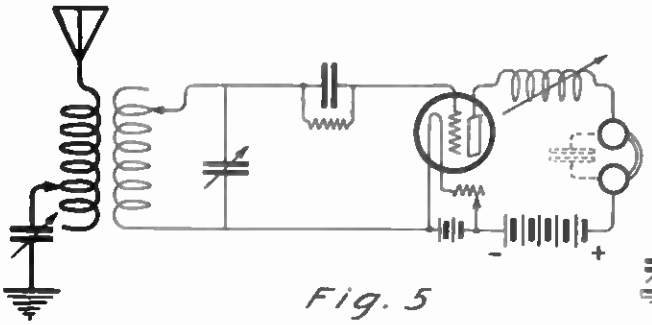


Fig. 5

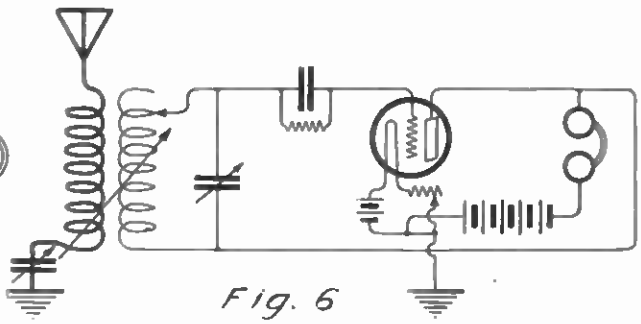


Fig. 6

A tuned-plate circuit and the ultraudion circuit

One of the first methods of regeneration used is the ultraudion system shown in figure 6. Its main feature is that it can be used without the use of any auxiliary equipment in the circuit. Ordinarily it is best adapted for long-wave receivers only. A further advantage is that the circuit may be readily changed back to a non-regenerative circuit if desired. As shown by the diagram the wire that usually connects from the secondary of the receiving tuner to the filament is connected instead to the plate. In many sets best results are obtained with one side of the filament grounded. Its action is not unlike that of the capacitive coupling of figure 4.

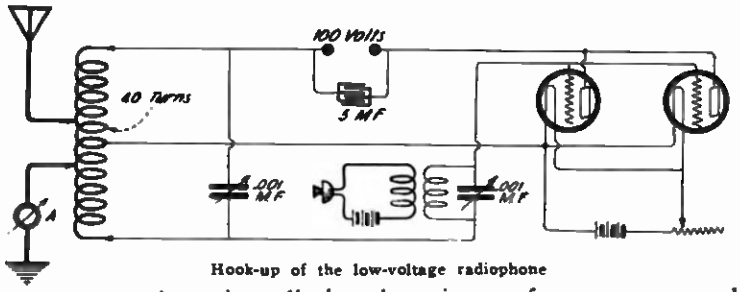
A Low Voltage Radiophone

IN common with many amateurs of limited means the writer for a long time allowed himself to be scared out of owning a radiophone by the high-cost-of-plate voltage "bugaboo." A little experimenting has given the writer a radiophone that gives good speech at two miles, with the receiving station using one tube in a regenerative hookup. The total cost of the set would be about thirty dollars if everything had to be bought, but a real amateur can get it for much less.

Figure 1 shows a familiar circuit that has been found to be very satisfactory, being easily handled and stable and efficient in operation. It gives nearly twice the antenna current of any other circuit tried.

Two Radiotron U.V.-201 tubes in parallel with a plate voltage of 100 gives an antenna current of .2 ampere. Filament current is kept at 1.1 amperes. This does not overload the tubes in any way and they should give good long service.

Plate voltage is supplied by standard three-cell flashlight batteries. The life of these batteries can be materially increased by removing the cells from the paper cases and coating all the outside of every cell, except contact points, with air drying insulating varnish. Treat the paper cases in the same manner, inside and out. Varnish the box or rack employed for holding the assembled battery. The paper tubes or cases if assembled untreated will absorb moisture, and at twenty or more volts leakage will become a serious matter, as regards the life of the battery. The writer has a 22½ volt battery assembled in this way that has been in use for two years and four months and is apparently still good for some time. For a modulation transformer the writer is using a Wayne bell ringing transformer 110/12 volts, stepped up. At 125 volts the writer has obtained .3 ampere in the antenna.



Hook-up of the low-voltage radiophone

A Shielded Short-Wave Receiving Set

By Richard Payne

ALL of us who have had trouble in tuning, and difficulty in preventing a multi-stage receiver-amplifier set from howling, will admit that anything which will help eliminate trouble of this nature will be heartily welcome. Shielding, if properly carried out in a set, will go so far in this direction that it will amply repay one for the small amount of extra

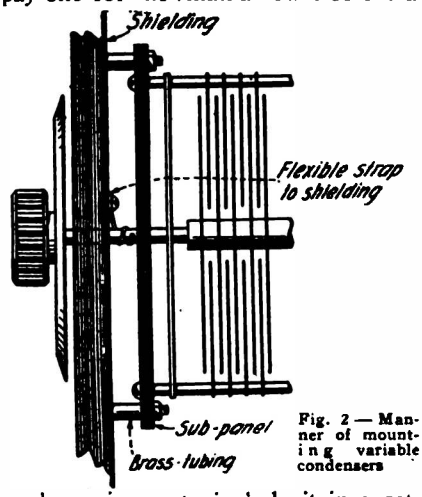


Fig. 2 — Manner of mounting variable condensers

work necessary to include it in a set. If improperly used, however, it may cause so much loss in the efficiency of a set as to make it worse than useless.

The set described herein was constructed after a study of capacity effects between different parts of the circuit, and advantage is taken of shielding in the mounting. The strength of the received signals is equal to that on a previous set constructed from the same equipment, minus the shielding.

First we shall consider the type of circuit which has been found admirably suited to shielding. It is to be understood, however, that the apparatus for any of the popular types of receiving circuits may be mounted in a shielded cabinet provided certain precautions are observed in arranging the apparatus.

Referring to the circuit diagram in figure 1 it will be noted that one side of the primary Lp, the secondary Ls, and the feed-back inductances Lf are connected to ground through jacks. With this arrangement maximum efficiency is obtained on the short wavelengths for which the set was primarily designed. The jacks in the circuit permit an external tuner for longer wavelengths to be easily connected. Such a tuner when used should have each of its three coils so connected to a separate plug that when the three plugs are inserted into the proper jacks the coils of the external tuner will be connected in series, thus aiding the corresponding coil in the regular tuner. It is obvious that the jacks and plugs thus used do introduce a certain amount of capacity across each of the external tuning coils. However, the effect of this will be negligible at the longer wavelengths, provided too much extra capacity is not introduced by the leads from the plugs to the external tuner. The positions of the primary and secondary condensers are such that when changed they affect the entire primary and secondary inductances, whether the external tuner is used or not.

In order to prevent the voice currents from being shunted through the feed-back coil to ground and to prevent the B battery from being shorted, a small fixed condenser is connected between the plate of the tube and the feed-back coil. When reception is taking place at a two-hundred-meter wavelength, this condenser with a value of .0005 mf. offers approximately 200 ohms impedance of the radio frequency, which is negligible in this circuit. The same value of capacity at average voice frequency, 800 cycles, offers approximately 400,000 ohms impedance, so that it should function very satisfactorily. Connected in series with the plate of the tube and the phones or primary of the inter-stage transformer and B battery is an inductance of approximately .003 henry. At the radio frequency for two hundred meters this offers 28,260 ohms impedance, and at the average voice frequency of 800 cycles the impedance is of the order of 15

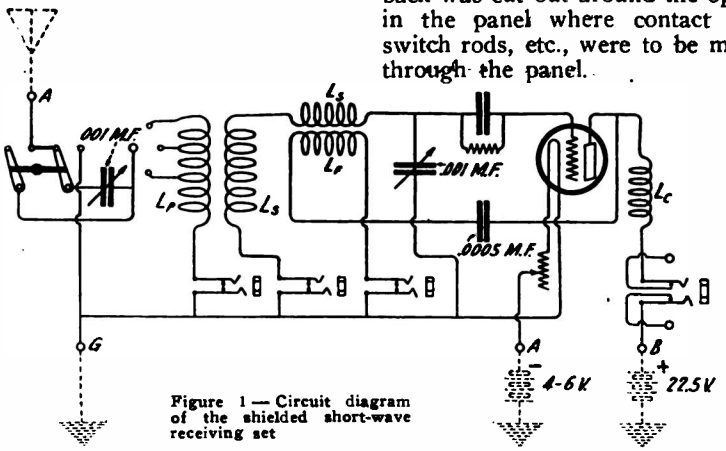


Figure 1 — Circuit diagram of the shielded short-wave receiving set

ohms, so that it serves the purpose of preventing the radio frequency from being shunted to ground through the capacity of the telephone cord or through the internal capacity of the inter-stage transformer. At the same time the effect on voice frequencies is negligible.

Now for a few points to be observed in the mechanical construction of the set. The back side of the bakelite panel for the set is covered with a layer of brass a few thousandths of an inch thick. In this connection, a solid panel of metal, either aluminum, brass or copper, could be used very nicely in place of the bakelite panel. The face could be finished black or

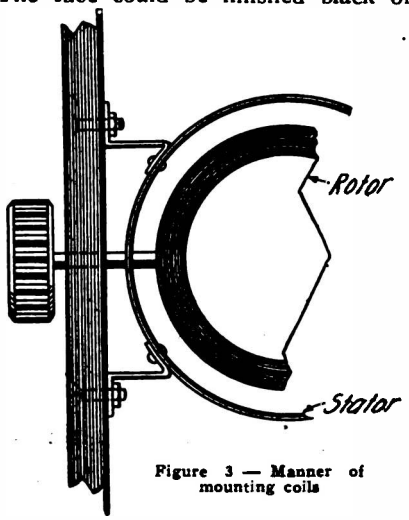


Figure 3 — Manner of mounting coils

as desired. In order to mount rheostats, switches, jacks, etc., it would be necessary to cut an opening in the metal and mount a small piece of bakelite or hard rubber over the opening by means of small screws or brads. The usual drillings could be made in this piece of bakelite for the switch points, etc. In the set constructed the metal covering on the back was cut out around the openings in the panel where contact points, switch rods, etc., were to be mounted through the panel.

The primary and secondary condensers were each mounted on a small sub-panel of bakelite, which in turn was mounted on the back of the main panel in such a manner that the nearest surfaces of the two panels were separated by one inch. The manner of mounting this panel is shown

in figure 2. The shaft on which the movable plates are mounted runs through to the face of the panel and is equipped with the usual dial and knob and is conected directly to ground on the shielding.

The primary inductance is wound on a piece of bakelite tubing 3½ inches in diameter. The winding consists of 65 turns of No. 24 D.C.C. wire with taps at the 15th, 25th, 35th, 45th, 55th, and 65th turns. Inside of this tube is mounted a wooden variometer rotor which is three-sixteenth of an inch smaller in diameter than the inside of the tube. The winding on this wooden rotor consists of 28 turns of No. 24 D.C.C. wire and forms one-half of the secondary inductance. The feed back, or "tickler" coil, consists of 35 turns of No. 24 D.C.C. wire on a second piece of bakelite tubing the same size as used for the primary inductance, and is mounted at right angles to the primary. Inside of this is a second wooden rotor identical with the one mentioned above. The winding on this rotor consists of 30 turns of No. 24 D.C.C. wire and constitutes the second half of the secondary inductance. Both of the stationary coils mentioned above are mounted as shown in figure 3. This provides a certain spacing between the conductors which form the winding on the lower side of the coil and the shielding. This spacing should be at least one-half inch in order to reduce capacity effects. For the radio frequency choke Lc a 400-turn honey-comb coil was found satisfactory.

All the wiring on the set was done with No. 14 hard drawn copper wire covered with varnished sleeving, except the leads to the variometer rotors, which were of flexible stranded wire with a braided covering. All the wiring should be kept at a reasonable distance from the shielding in order to avoid any noticeable capacity effects.

Suggestions on C.W. Circuits

By George N. Garrison

ON page 43 of the October, 1921, issue of THE WIRELESS AGE, appears a hook-up and description of a "C.W. Transmitter" that can be made to function infinitely better.

The main disadvantage of the circuit shown lies in the fact that the author has provided no means for preventing the high-frequency current in the oscillating circuit (between plate and grid), from backing up through the high-potential source to the filament. By preventing this, the author would have been able to obtain a considerably greater antenna current. The complete hook-up, made more efficient, is shown in figure 1.

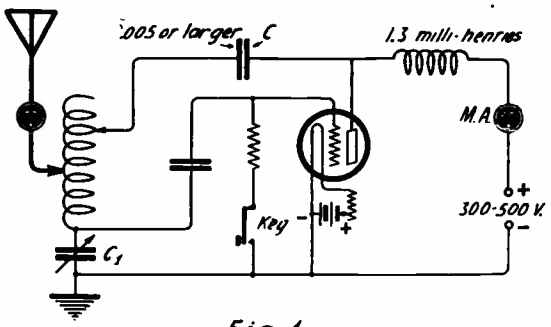


Fig. 1

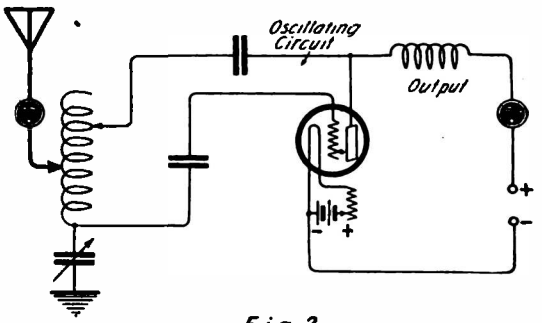


Fig. 2

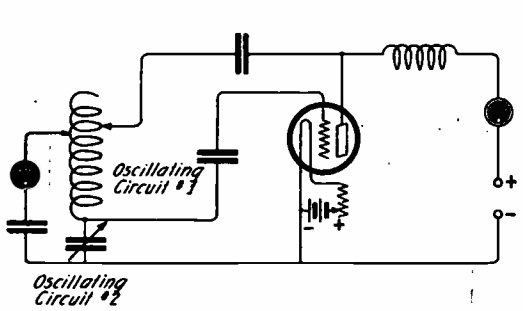


Fig. 3

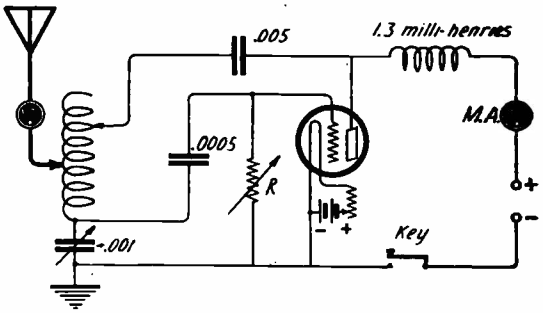


Fig. 4

In figure 2, which shows only the two circuits, the oscillating and the output, any current from the oscillating circuit that finds its way back through the source of high potential, is prevented from flowing into the antenna and ground and is, of course, totally lost as far as transmission is concerned. For that reason, a choke "K" of approximately 1.3 millihenries has been added and for transmission on 200 meters, this size choke is highly efficient.

The sole purpose of condenser C-3 in your correspondent's diagram is to prevent the high potential from reaching the plates of his variable condenser, C-1. Since the greater the capacity of a condenser the more easily will the high-frequency current pass through it at any specific wavelength, this condenser should be large with respect to the coupling condenser, C-1. In no case should it have a capacity less than .005 mfd.

It is not advisable to place the key in the grid leak as shown by your correspondent.

circuit. The most approved place for the key is in the negative lead of the high potential, as shown in figure 4. When thus connected and the key released, the oscillations immediately cease as before, and the plate, or space, current returns to zero.

The value of the resistance "R" in figure 4 should be variable and should be increased with an increase of plate potential. 5,000 ohms is approximately correct for a plate potential of 300 volts when using a W.E. "E" tube as oscillator.

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

THE committee which was appointed some time ago by the Postmaster-General of Great Britain to investigate the advisability of allowing the amateurs of the British Isles greater privileges has decided to make some radical changes in the present regulations, all in favor of the amateur.

For one thing, a wave-length of 440 meters has been sanctioned for amateur transmission, in addition to 180 and 1,000 meters previously authorized. Amateur installations devoted to receiving only will hereafter be exempt from inspection, and all restrictions as to the size of receiving aerials are removed. No change in the regulation regarding power was made and the provision of 10 watts input still stands.

The committee reported further that it desired to give amateurs all the freedom which was compatible with public interest. This may, or may not, mean an increased power allowance.

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RADIO amateurs of St. Louis gave an interesting demonstration recently when station KSD was silent for five minutes to allow the president of the St. Louis Radio Association, Dr. Charles L. Klenk, to make a statement concerning the drive for increased membership and to explain the benefits it offers to all interested in wireless. To illustrate one of the functions of the association—air traffic rules—and to show what might result without these regulations, Dr. Klenk asked all sending stations, at the end of his address, to operate for two minutes under full power.

No sooner had Dr. Klenk given the word than transmitters were busy with international code signals. Rotary spark gaps, CW outfits and the smaller spark coils all joined in a bedlam of dots and dashes. At the end of two minutes the confusion ceased and the regular program of KSD was resumed.

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J. E. MARTINEAU, chancellor of Pulaski County, Arkansas, in refusing to grant an injunction against two radio enthusiasts—father and son—ruled that an amateur radio station is not a nuisance, according to a dispatch.

Several persons, seeking the injunction, complained of buzzing noises interfering with their sleep between 9 p. m. and 7 a. m., when the radio plant was alleged to be in operation.

The chancellor held that the noise is one that persons must become accustomed to.

The Milwaukee Amateurs' Radio Club. Officers: (first row, left to right) E. J. Seifert, L. S. Baird, E. W. Ruppenthal, H. F. Wareing, L. W. Klingbiel, A. J. Simandl and I. H. Strassman

The revised by-laws were adopted.

Final arrangements were made to have the complete radio telephone transmitter and receiver in operation at the next meeting.

A committee was formed to visit and assist the novice who is having difficulty with his apparatus. The following were named to serve on this committee: H. L. Buskey, M. W. Barrett, D. F. Fisher.

The subject of local interference was given a lengthy discussion and brought out the fact that the receiver using the oscillating audion is one of the worst offenders.

Many technical subjects were discussed. The most prominent speakers were L. H. Gilpin, M. Ferris, A. A. Kubiac.

The association will hold its regular meetings every Wednesday evening in the headquarters at 222 Brewer street, Norfolk, Va.

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WITH the installation of a code school, the Louisville Radio Club promises to become one of the leading local civic organizations. The club, which was formed recently by a few radio enthusiasts, now has a membership of more than seventy, and new applications for membership are coming in at every meeting.

The club was organized through the efforts of W. A. Link, president of the H. C. Tafel Company, 236 West Jefferson street, who sent notices to a number of radio operators in the city asking them to attend a meeting for the purpose of organizing a radio club. More than twenty-five radio fans attended the opening meeting and decided to organize the club on a semi-technical and social basis, and to include everyone who has a desire to become familiar with radio.

Transmitting and receiving equipment of 8JP, owned and operated by Oscar A. Chamberlain, Akron, O.

THE first meeting of the Hampton Roads, Va., Radio Association was marked by an attendance greater than any previous gathering of the association, and the increasing interest of the public in radio affairs was evidenced by the unusual number of visitors present. Many new members were enrolled.

Prize Contest Announcement

The subject for the new prize contest of our year-round series is:

INDOOR ANTENNA WITH CRYSTAL SET

CLOSING DATE :: :: JULY 1, 1922

Contestants are requested to submit articles at the earliest practical date.

Prize winning articles will appear in the September, 1922, issue.

All manuscripts should be addressed to the CONTEST EDITOR OF THE WIRELESS AGE.

Many broadcasting listeners are not in a position to erect outdoor aerials and have not a large amount of money available to buy a very elaborate set. Some of the boys have been getting excellent results with indoor antenna and crystal sets and we want this explained in detail for the new broadcasting listeners.

PRIZE CONTEST CONDITIONS—Manuscripts on the subject announced above are judged by the Editors of THE WIRELESS AGE from the viewpoint of the ingeniousness of the idea presented, its practicability and general utility, originality and clearness in description. Literary ability is not needed, but neatness in manuscript and drawing is taken into account. Finished drawings are not required, sketches will do. Contest is open to everybody. The closing date is given in the above announcement. THE WIRELESS AGE will award the following prizes: First Prize, $10.00; Second Prize, $5.00; Third Prize, $3.00, *in addition to the regular space rate paid for technical articles.*

A committee, composed of J. B. Riley, George DuR. Farleigh, Carl Pflum, F. L. Sparr and J. N. Ruffner, was appointed to draw up a set of by-laws and rules and present them for adoption at the first regular meeting, which was held April 3. A constitution was adopted and officers for the coming year were elected, after which Mr. Link donated a room on the second floor of the H. C. Tafel Company Building to the club, to be used as a temporary clubroom.

Officers of the organization who were elected are J. B. Riley, president; George DuR. Farleigh, vice president; C. E. Weigel, secretary and treasurer; R. L. Mercke, chairman of the membership committee; Jack Ward, chairman of the entertainment committee, and John L. Green, chairman of the engineering committee.

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THE bi-monthly meeting of the Radio Club of Long Island in the rooms of the Plaza Business School, 257 Bridge Plaza North, Long Island City, was attended by fifty members. A new constitution was adopted.

In the drawing for a complete radio outfit, the holder of the lucky ticket was Joseph Levine. Refreshments were served by the entertainment committee.

During the luncheon, tickets were sold for a "Blind Horse," which proved to be a radio receiving vacuum tube, and it was won by Lyman J. Wiggin of Elmhurst.

Many interesting and humorous radio stories were told by Dr. Miller and other members.

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E. T. JONES, of New Orleans, has severed his connection with the Shipping Board as radio supervisor of the Gulf Division and has become manager of the radio department of the Electric Supply Company of that city.

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A FATHER and his son and a second boy, seriously, was saved from death by an electric shock in a tragedy brought on when a kite crossed a 2,200-volt electric wire at Cleveland, O.

The dead are Carl Braun, 48 years old, and his son, Henry, 15. The injured lad is Cleveland Leber, 15. The tragedy resulted when the haste of four boys to set up a home-made receiving set to hear the local concert.

Young Braun, aided by Carl Longstreet, 17, had attached the aerial of the set to the chimney of the Braun home and thrown it over a high-tension electric wire. Disregarding warnings of Longstreet to let the aerial alone until he had tied a rope to it, young Braun and Leber clutched the aerial. Meanwhile friction of the aerial had rubbed off the insulation of the electric wire. A flash of flame followed. Young Braun was instantly killed. His father rushed to rescue him. He, too, died within a few minutes

A NEW radio organization has been organized at San Francisco. It is called the Radio Technical Association.

The first regular meeting of this body took place recently at the I. O. O. F. Hall at Grove and Nineteenth streets, Oakland.

Tentative plans as drawn up at the first gathering state that any person over 18 years of age, of good character and interested in radio in keeping with the intentions of the organization is eligible to membership.

The officers elected were as follows:

F. A. Brandis, president; C. Eiferle, vice president; A. P. Monteiro, secretary and treasurer, and C. Poage, sergeant-at-arms.

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THE following officers have been elected by the Radio Association of Greater New York: A. K. Ransom, president; H. Bentman, first vice president; H. Cervantes, second vice president; Miss M. L. Powers, recording secretary; R. H. Strahlman, corresponding secretary; E. Wilbur, sergeant-at-arms, and M. Hendricks, treasurer. Meetings are held every Monday night at 8 o'clock at the Fort Washington Branch, Public Library, No. 535 West One Hundred and Seventy-ninth street.

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AN invitation to the public to listen in on broadcasting programmes is extended by the Hudson City Radio Club, Inc., No. 37 Sherman avenue, Jersey City, N. J. The club rooms are open [illegible] from 9 a. m. to 10 p. m. A regular [illegible] meeting, held once a month, is open [illegible] only. The club's call number is [illegible]. The station operates every [illegible] and would like [illegible] hear the signals [illegible] device is being [illegible] Lister 4388. April [illegible] should be addressed [illegible], secretary.

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FOLLOWING are the prize winners of the radio show held recently at Newark, N. J., by the Newark, N. J., Ledger:

1. Most unique set: Ralph H. Dixon, 185 Orford avenue. Mr. Dixon made a model of a [illegible] one of the most remarkable [illegible] of the show, and mounted a working set on it.

2. Smallest working set: John M. Bien, [illegible] Sunset avenue. This set measured one inch square, worked perfectly, and was all hand-made.

3. Most efficient crystal detector: C. Johnson, 83 Third avenue.

4. Most home-made parts: J. Horacio Rodriguez, 725 High street.

5. Most efficient vacuum tube receiver. Roscoe D. Conklin, 259 Westfield avenue, Elizabeth.

6. Most efficient vacuum tube receiver with amplifier: C. H. Lane, 465 Clifton avenue.

7. Best radio frequency receiver: Gaston de Requier, 209 Lake avenue, Lyndhurst.

8. Best regenerating set: Rudolph Knapp, Cedar Grove.

9. Best set by Boy Scout: Henry Droughn, 15 Coledge place.

10. Best set in show: Lysander E. Wright, Jr., 567 William street, East Orange.

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THE Nashville, Tenn., Radio Club held a meeting recently at the Y. M. C. A. and discussed at length plans for interesting a greater number of people in the city in the wonders of radio and providing them with competent advice and instruction along such lines.

The radio club also expects to appoint educational, electric and publicity committees within a short time and to secure a competent man for inspector. There are no fees connected with membership in the radio club and there will likely be no charge for instruction. The officers are E. L. Spain, president; McGregor Smith, vice president, and Joseph Weis, secretary and treasurer.

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THE Radio Club of the Schenectady Y. M. C. A. met with Leroy D. Lester and Wendell King of the research department of the General Electric Company and member of the Union College Radio Club. At this time the plan of the executive committee to purchase a three-unit set, which would communicate with stations at Washington, D. C., Chicago, Pittsburgh and all within a thousand mile radius, was approved. This set will be purchased at once and installed by Mr. King, the expense being borne jointly by the Radio Club and the Men's Brotherhood of the Y.

THE Belmar, N. J., Radio Club held its meeting Friday evening, March 31, at the home of Chester R. Davison, the club's secretary. The early evening was devoted to business, after which refreshments were served by Mrs. Davison. The remainder of the evening was spent in sociability.

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THE regular meeting of the Chester, Pa., Radio Club was held on April 14. A complete discussion on crystal circuits was given by H. McFadden. Committees were appointed to take care of various subjects, such as procuring speakers and formulating by-laws. Mr. Burns was appointed chairman of publicity and Mr. McFadden chairman of rules. It was decided that the name of the organization be the Chester Radio Club. The officers elected for the year are: Mr. Bell, president; R. Webster, vice president; R. Reis, secretary-treasurer.

A CHICAGO radio fan made a set and then discovered his landlord would not let him put up an aerial.

The landlord has no rules against screening the windows, however, and this gave the radio bug his chance. He screened the window with copper mesh wire, properly insulated, hitched his lead to it, and says he hears "everything."

THE Harrisburg, Pa., Radio Club has adopted the following rules and regulations:

"In order to give due consideration to the man who listens only to radio broadcasts, all amateurs' operating transmitters will refrain from using same during a period from 7:30 p. m. to 10 p. m.

"Licensed spark C. W., or phone sets will have the air from 10 p. m. These stations will be arranged alphabetically by the Harrisburg Radio Club and the said transmitters will two QT the number of messages they have to transmit. This is for the purpose of having them get lined up on the evening relays.

"The period from 10.15 p. m. to 10.45 p. m. is for all spark coils only. During this time no Rock Crushers, CW, or phones will answer if called. This is to give the spark coils the time to work each other without interference.

"The period from 10.45 p. m. to 2 a. m. will be for the high-powered stations only, and the spark coils will absolutely stop transmitting at this period unless said coil wishes to talk with a said high-powered station.

"The period from 2 a. m. until the succeeding afternoon at 4 o'clock will be turned over to every transmitter; i. e., free air.

"From 4 p. m. until 6 p.m. the spark coils will be given an opportunity for local work referred to in paragraph three.

"From 6 p. m. to 7.30 p. m. will be open for high power stations who wish to transmit to local amateurs or any other work." Note: The high-powered station will be designated as those who have at any time worked outside the city, a distance of twenty miles or more.

"These rules will apply Sunday as well as weekdays."

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THE latest radio "bug" to announce that he is the proud possessor of the smallest radio outfit in the world, is Alfred J. Di Giovanni, a 14-year-old freshman in the Union high school of Knoxville, Pa. His outfit is less than one inch square, not much larger than a nickel, but it is claimed to have recorded distinctly the programs broadcasted by the large broadcasting stations in East Pittsburgh, which is about fifteen miles from Di Giovanni's home.

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NO matter what else you do, don't try to receive during an electrical storm. Ground your antenna and sit back in the knowledge that no lightning is going to burn out your set and possibly your house.

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MEMBERS of the Caldwell, N. J., High School Radio Club have been busy assembling their new receiving set, recently purchased from the appropriation made them by the Board of Education. It consists of a Simplex short wave tuner, with one step of amplification. The balance of the fund will be used to install a 5 watt C. W. transmitting set.

The club has been allotted separate quarters in the school building in which to install their station and hold their meetings, and the association is altogether in a flourishing condition.

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THE 100 watt C. W. station of C. J. Dow, Mani, Hawaii, has recently been in communication with several amateur stations on the Pacific Coast.

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ONE 5 watt transmitting tube is used at Amateur Station 8 BO, of Detroit, which has been heard frequently of late by Lawrence Mott, Station 6 XAD, on Catalina Island, Calif. Mr. Mott has also frequently heard Station 8 HJ, Elmira, N. Y. The latter station uses a 10 watt transmitter.

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RALPH SHOWERS, Shelbyville, Ind., made a dictaphone record of a concert from Detroit, recently, then played it on the Dictaphone the next day, for the benefit of his family.

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AMATEUR radio operators at Norfolk, Va., are admonished by Admiral A. C. Dillingham, Director of Public Safety, that it is necessary to obtain a permit from the city electrical department before installing wireless apparatus. This permit is easily obtainable by application to the department.

This requirement is a fire-prevention measure, and applies more directly to transmitting apparatus rather than to receiving sets. The reason, as explained by the electric officials of the city, is that it is necessary for wires to be grounded when installing transmitting apparatus, and in view of this fact such wires prove a hazard in time of electrical storms.

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THIEVES broke into the offices and storerooms of the Central Electric and Lock Company, 1309 Arch street, Philadelphia, recently, and stole materials valued at $2,000, including much radio apparatus.

THE prize of $25 offered by the Detroit Radio Show officials for the best home-made set by girls was won by Miss Betty Rothfus, 10, daughter of Mr. and Mrs. John G. C. Rotfus, Henry Clay Hotel.

Her set is built of two cigar boxes, some wire and odds and ends of metal.

The prize for the most novel set made by girls was awarded to Marjorie Simpson, 13, of 277 Palmer Park boulevard, Highland Park, whose set was so arranged as to be carried in a small handbag.

Cameron J. Bastel, 13, of 63 Edgewood avenue, won the prize for the best radio outfit constructed by boys.

A practical radio set built in a tiny snuff-box won the prize for the most novel set made by boys for Marion H. Korreck, 3389 Warren avenue east.

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IRVING ENGLE DEVENDORF, 8-year-old cub boy scout, enrolled recently with the Extension Division of the University of California for the radio course being given in Oakland by Herbert E. Metcalf, radio expert.

With the young radio fan was his grandfather, Dr. Theodore Engle, of 1531 Tacoma avenue, Berkeley, who also wished to register for the instruction. Young Irving has read all the material he could get hold of on the subject of radio and talks fluently about wave lengths, receiving sets, and antennas. He will be the youngest member in the group.

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RADIO STATION 3AOD owned and operated by Richard W. Delmotte, Harrisburg, Pa., has done excellent work lately.

Three means of transmission are used. They are CW, ICW and wireless telephone. A Radio Corporation transformer furnishes 7.5 volts for the filament, and 550 volts for the plate. The high-tension A. C. is rectified by an aluminum electrolytic rectifier. Four five-watt power tubes are used as oscillators. The usual filter system is used and consists of a Tuska inductance, Clapp-Eastham balanced condenser, a Clapp-Eastham thermocouple type O, one ampere, a Roller-Smith 0-4 ampire meter, and an 0-500 milli-ammeter. The apparatus is mounted on a heavy bakelite panel. A desk transmitter is used for radiophone speech, and a transmitter has been put into a Victrola to broadcast music.

The receiver is one of the well-known Westinghouse type RC receiver, which consists of a single circuit tuner, and a detector and two step amplifier. Brandes Navy receivers are used and several extra pairs have been installed for the convenience of visitors. The Marconi VTs are used for long distance relay work, the three tubes taking only one ampere at four volts. Although these tubes are efficient they will not give sufficient amplification of radiophone concerts from the different broadcasting stations sufficient to be heard all over the house. In order to overcome this, two five-watt power tubes are used as amplifiers. The output of these tubes is fed to a type R-13 Magnavox. When using the two five-watt tubes and Magnavox the music and speeches from Pittsburgh, Schenectady, N. Y., and various other stations are plainly heard throughout the house. The direct current for the tubes and Magnavox comes from both an eight-volt, 140-ampere Exide Navy battery, and a four-volt, 280-ampere hour battery.

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AT the regular meeting of the New Haven Radio association on April 12, in Fraternal Hall at 19 Elm street, Pres. J. T. Butler announced that the association is starting a membership campaign and contest.

Pres. Butler also announced another contest which will be open to every amateur in the city, whether a member of the organization or not. This contest will be divided into two classes, the school boys in the junior class and the adults in the senior class. In this competition any amateur schoolboy having a crystal set of his own construction may bring it to the club meeting on May 18 to be inspected by the judges. The five judges will carefully look over each set submitted, taking into consideration the general appearance, wiring, workmanship and operation, and after examining the diagram which must accompany the apparatus, will determine the winner, who will then receive a year's supporting membership in the association, which is equivalent to $6. The senior contest will be on the same plan, excepting the sets, which will comprise only those of the regenerative type. The senior prize will be the same as the junior. The judges in this competition will be A. P. Seeley, S. Martino, Charles C. Aldrich, Roland Barnum and W. H. Wygant. A diagram of the hookup must accompany each set submitted.

At the special meeting held on April 20, the meeting night of the association was changed from the second and fourth Thursdays of each month to the first and third Thursdays. An amendment to this effect was also made in the by-laws.

Owing to the absence of J. T. Butler, president, and R. E. Wilmott, secretary, who were unable to be present due to previous engagements, Stallo Martino presided and Stanley Need was secretary.

THE Des Moines Radio association met recently to continue deliberation on measures for regulating and improving radio transmission and receiving in this section.

Information concerning proper construction of aerials from the standpoint of lightning safeguards will be distributed to members who attend, through the courtesy of City Electrical Inspector Stedman.

A committee on revision of the association's constitution, appointed at a previous meeting by President Frank Page, reported.

The revision is intended to open the membership to radiotelephone experimenters and enthusiasts, not all of whom would be eligible under the old rules of the association, which was formed when wireless telegraphy was the only form of radio in use.

INTERFERENCE of radiophone broadcasts and wireless transmission in general by amateurs operating badly tuned stations on unauthorized wave lengths was condemned by the Seattle Totem Radio Club at its meeting in the Chamber of Commerce assembly room.

The club's traffic committee was instructed to locate wireless operators in the district who have refused to comply with existing air regulations, and urge them to take notice of the annoyance they cause all radio fans. A resolution was passed to the effect that the club's radio traffic rules be published in the press, so that all amateurs will know when they can send messages and on what wave length.

THE Desdemona, Texas, Radio Club was organized on March 8th with a membership of 125. An initiation fee of ten dollars per member was charged, the money to be used for the purchase of radio apparatus. The club has already installed a Colin B, Kennedy universal receiver with a two-step amplifier, including a Magnavox. Code and theory classes are held by the club three times a week. The club is contemplating the installation of a spark and also a C.W. transmitter, possibly in the near future. The officers of the club are T. W. Griffith, President; Elmer Simpson, Vice President; W. S. Jarrett, Secretary, and Frank Gee, Treasurer.

△ △

A RADIO show will be staged at the Emporium, San Francisco, Calif., in conjunction with the Shriners' Convention, June 12 to 17.

△ △

A RADIO exposition, under the auspices of the Springfield Daily Union, will be held at the Auditorium, Springfield, Mass., June 19, 20 and 21.

△ △

THE Milwaukee Amateurs' Radio Club was founded in January, 1917, by L. S. Baird, A. C. Kletzsch, Jr., J. B. Hitz and Alonzo Pawling.

In the spring of 1919 and shortly after the government ban on amateur radio activities was removed, a meeting of the Milwaukee Amateurs' Radio Club was held and plans were made for the club season of 1919-1920. A careful survey of the city was made and a list of all amateurs was compiled. This list was the nucleus of the complete record of all amateurs in the city that the club now keeps. The trustees' room of the Milwaukee Public Museum, which has a seating capacity of about one hundred, was secured as a hall for the club to convene in.

The season of 1921-1922 was opened with L. S. Baird as past-president; C. N. Crapo, chairman of the board of direction; D. J. Gellerupt, president; H. F. Wareing, vice-president; L. W. Klingbiel, secretary; and E. W. Ruppenthal, treasurer and business manager.

The club meets weekly at 8:00 P.M. on Monday evenings, except the third Monday of each month. Visitors and prospective members are welcome at all meetings. At meetings when outside speakers are not present, members present papers and informal discussions take place. Previous to the hour of opening the meeting, half an hour is devoted to code practice. Members at meetings are encouraged to present both radio traffic and technical problems and in the near future a plan will be inaugurated whereby a certain period of the meetings will be devoted to giving instruction in elementary electricity and radio communication.

Clubs in Milwaukee and its suburbs affiliated with the Milwaukee Radio Executive Council, consisting of Wauwatosa Radio Club, meeting on Monday evenings in the Wauwatosa High School; West Allis Radio Club, meeting on Friday evenings in the West Allis Public Library; South Side Radio Club of Milwaukee, meeting on Wednesday evenings in the South Side Branch of the Public Library, and the Milwaukee Amateurs' Radio Club, are engaged in the solution of local radio traffic problems.

Correspondence should be addressed to 601 Enterprise Building, Second and Sycamore Streets, Milwaukee, Wisconsin.

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.

1CMK, P. H. BLOOM, 682 East St., Holyoke, Mass. (March and April)

CW—1agi, (1anq), 1amq, (1ary), (1asf), 1avr, 1awb, (1azx), 1azw, (1bas), 1bdc, (1bdi), (1bea), 1bep, 1bes, (1bfu), 1bhd, (1bgf), 1bkp, (1bkq), 1bqe, 1brq, 1bsd, 1btu, 1bua, 1bwj, (1cak), (1cgq fone), 1cik, 1cjz, 1cod, 1cpz, (1eo fone), (1ii), (1kn fone), (1qp), 1uj (1vt), 1xm, 1xz, 1yk, 1ze, (2aab), 2abz, 2acq cw&fone, 2afp, 2agb, (2aja), 2am, 2amq, (2aqu), 2awf, 2awl, 2aws, 2ayi, (2ayv), 2ba, 2bb fone, 2bbb, 2bcf, 2bea, 2beb, 2beh, 2bem, 2bgi, 2bgm, 2bjl, (2bnz), 2brb, (2btj), 2btw, 2bxp, 2byw, 2bzv, 2caf, 2cbw, 2ccd, 2ccl, 2cda, 2cft, 2cgq, 2cjn, 2el, 2fp, 2kp, 2ku, 2kv, 2nz, 2of, 2ud, 2va, 2zk fone, 2zs, 3aae, (3aag), 3aao, (3adx), 3ahk, 3aig, (3ajd), (3aln), (3alu), 3all, 3any, 3apq, 3aqr, 3arm, 3arj, 3ary, 3aso, 3atz, 3avy, 3ba, 3bag, 3bfu, 3bhl, 3bof, (3biv), 3bm, 3bnu, 3buv, 3bz, con 3bp, (3cg), 3cc, 3cm, 3cz, 3dm, 3em, 3ff, 3fs, 3fr, 3hg, 3iw, 3il, 3jj, 3jf, 3km, 3lr, (3mo), (3blf cw&fone), 3sq, 3vs, 3vw, 3wf, 3zo cw&fone, 4az, 4by, 4bf, 4bq, 4dc, 4db, 4dq, 4gl, (4id), 4lp, 4zc, 4ce, con 4co, 5if, 5fv, 5ek, 8ahe, 8abz, 8acf, 8adg, (8ago), 8aio, 8alt, 8alb, 8amk, 8anb, 8anc, 8anr, 8apt, 8aqv, 8aoa, 8aoo, 8ark, 8ari, 8arw, (8avd dalite), 8awm, 8awp, 8awx, 8axk, 8azx, 8bbk, 8bdh, 8bdu, 8bcj, 8bjv, 8bnj, 8bny, 8bqu, 8bss, 8btp, 8buq, 8bum, 8bzh, 8bzy, 8cay, 8caz, 8cbj, 8cfp, 8cfs, 8cko, 8ckm, 8cns, 8coo, 8dv, 8ev, 8ge, (8am), 8hj, 8iq, 8js, 8ks, 8lb, 8lf, 8nb, 8nv, 8oc, (8os), 8oz, 8pc, 8pt, 8qb, 8qm, 8qz, 8ro, 8se, 8sf, (8th), 8ud, 8uk, 8vv, 8xae fone, 8xe, 8xv, (8vae), 8zx, 9aay, 9aja, 9ajh, 9als, 9ark, 9axf, 9blo, 9bp, 9brl, 9bsg, 9dax, 9dv, 9dw, 9dyn, 9hw, 9io, 9kp, 9lq, 9wh, 9wk, 9zg, 9zl, con 9al.

Receiving done on only one tube. Would be glad to hear from anyone hearing my 10-watt cw transmitter, 1cmk.

2NE, A. H. SAXTON, 211 Claremont Ave., Jersey City, N. J. (March and April) Single Tube.

CW—Can 3bp, 1af, 1aip, 1ajp, 1alz, 1ary, 1azw, 1bbw, 1bdc, 1bdi, 1bes, 1bkq, 1bsd, 1cak, 1cjh, 1cka (voice), 1cnr, 1jg, 1pr, 1pt, 1qp, 1vt, 1xa, 1xm, 1xz, 1yk, 2bqd, 2xq, 3aln, 3ba, 3bnu, 3buv, 3cc, 3fs, 3qv, 3xl, 3zo, 3zy, 4bf, 4by, 4eh, 4gl, 4zc, 5fv, 5uu, 5za, 8acf, 8ago, 8aim, 8aio, 8and, 8aqo, 8aqz, 8ark, 8awm, 8awp, 8axc, 8axk, 8bdg, 8bef, 8bo, 8brl, 8bss, 8bzh, 8caz, 8cld, 8du, 8ea, 8eb, 8ga, 8hj, 8iz, 8nn, 8oz, 8qb, 8qm, 8qz, 8sp, 8uk, 8vp, 8vy, 8xz, 9aja, 9axf, 9brl, 9fz, 9kp, 9vg, 9wa, 9zl, nof, wgy.

Spark—Can 3bp, can 3jl, 1adc, 1akg, 1aok, 1ary, 1auv, 1aw, 1azk, 1bdt, 1bjc, 1bop, 1bqa, 1bvh, 1cc, 1cgu, 1cja, 1cm, 1cni, 1cok, 1cp, 1cz, 1dy, 1gm, 1lz, 1rv, 1rx, 1sn, 1wq, 2ahu, 2pv, 2sz, 2xq, 3ei, 3gn, 3ta, 4bi, 5sm, 5ka, 8acf, 8afk, 8ahh, 8ahq, 8alo, 8ard, 8awp, 8awu, 8axy, 8ay, 8ayi, 8ayn, 8bco, 8bfh, 8bxx, 8ew, 8ft, 8jj, 8nz, 8rq, 8tb, 8tk, 8uc, 8vq, 8wo, 8xe, 8zac, 9aaw, 9acb, 9afk, 9agr, 9aiu, 9aky, 9awz, 9azf, 9bp, 9dso, 9dzy, 9lf, 9ox, 9pc, 9ug, 9uh, 9vl, 9wt, 9yb, 9zj, 9zn.

2AWF, E. WIRSING, Albany, N. Y. (April)

Spark—1aa, 1aco, 1aw, 1bop, (1boq), (1brq), 1cni, 1gm, 1ho, 1rv, 1rx, 1yd, 2aaf, 2abm, 2aje, 2aqi, 2ar, 2cgj, 2ct, 2dn, 2el, 2rm, 2ts, 2wb, 3abb, 3agt, 3aov, 3aqz, 3eh, 3fb, 3fp, 3gx, 3hj, 3ii, 3nb, 3pu, 3qn, 3rw, (4cx), 8acf, 8afb, 8ahh, (8ahq), 8ahz, 8aic, 8aij, 8ard, 8auy, 8bep, 8bss, 8bsy, 8cdi, 8ch, 8chv, 8cqf, 8eb, 8ft, (8jj), 8ky, 8lb, 8rq, 8tt, 8vq, 8wo, 8wz, 8zo, 9aaw, 9agr, 9awp, 9dcx, 9dhz, 9dso, 9ki, 9mc, 9ox, 9uh, 9yb, can 3bp, 3fo.

CW—1ayz, 1azw, (1brq), 1bwq, 1cac, (1cnc), 1cnr, 1jt, (1qp), 1uj, 1xz, 2ajr, 2ayv, 2azz, 2bcf, 2bea, 2beb, 2bem, 2bfz, 2bnd, (2brc), 2ccd, 2cft, 2dx, 2fp, 2fz, 2kp, 2nz, 2of, 2vh, 2wi, 2zl, 3aad, 3adt, 3alu, (3anj), 3any, 3aqh, (3awh), 3ba, 3bg, (3bhl), 3bij, 3bjy, 3cc, 3fs, 3fv, 3hg, 3iw, 3km, 3qv, 3sh, 3vw, 3xl, 3xz, 3zo, 3zy, 4bq, 4by, 4eb, 4eh, 4gh, 4gl, 4iv, 4kc, 4lp, 5do, 5fv, 5rl, 5wo, 8ago, (8aja), 8anb, (8anj), 8aqo, 8aqz, 8ark, 8arw, 8asm, 8auy, 8avd, 8awn, 8awy, 8axc, 8bke, 8blx, 8bo, 8bpu, 8coo, 8czd, 8dv, 8ft, 8hm, 8lb, 8lx, (8pn), 8qz, 8tb, 8uk, 8vy, 8xak, 8xe, 8xv, 8xwa, 8ym, 8zae, 8zz, 9aap, 9ajh, 9aou, 9arg, 9bp, 9dea, 9dgq, 9dzz, 9ei, 9fz, (9il), 9kp, 9so, 9xi, nfkx, (nzo), wha.

Fone—1bka, 2xb, 2xj, 3xw, kdka, kdow, kyw, nof, wbl, wbz, wfi, wgi, wjz, wlk, woh, wpi, wwj.

Queries Answered

Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of one reader can be answered in the same issue. To receive attention these rules must be rigidly observed.

Positively no questions answered by mail.

C. J. A., Brooklyn, N. Y.

Q. 1. Can I use a loop aerial (indoors)? I am located in the Greenpoint section of Brooklyn.

Ans. 1. Yes.

Q. 2. What sort of apparatus must I use with a loop aerial, using head phones? Please give the hook-up.

Ans. 2. Hook-up can be secured by writing the Commercial Dept. of the Radio Corporation of America asking for Bulletin No. 6A, which contains advanced information on this subject.

Q. 3. What sort of apparatus must I use with a loop aerial, using a loud talker?

Ans. 3. Add two steps of Audio Frequency to the diagram mentioned above.

Q. 4. If the loop aerial is practical, please give size same should be made.

Ans. 4. Use wooden frame three foot square wound with six turns of No. 14 B and S lamp cord, each turn spaced ½-inch apart. A tap should be provided at each turn. The loop should be shunted by a variable condenser of about .0005 mfd. capacity.

Q. 5. What would be the probable range?

Ans. 5. Answer to this question would only be a guess and would not be worth anything under varying conditions.

A. L. F. Wallace, Kansas.

Q. 1. I have never seen a good explanation of wavelength for receiving wireless.

Ans. 1. Refer you to part six of "Practical Wireless Telegraphy" by Elmer E. Bucher.

Q. 2. Does the amount of capacity of an antenna count in, when using inductances? Say we use a two hundred meter coil and a two hundred meter antenna, does this total four hundred meters?

Ans. 2. Yes. Four hundred meters. Suggest that you get a copy of "Wireless Experimenter's Manual" by Elmer E. Bucher.

C. R. D., Belmar, N. J.

Q. 1. What is the transmitting wavelength of an aerial of the "T" type, four wires (not shunted at spreaders) 60 feet long, 10 feet wide, a 40 feet lead-in, and a ground wire 6 feet long?

Ans. 1. Your antenna will have a natural period of approximately 115 to 125 meters but the transmitting wavelength will be greater depending upon the transmitter used, whether it be a tube or spark.

Q. 2. Will the receiving wavelength be the same as the transmitting wave?

Ans. 2. The receiving wavelength will depend upon the adjustments of the receiver as well as the natural period of the antenna.

Q. 3. Will it make any difference if I shunt the aerial wires at the spreaders?

Ans. 3. Yes. This would be very advisable.

Q. 4. Where can I buy Meyer's Tubes, Western Electric Tubes, and French Tubes?

Ans. 4. We are unable to state.

Q. 5. Will you please print a hook-up for one stage of Radio Frequency (using Radio Corporation Tube and Transformer)?

Ans. 5. Write to Commercial Dept. of the Radio Corporation of America asking for Bulletin No. 6A.

W. H. McA., Monterey, Cal.

Q. 1. Please tell me how long a six-wire cage aerial, 60 feet long and 30 feet high, 40 feet lead-in and eight-wire counterpoise should be, to be used with a C. W. transmitter under 200-meter wavelength. How long should the counterpoise be?

Ans. 1. Approximately 90 feet long for a "T" type of antenna. The counterpoise should be of same length and contain the same number of wires and should be placed directly under the aerial. These figures can only be taken to be approximate as the surrounding metallic objects, trees, etc., will have a considerable effect upon the natural period of your antenna.

Q. 2. How many turns of No. 22 wire should there be on a short wave plate variometer?

Ans. 2. Approximately 50 turns on each coil but this is governed by the diameter of the coils.

NOTE.—After reading the question by G. C. H. in the February WIRELESS AGE, I believe I may be able to give some information of interest to you, and to the inquirer. WGG is on a wavelength which is about 600 cycles different from that of NSS, and NSS heterodynes him so that we can copy him at any time on galena. NSS changes his wavelength slightly to form dots and dashes, and this results in a slight change of tone heard when copying WGG. It is very likely that all the other CW stations that G. C. H. reports hearing are the result of two transmitting stations operating on nearly the same wave.—VICTOR ANDREW, 8 BPP.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of the Wireless Age, published monthly at New York, N. Y., for April 1, 1922.

State of New York } ss
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. Andrew White, who, having been duly sworn according to law, deposes and says that he is the editor of the Wireless Age, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Wireless Press, Inc., 326 Broadway, New York, N. Y.

Editor, J. Andrew White, 326 Broadway, New York, N. Y.

Managing Editor, none.

Business Manager, J. D. Conmec, 326 Broadway, New York, N. Y.

2. That the owners are (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.)

Wireless Press, Inc., 326 Broadway, New York, N. Y.

E. J. Nally (850 shares), 233 Broadway, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is ..... (This information is required from daily publications only.)

J. ANDREW WHITE,
Editor.

Sworn to and subscribed before me this 18th day of March, 1922.

[Seal] M. H. PAYNE,
Notary Public.

(My commission expires March 30, 1924.)

A Real Radio Magazine *for* The Whole Family

This is the second issue of THE WIRELESS AGE in its new form. You know by this time we are producing a publication that every member of your family enjoys. There is something in it for those who enjoy only the Broadcasting and also plenty of meat for the real fan.

The July Issue

Yvonne de Treville, coloratura soprano, and Grand Opera prima-donna, tells of her broadcasting experience from WJZ. She tells also of another experience she had shortly before the war. She was singing at the Royal Opera House at Budapest. Her mother was ill in a local hotel, but merely by putting phones over her head, the mother heard every note sung by the diva. She explains how this was done, and it will be of interest to present day radio fans.

Here are a few of the features for The July issue. This doesn't tell half the story of what we are planning for you.

Twenty years ago Byron G. Harlan, making his bow to the public as a singer, thought he could best achieve lasting fame by making people cry. And now the twenty years have flitted into the never returning past and Byron G. Harlan still is singing to the public through the music records. His fame has spread into all countries during this time, but now all of his efforts are directed toward making people laugh and many hundreds of thousands of radio telephone users will readily testify that these efforts are quite successful.

Although Mr. Harlan has broadcasted several times and "knows" his audience as well as any entertainer, he welcomed the interviewer who wished to present him to the radio audience in printed word and picture.

Olga Cook, star of Blossom Time, the musical comedy success, in an interview tells how a singer over the radio guides herself, that is, how she knows she is or is not "registering" with the unseen audience. All who listen in wonder how the singers "feel the pulse" of their audience, and Miss Cook lifts the veil before the question in a most enlightening way.

Dots and Dashes

Folks who started in wireless by listening to concerts want to know what the teh-deh-deh-dar stuff is all about. To help them satisfy their curiosity we have developed the SOUND METHOD OF LEARNING THE CODE—a method that saves at least half the time usually needed.

A copy of this SOUND METHOD will be given free with each WIRELESS AGE subscription ordered from this ad and mailed to reach us by July 15, 1922.

SPECIAL OFFER COUPON

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326 Broadway,
New York City.

Enclosed please find $2.50 ($3.00 outside U. S.) for one year beginning with the ..... issue and send me a complimentary copy of SOUND METHOD FOR LEARNING THE CODE.

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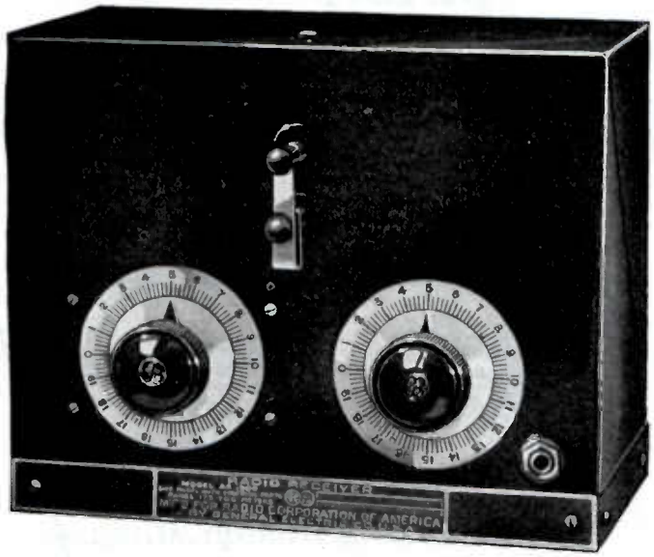

THE set meets the de
wishes to start with
and later to pass on to
and amplification.

RADIO RECEIVER MODEL AR - 1300 is a new single-circuit tuner, incorporating unusual features of design, which makes it ideal for the broadcast enthusiast.

The unit can be used for crystal detector reception, and when so used it is a complete receiver. Simply plug in at the telephone jack, adjust the detector crystals, tune in, and the instrument is ready. Only two tuning operations are required.

AR - 1300 can also be used in connection with the vacuum tube amplifier set Model AA - 1400 (see opposite page). When so used the crystal detector is switched off and the signal amplification controlled by regeneration.

Signals are received over the wave length band of 180-700 meters. This meets the requirements of present-day broadcasting.

Price of Radio Receiver Model AR - 1300 . . . **$50.00**

Here we see Radio Receiver AR - 1300 and detector amplifier AA - 1400 combined in an ideal set for the home. Both sets are enclosed in metal EZKASE so that they are effectively shielded from the undesirable capacity effects of

Radio Corporation of America

WORLD WIDE WIRELESS

Sales Department, Suite 1801
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Most Versatile of Receivers
Detection with the Same Set

mand of the novice who
a simple crystal detector
vacuum tube detection

the operator's body. These two radio units are General Electric products. The price of the units as here combined is $125.00 (antenna, tubes and batteries not included). See them at your nearest radio dealer.

DETECTOR AMPLIFIER MODEL AA - 1400 is a compact, easily operated amplifier unit. It consists of a vacuum tube detector and two stages of audio-frequency amplification. To increase the strength of broadcasted concerts, beyond the possibilities of simple crystal detection, use it with radio receiver Model AR - 1300.

The three vacuum tubes employed in Model AA - 1400 (a detector and two stages of amplification) are furnished with separate rheostats. Thus the operator is enabled to control very closely, the strength of incoming entertainment.

The left-hand telephone jack plugs in only on the detector tube. The central jack furnishes detection and one stage of audio-frequency amplification. The right-hand jack gives maximum amplification, i. e. detection with two stages of amplification.

A special arrangement incorporated in this amplifier practically eliminates distortion of music when Model AA - 1400 is used.

Price, Detector Amplifier, Model AA - 1400 (without tubes) ***$75.00***

Radio WORLD WIDE WIRELESS **Corporation of America**

Sales Department, Suite 1801
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Amateur Radio Stations of the United States

Supplementary List brought up-to-date from May WIRELESS AGE

First District

1 CTL Chester W. Hill, Kent Marsh Road.....Dover, N.H.
1 CTM Clinton F. Hanson .....East Walpole, Mass.
1 CTN Louis W. Stevens, 43 Pleasant St.....Marlboro, Mass.
1 CTO Oscar J. Ambre, 102 Nilsson St.....Brockton, Mass.
1 CTP Nathaniel L. Mower, 11 Forest Ave...Auburn, Maine
1 CTQ Daniel E. White, 12 Park St.....Newport, R.I.
1 CTR Fred'k W. Gately, Newfield St., No. Chelmsford, Mass.
1 CTS Francis P. Carney, 3 Maiden St.....Boston, Mass.
1 CTT William F. Health, 207 Brock St., New Bedford, Mass.
1 CTU Fred P. Werder, 15 Puritan Rd., Swampscott, Mass.
1 CTV Walter G. Thurston, Alston St.....Lynn, Mass.
1 CTW M. A. Gordon, 1156 Washington St., So. Braintree, Mass.
1 CTX Maxwell Cohen.....Montville, Conn.
1 CTY Robert C. Higgy, 40 E. Mansfield St., Hartford, Conn.
1 CTZ David Hertel, Jr., Library St.....New Haven, Conn.
1 CUA Harold E. Morse, 293 Hamilton St., Swampscott, Mass.
1 CUB Merle L. Towle, 53 Union St.....Auburn, Maine
1 CUC Chester L. N. Emerson, 14 Goddard St., Webster, Mass.
1 CUD Lyman A. Ryan, Jr., Acton St., So. Chesterfield, Mass.
1 CUE Wesley R. M. Millett, Sanford St., 300 Chilmark St., Mass.
1 CUF Perley H. Douglas, Taylor Ave., Buzzards Bay, Mass.
1 CUG Alan W. Hutchins, 28 Locke St.....Amesbu, Conn.
1 CUH Wolfert S. Atwood, 78 Howard Ave...New Haven, Conn.
1 CUI Raymond G. Kitch, 12 Gay St., So. Chelmsford, Mass.
1 CUJ George A. Carr, 231 Pleasant St.....Brockton, Mass.
1 CUK John W. Packard, 1442 Washington St., Canton, Mass.
1 CUL Joseph Travis, 3 Gifford St.....New Bedford, Mass.
1 CUM Walter Somerveld, 170 River St.....Greenfield, Mass.
1 CUN Harold R. Fredericks, 11 Hope St...Pawtucket, R.I.
1 CUO Walter E. Berger, 3191 Main St.....Stratford, Conn.
1 CUP Herbert Newman, 21 Cameron St.....Worcester, Mass.
1 CUQ Oswald H. Kandetzke, 2 Washington St., Milford, Conn.
1 CUR Edward F. Gaudet, 7 Maxwell St.....Beth, Maine
1 CUS Felix W. Stubbs, 232 Orchard Ave...Bridgeport, Conn.
1 CUT H. S. Barnett, R. 903 Manton Ave...Providence, R.I.

RE-ISSUED CALLS

1 AN Chelmsford High School, Billerica Road
Chelmsford, Mass.
1 AP O. A. Korrel, Jr., 42 Prospect St. Thompsonville, Conn.
1 AQ Coal Johnson, Fort Williams.....Portland, Maine
1 AV Alfred Teachman, 757 Gano St.....Woonsocket, R.I.
1 AY Elmer Branch .....West Mystic, Conn.
1 BD George Hill, 3 Orange St.....Williamsport, Mass.
1 BL W. Burr O'Connor, Jr., 136 Grant St.....Bangor, Maine
1 BN William A. Jerome, 67 Day St.....Amesbu, Conn.
1 BQ Myron O. Miller, Oneida Ave.....New Canaan, Conn.
1 BR George A. Crafts, 20 Poplar St.....Bangor, Maine
1 BX Lester A. Cushman, 13 Highland Ave., So. Paris, Me.
1 BZ Clinton C. Pickett, 100 Ocean St., So. Portland, Me.
1 CD Louis S. Isbell, Elm St.....North Anson, Me.
1 CE Edward S. Watkins, 29 Hillside Ave...Waterbury, Conn.
1 CL Charles A. Smith, 235 Preble St., So. Portland, Me.
1 CN Raymond P. Griswold, 166 Webster Av., Providence, R.I.
1 CR Clarence F. Hall, 44 Washington St., New London, Conn.
1 CT Harold G. Corbin, 242 Church St.....Keene, N.H.
1 DB Lewis P. Tabor, 103 East St., East Bridgewater, Mass.
1 DC Tabor Academy Radio Club, Spring St., Marion, Mass.
1 DI John W. Porter .....Georgetown, Conn.
1 DQ J. D. MacGregor, Jr., 52 Pleasant St., Stamford, Conn.
1 DT James F. White, 111 Lexington St., East Boston, Mass.
1 DX Frank A. Arsenault, 287 Center St.....Bath, Me.
1 EA Alexander B. Johnson, 19 Alsy St., Providence, R.I.
1 ED Henry M. Armbrust, Box 42.....Jamestown, R.I.
1 EF Alston M. Wheelden, 165 State St.....Ellsworth, Me.
1 EJ Peter A. Marfiotte, 6 Fairmale Ave...Providence, R.I.
1 EL Dwight H. H. Smith, 140 Oak St.....Lewiston, Me.
1 EQ George R. Cann, 90 Mechanic St...Danielson, Conn.
1 FN Forrest L. Adams, Taft's Flat.....Hartford, Vt.
1 FU Elmer Rosen, 171 Beechwood Ave...Bridgeport, Conn.
1 FO Albert M. Hunt, 14 Chagrenill Ter., Newtonville, Mass.
1 FX James E. Thayer, 83 No. Main St., Farmington, N.H.
1 GA George A. Hinckley, 121 Grant St.....Bangor, Me.
1 GD Bennett B. Gardner, 37 Day Ave.....Westfield, Mass.
1 GK Harry C. Gifford, 8 Lincoln St.....No. Easton, Mass.
1 GF Eugene J. Callahan, 66 Centre St.....No Easton, Mass.
1 GG Robert H. Sproul, Amherst St.....So. Hamilton, Mass.
1 GL Carroll B. Sawyer, 11 Stark St.....Manchester, N.H.
1 HE Walter A. Rattlee, 4 Horsan St.....Stoneham, Mass.
1 HP S. M. Humphrey, 12 Humphrey St., Swampscott, Mass.
1 HX Charles L. Yeaton, 6 1/2 Hutman St.....Beverly, Mass.
1 IX Angus M. MacNeil, 120 James St.....Somerville, Mass.
1 IZ Fred S. Kerner, 11 Madison Ave.....Beverly, Mass.
1 KO Harold L. Greene, Winter St.....West Hanover, Mass.
1 LB Walter M. Conley, 536 Gorham St.....Lowell, Mass.
1 LW Albert E. Mertrud, 154 Howard St.....Lowell, Mass.
1 NO Carleton F. Wright, "Bayeastr".....Plymouth, Mass.
1 NU Ernest C. Resnick, Lake Lane.....Kittery, Me.
1 OH Charles W. Gamage, 94 Hall St.....Lynn, Mass.
1 AJD Ralph E. Pierce, 128 So. Spooner St., Plymouth, Mass.
1 AJQ Harry Simpson, 214 Church St.....New Bedford, Mass.
1 AQS Robert E. Lesiak, Jr., 209 Yantic St., Norwich, Conn.
1 ARK Chester W. Ward, 2163 Cranston St., Cranston, R.I.
1 ATK Robert E. Leadlich, 77 Park St.....Lynn, Mass.
1 BFS Dana B. Hinckley, 510 State St.....Hanover, Me.
1 BGF Arthur Houlihan, 3 Windham Ave.....Ansonia, Conn.
1 BZB John K. Dartlee, 94 Market St.....Norwood, Mass.
1 BXV Hugh S. MacDougall, 24 Mohawk St.....No Adams, Mass.
1 CWL Irving F. Grant.....Sangerville, Me.
1 CXH Harold L. Johnson, 20 Washington St.....Malden, Mass.

CHANGE OF ADDRESS

1 MH Charles V. Clark, 7 Riverview Ave.....Danvers, Mass.
1 MF William H. Cunningham, 27 Linwood Ave., Melrose, Mass.
1 AAZ C. Pendergrast, Jr., 441 Huntington Ave. Boston, Mass.
1 AHD Willard G. Eastman, 24 Cobb Road.....Bath, Me.
1 AWI Louis J. Smith, 9 Washington St.....Kensico, Conn.
1 BMK Elliott A. Webb, The Parker, North Port St., Hanover, N.H.
1 ER Robert P. Hazzard, Jr., 64 Winter St., Gardiner, Me.
1 ET George A. Brown, 13 Prince St.....Pawtucket, R.I.
1 EX Rudolf H. Fowler, 6 Quentin St.....Whitneyville, Conn.
1 FJ Robert F. Potter, 13 Bowles St.....Springfield, Mass.
1 FK R. H. Olson, 652 Newport Ave., So. Attleboro, Mass.
1 GO Everett A. Whitney, 12 Merrill St.....Nashua, N.H.
1 GR Gerard J. Kohler, 54 Niell St.....Rockdale, Mass.
1 GU Hans H. Parrer, 78 Reservoir Ave...Bridgeport, Conn.
1 HJ Matthew Camilla, 61 Steuben St.....Bridgeport, Conn.
1 HM Leon W. Bishop, 10 Irving St.....Boston, Mass.
1 HX (R. L. Northrop, 44 E. Mansfield St...Hartford, Conn. (Lloyd Phelps
1 IB Frank G. Patterson, 18 Capitol St.....Augusta, Me.
1 ID John B. Pass, 69 South Elm St.....Waterbury, Conn.
1 IF Joseph A. Shaughna, Gardner's Lane New London, Conn.
1 IJ Jesse B. Sherman, 87 Hinsdale Ave.....Wheeler, Conn.
1 IK Thomas F. Keane, 36 Center Ave.....Norwalk, Conn.
1 IL Raymond Nyaren, 874 State St.....Springfield, Mass.
1 IO Warne W. Dixon, 69 Rochester St.....Berwick, Me.
1 IP Harold E. Andrews, 29 Pine Hill Road, Berwick, Me.
1 IQ Franklin P. Bonnier, 472 Beach St., West Haven, Conn.
1 IX Lowell Radio Club, 880 Main St.....Lowell, N.H.
1 JE Eugene H. Rogan, 9 Bow St.....Auburn, Mass.
1 JL Frank Garreyra, 3 Columbia St.....Adams, Mass.
1 JM Roy E. Collins, Robbins Drive, West Hartford, Conn.
1 JS William B. Archibald, 24 Gould St.....Newport, R.I.
1 JS George W. Fyler, 104 Greenwood St., New Haven, Conn.
1 KA Paul O. Farnham, 94 Randolph Ave., Waterbury, Conn.
1 KC Frank Lyman, Jr., Fort Hill St., Northampton, Mass.
1 KD Hawthorne Dennison, R. F. D. No. 2, Redding, Conn.
1 KN Fred B. Gruhr, 1063 Maple St.....Holyoke, Mass.
1 KQ Reed E. Broughton, 93 Concord St.....Portland, Me.
1 KT Ralph C. Thompson, 76 Osborne St.....Salem, Mass.
1 KV Winfred Y. Dunbier, Newfield St., Middletown, Conn.
1 KX Richard E. Chase, Pequaket Trail...West Buxton, Me.
1 LA Howard H. Howe, 29 Bond St.....Springfield, Vt.
1 LN George W. Kenerson Cor. 72 Temple St., Lowell, Mass.
1 LQ R. E. McAviney, 169 Columbus Ave., New Haven, Conn.
1 LT Chas. H. Peterson, 10 Chapel St.....Yarmouthville, Me.
1 MC Bernard M. Stevens, 2225 Union St., Manchester, N.H.
1 ME Kenneth A. Clement, 15 Parker St.....Holyoke, Mass.
1 MG Louis P. Aschbee, 2 Forest St., Williamansett, Mass.
1 MM Walton F. Lewis, 1 Astmore Road, Worcester, Mass.
1 MS Whitney M. Hanson .....Walnut Hill, Me.
1 MV Elliott H. Nagle, 3 Milk St.....Salem, Mass.
1 MW Francis F. Donahue, 60 Green St.....Worcester, Mass.
1 MT Frank W. Bell, 115 South Broad St., Wenfield, Mass.
1 NA Geoffrey K. Warburton, 21 Walker Ave., Allendale, R.I.
1 NC Emile H. Aubin, 164 Rodman Ave., Pawtucket, R.I.
1 ND Bertrand F. Lovejoy, 21 Hicks St.....Lewiston, Me.
1 NJ Charles T. Wilson, 25 Millett Rd., Swampscott, Mass.
1 NQ Winthrop N. Hodges, 237 Naland St.....Naland, Mass.
1 NW Franklin K. Lamb, 4 Tower Place...Danbury, Conn.
1 OA Charles L. Gardiner, 334 School St., Waterman, Mass.
1 OB Richard E. Stevens, 54 Vernon St., Brookline, Mass.
1 OF Frederick T. Van Buren, 3rd.....East Bloe Hill, Me.
1 OG Carleton A. Ayers, Pierce St.....E. Greenwich, R.I.
1 OO Edward H. Betts, 24 Pleasant St.....Stamford, Conn.
1 OQ William C. Derry, 157 Beacon Hill Ave., Lynn, Mass.
1 OR Plymouth Radio Club, 130 Water St., Plymouth, Mass.
1 OU Hugh Lemle, 31 Gardner's Lane.....Ansonia, Conn.
1 OV John F. Lamgnald, 87 Phillips Ave., Beaverdell, Mass.
1 OX Harry G. Aldee, 37 Normal Ave.....Brockton, Mass.
1 OY John W. Davidson, 286 Ash St.....Brockton, Mass.
1 PA Charles A. Monaghan, 107 Wilcox St...Providence, R.I.
1 PH David Ericson, 10 Wiggin St.....Concord, N.H.
1 PJ Albert E. Cosier, 209 Broadway.....Everett, Mass.
1 PK Harold H. Wish, 142 Sherman St.....Portland, Me.
1 PN Harbor Electric Mfg Co.....So. Attleboro, Mass.
1 PP F. D. Merrill, Jr., 50 Harrison Ave., Beech Bluff, Mass
1 PQ Ralph W. Monorch, 31 Dell Ave.....Hyde Park, Mass.
1 QA Henry A. Barnard, 9 Saratoga St., East Boston, Mass.
1 QH Ross M. Cunningham, 28 Buckingham St., Cambridge, Mass.
1 QH Herbert M. Hammett, 4 Blue Hill Ave., Roxbury, Mass.
1 QI Ellery E. Estes, 1191 Main St.....Brockton, Mass.
1 QJ Clifford L. Rogers, 43 Orient St.....Malden, Mass.
1 QL John F. LeBlanc, 14 Ashley St., Jamaica Plain, Mass.
1 QN H. M. Bascom, 170 Paquena Hill, Bridgeport, Conn.
1 QV John H. Francis, 13 East Spring St.....Avon, Mass.
1 RA John H. Breslin, 61 Hancock St.....Somerville, Mass.
1 RQ Earl W. Clark, 51 Pond St.....Lynn, Mass.
1 RT Talcott M. Banks, Jr., Second Cliff.....Scituate, Mass.
1 RZ Howard K. Cranstead, 109 Green St.....Melrose, Mass.
1 SH Otis Prescott Davis, 124 Pearl St.....Somerville, Mass.
1 TG Gordon C. Smith, 37 Mason St.....Salem, Mass.
1 TH Robert S. Pride, 130 Hudson St.....Somerville, Mass.
1 UP Madelyn L. Meade, 202 North Ave., Rockland, Mass.
1 UV Wendell L. Wright, 114 Kasunga St., Rockland, Mass.
1 UW Ralph L. Cutler, 31 Avon St.....Melrose, Mass.
1 APZ Harold L. Staples, 1250 Chapel St...New Haven, Conn.
1 AQV (George Cullen, 27 Jenney St....New Bedford, Mass (Harold Crane

CHANGE OF ADDRESS

1 ARS Harold G. Carkin, 119 St. Botolph St...Boston, Mass.
1 BBZ Adrian H. Van Kea, 49 Blake St.....Lewiston, Me.
1 BEA Joseph D. Riley, 285 Washington St., Somerville, Mass.
1 BFP Paul E. Corbille, 85 Park Ave.....Rutland, Vt.
1 BDQ Berchtlin Radio Club.....Lakeville, Conn.
1 CQA Frank H. Geier, 264 Wood St.....Waterbury, Conn.
1 CPU John W. Fleet, 10 Cambridge St.....Lowell, Mass.

CHANGE OF ADDRESS

1 EM Arthur D. Moulton, 84 Howard St.....Reading, Mass.
1 PS Harold F. Southwick, Prospect St.....Swansea, Mass.
1 AGJ P. F. Braley, 27 Cameron Ave., No. Cambridge, Mass
1 AIP Sidney B. Blake, 9 Spruce St.....Westerly, R.I.
1 AJW Hankon Ross, Salisbury St.....Holden, Mass.
1 AKB Peter T. Cucevalas, 451 Bates St.....Lynn, Mass.
1 ARC Merrill C. Hubert, 35 Pearl St.....Quincy, Mass.
1 ALV R. M. Hood, Weathers State Hosp. Weathers, Mass.
1 AMH Harold J. Morse, 48 Bolton St.....Hartford, Conn.
1 AOD John D. Lawler, 1 Spruance St.....New Bedford, Mass.
1 AOL Verner A. Hendrickson, Boston St., Nichendale, Conn.
1 ATT Nathan Hale, 875 State St.....New Haven, Conn.
1 ATX Alton B. Carney, 110 Division St...Pawtucket, R.I.
1 AVG John T. Davenport, 71 Delcef St.....Quincy, Mass.
1 BKK Leon E. Felker, 34 No. Belfast Ave., Augusta, Me.
1 BOY Henry C. Aspinall, 10 Cumberland St.....Ayer, Mass.
1 BRL Charles W. Wright, 43 Alanson Rd., Bridgeport, Conn.

Second District

2 CHD George Patterson, Main St.....Bergenfield, N.J.
2 CHE Westchester Amateur Radio Assn., Ed. Kerrigan, Opr. 92 W. Boston Post Rd., Mamaroneck, N.Y.
2 CHF Hyman Wallis, 776 De Kalb Ave., Brooklyn, N.Y.
2 CHG Lee H. Hirschhorn, Columbus Ave...Palisade Pk, N.J.
2 CHH Louis Kingdon Gebbie, 381 Oakland Ave., W. New Brighton, N.Y.
2 CHI M. J. Grainger, Deal Beach Ave., Allenhurst, N.J.
2 CHJ Arthur Otto Meurer, 4 Ash St.....Flushing, N.Y.
2 CHK Harold Sachs, 170 W. 73rd St.....New York City
2 CHL James B. Strang, 50 St. Paul Pl....Brooklyn, N.Y.
2 CHM H. E. Kaltenauer, 735 E. 166th St...N.Y.C. (Bronx)
2 CHN Edwin J. Dyer, 57 Hemlock Ave....Brooklyn, N.Y.
2 CHO Langley W. Isom, 110 Stewart Ave...Garden City, L.I.
2 CHP John C. Hayden, 1900 Daly Ave....N.Y.C. (Bronx)
2 CHQ Stanley A. Hall, 600 E. 18th St.....Brooklyn, N.Y.
2 CHR Stuart Phelps Cornell, 19 Bayley Ave...Yonkers, N.Y.
2 CHS Maurice Hecht, 28 St. Nicholas Pl....New York City
2 CHT Harold Sears, 630 E. 9th St.....Brooklyn, N.Y.
2 CHU R. Du Puy, 109 E. Tremont Ave., New York (Bronx)
2 CHV Pitney E. Oakland, Jr., 336 Moore Ave., Leonia, N.J.
2 CHW Edward John Krause, 129 E. 82nd Ave...New York City
2 CHX William J. Mentz, 307 W. 9th Ave....Roselle, N.J.
2 CHY W. A. Schmitt, 227 Clermont Ave...Brooklyn, N.Y.
2 CHZ William H. Slater, 81 Canal St.....Port Jervis, N.Y.
2 CIA George N. Ashley, 87 Spring St.....Chatham, N.Y.
2 CIB Leonard Lynch .....Newark, N.Y.
2 CIC Lester Maxwell McCoy, Hillside Ave., Pennhill, N.Y.
2 CID Fred Weissleimer, Millstown Road, South River, N.J.
2 CIE Chester Walbert, 672 Grand Ave...Schenectady, N.Y.
2 CIF Robert Purdy Kramers, Parker St.....Mamaroneck, N.J.
2 CIG Charles E. Kidd, Mahwah Road.....Mahwah, N.J.
2 CIH Charles F. Weaver, 64 Abbott Ave...Ocean Grove, N.J.
2 CII Stanton McDora, 95 Main Ave.....Ocean Grove, N.J.
2 CIJ H. D. Coffman .....Delmar, N.J.
2 CIK Nathan W. Layton, Bond Ave., Farmingdale, N.J.
2 CIL W. K. Baker, P. O. Box 283, Smalley Ave., Dugeller, N.J.
2 CIM Sidney Lewis Winslow, 441 Southern Blvd., Bronx, N.Y.
2 CIN Francis Cunsolin, 923 Malone St.....West Hoboken, N.J.
2 CIO Morris Harry Mogerman, 23 Cypress St.....Newark, N.J.
2 CIP James Edward Ward, Runsey Road.....Runsey, N.J.
2 CIQ Chelsea Radio Club, 436 W. 27th St....New York City
A. Herbert, Opr.
2 CIR Wireless Tel. Co. of Hudson County, C. F. Burger, Opr. 997 Bergen Ave., Jersey City, N.J.
2 CIS W. MacDonald, 128 De Hart St., Mariners Harbor, N.Y.
2 CIT Henry J. Yack, 695 E. 137th St.....Bronx, N.Y.
2 CIU Daniel Monsierdz, 1781 Anthony Ave.....Bronx, N.Y.
2 CIV K. Y. University Radio Club, Morris Press, Opr. 162nd St. and University Ave., New York City
2 CIW Nelson Shaw Beal, 10405 Fulton St., Jamaica, N.Y.
2 CIX Radio Club of Patterson U. S. R. C. Hennemamp, Opr. Hamilton St., Patterson, N.J.
2 CIY Robert Pennelli, 94 Bergen Ave.....Jersey City, N.J.
2 CIZ P. D. Baldwin, 161 St. Marks Pl...New Brighton, N.Y.

2 CJA A. E. Hopper, 103 Arlington Ave...Hawthorne, N.J.
2 CJB Morton B. Deems, 47 W. 73rd St.....New York City
2 CJC Frank E. Risinger, 31 Fresno Pl.....Corona, N.Y.
2 CJD F. G. Merritt, 117 Willow Ave.....Hoboken, N.J.
2 CJE Frank T. Rhea, Jr.....Malba, Long Island, N.Y.
2 CJF Arthur K. Iber, 610 Maple St.....Elizabeth, N.J.
2 CJG William Odlewartin, 18 Hackett St.....Corona, N.Y.
2 CJH Michael Levine, 279 Longwood Ave.....Bronx, N.Y.
2 CJI John Schoetanayer, 21 Trimble Ave...Westfield, N.Y.
2 CJJ Ludwig Bone, 1229 Franklin Ave.....Bronx, N.Y.
2 CJK Frank B. Keller, 84 Elm St.....Summit, N.J.
2 CJL W. C. Smith, Short Hills Ave.....Millburn, N.J.
2 CJM Samuel L. Barriette, 319 Macon St., Brooklyn, N.Y.
2 CJN Fayette S. Simmons, 264 Parker St., Newark, N.J.
2 CJO Charles A. Gentman, 236 Elbert St., Bressler, N.Y.
2 CJP Rayvon May, 62 Jefferson Ave....Jersey City, N.J.
2 CJQ Harold R. Elliott, 10 Agnes St.....Bellerille, N.J.
2 CJR Benjamin Oliver, 535 13th St.....Brooklyn, N.Y.
2 CJS O. M. Smith, Jr., 1308 Glenwood Rd. Bklyn, N.Y.
2 CJT E. Wagner, Jr., 525 Avenue St....West Hoboken, N.J.
2 CJU Paul G. Watson, 5 Clifton Pl.....Brooklyn, N.Y.
2 CJV William H. Bennett, 253 92nd St....Brooklyn, N.Y.
2 CJW Milton J. Jacobson, 120 W. 90th St....New York City
2 CJX S. J. Dudley, 21 Preston St., Hillcrest Park, N.J.
2 CJY Thos. G. Kearn, 140 Bowers St.....Jersey City, N.J.
2 CJZ Fred C. Dilasky, 170 Van Buren St....Brooklyn, N.Y.
2 CKA C. Oliver Rezenor, 4 Tuxedo Ave....Hawthorne, N.J.
2 CKB Joseph C. Smith, 548 86th St.....Brooklyn, N.Y.
2 CKC William F. Trute, 48 Quincy St.....Passaic, N.J.
2 CKD Karl B. Hoffman, 5 Hamsalt Ave.....Albany, N.Y.
2 CKE John M. Frith, Central Ave....Spring Valley, N.Y.
2 CKF W. J. Hopson, 5 Hudson Ave...Green Island, N.Y.
2 CKG D. D. Hancock, Newman Stas Ave., Red Bank, N.J.
2 CKH H. Kutner, Jr., 29 Washington St...South River, N.J.
2 CKI Max M. Vermont, 1201 State St., Schenectady, N.Y.
2 CKJ Harold R. Graham .....Spring Valley, N.Y.
2 CKK Peter H. Sharry, 183 Pains St...Green Island, N.Y.
2 CKL H. M. Warner, Long Hill Rd.....Great Notch, N.J.
2 CKM Irving N. Herman, 171 Elm St.....Albany, N.Y.
2 CKN R. M. Francisco, 12 No. Jay St...Schenectady, N.Y.
2 CKO DeVere M. Greatlee, 21 Duane Ave., Schenectady, N.Y.
2 CKP A. Yonnum, 221 Harrison Ave., New Brunswick, N.J.
2 CKQ F. Anzalone, Box 85, R.F.D. No. 4...Highland, N.Y.
2 CKR F. F. Hallock, 20 Elliott Ave....Schenectady, N.Y.
2 CKS Karle Bennett, 317 Bangs Ave....Asbury Park, N.J.
2 CKT Floyd F. VanPelt, 211 Bernard St...Tottenville, N.Y.
2 CKU William B. Hurley, 159 19th St....Brooklyn, N.Y.
2 CKV Joseph B. Cohen, 49 Forest Ave.....Verona, N.J.
2 CKW Joseph Bonanno, 23 20th St.....Corona, N.Y.
2 CKX Natale Donato, 23 20th St.....Corona, N.Y.
2 CKY Harold Van Winkle, 424 W. 144th St...New York City
2 CKZ Henry Peck Barker, 1963 E. 9th St...Brooklyn, N.Y.

2 CLA Dr. L. J. Dana, 660 E. 19th St.....Brooklyn, N.Y.
2 CLB James Dreyfus, 1516 59th St.....Brooklyn, N.Y.
2 CLC George H. Mellain, 245 W. 53rd St...New York City
2 CLD Henry G. Wright, 115 Mountain Ave...Westfield, N.J.
2 CLE Stuyvesant Radio Club, Nesaw Gray, Opr. 345 E. 15th St., New York City
2 CLF H. W. Hitchcock, 3304 Amber Rd...Great Kills, N.Y.
2 CLG Kenneth T. Hill, 95 Elm St.....Flushing, N.Y.
2 CLH Phillip Hart, 113 Neville St.....Perth Amboy, N.J.
2 CLI Rae Wimpfheimer, 416 W. 129th St., New York City
2 CLJ M. A. Williams, 323 Lincoln St.....Flushing, N.Y.
2 CLK Henry Fischerstadt, 69 Hudson Pl., Weehawken, N.J.
2 CLL John G. Plantinga .....Hoboken, N.J.
2 CLM James Raglin, 113 E. 126th St.....New York City
2 CLN Miss Sarah, 1745 Bathgate Ave.....New York City

2 CLO Adam Beelaich, 179 Rockaway Rd.....Jamaica, N. Y.
2 CLP A. Vinciprone, 129 Jer. Turnpike, Floral Park, N. Y.
2 CLQ I. D. Perry, 48 No. Parkway.....East Orange, N. J.
2 CLR John E. Nelson, Jr., 161 W. 68th St...New York City
2 CLS F. W. Grenabach, 145 W. 122nd St...New York City
2 CLT A. F. Keers, 240 Emerson P.....Brooklyn, N. Y.
2 CLU A. C. Wedgeworth, 166 Warwick St...Brooklyn, N. Y.
2 CLV H. A. Lowerison, 134 Mercer St....Jersey City, N. J.
2 CLW H. N. Steffens, 160 Warwick St....Brooklyn, N. Y.
2 CLX Jacob Schmidt, 663 13th St.....West New York, N. J.
2 CLY Arthur Weyberg, 461 Union Ave.....New York City
2 CLZ C. R. Lewis, Jr., 1500 E. 19th St....Brooklyn, N. Y.
2 CMA Ernest D. Renard, 301 7th St.....Brooklyn, N. Y.
2 CMB W. G. Baldwin, 100 Waller Ave...White Plains, N. Y.
2 CMC J. T. Underwood, 1250 E. 22nd St...Brooklyn, N. Y.
2 CMD Samuel Colman, Jr., 320 Central Pk West, N. Y. C.
2 CME Henry F. Burrows, 361 4th St.....Brooklyn, N. Y.
2 CMF A. J. Geyer, Jr., 102-19 91st St...Richd Hill, N. Y.
2 CMG L. A. Munson, 92nd St. & North River, New York City (Hudson River Yacht Club)
2 CMH 20th Century Wireless Tel. Corp. (Wm. Chinn, Opr.) 2 & 4 Mamaroneck St., White Plains, N. Y.
2 CMI George Moog, 3703 16th Ave.....Brooklyn, N. Y.
2 CMJ G. W. Bailey, 137 Onondaga Circle....New Rochelle, N. Y.
2 CMK William Seebach, Rockaway Rd....Grant Park, N. Y.
2 CML Harry M. Rhodi, 604 Park Ave.....Elizabeth, N. J.
2 CMM A. C. Kash, 6 Round View Drive, Lawrence, N. Y.
2 CMN Chas. N. Mandery.....East Northport, N. Y.
2 CMO H. R. Gass, 862 Howard Ave....Orpsum Hill, N. Y.
2 CMP Vincent Cassell, 103 Leonard St.....Brooklyn, N. Y.
2 CMQ Werner P. Uhl, 332 Murray St.....Elizabeth, N. J.

CHANGE OF ADDRESS AND RE-ASSIGNMENT

2 KA J. W. Swanson, 1114 Grandview Ave...Wyckoff, N. J.
2 ATT H. S. Connolly, 292 Whitford Ave....Nutley, N. J.
2 BQT W. A. Wilson, 103-19 122nd St...Richmond Hill, N. Y.
2 ACK W. F. Bingham, 134 Manhattan Pl....Manasquan, N. J.
2 YN Frank M. Rogers, 650 52nd St.....Brooklyn, N. Y.
2 LK Emory H. L. Lee, 211 60th St.....Brooklyn, N. Y.
2 DK Wm. H. Chinn, 10 Linda Ave...White Plains, N. Y.
2 ASP H. L. Chute, 7 Trinity Pl.....Montclair, N. J.
2 BGW D. J. McMonagle, 849 Rogers Ave...Brooklyn, N. Y.
2 BV Erwin Geller, 7 Oneida St.....Schenectady, N. Y.
2 EH E. Malcolm Williams, Box 573.....Richmond, N. Y.
2 DD Julius Schmidt, 232-236 Broadway, Schenectady, N. Y.
2 DJ Edwin H. Lant, Wagner St.....Schenectady, N. Y.
2 BTY Edgar Radio School, Carl R. Dahlgren, Opr.
60 Hudson St., Hoboken, N. J.
2 AAC Arlington Hall, 12 Radford St.....Yonkers, N. Y.
2 BWT Erik W. Pearson, 10 Broad St.....Fairview, N. J.
2 NW H. S. Amrhein, 1450 Flushing Ave...Brooklyn, N. Y.
2 ACQ Robert Mura, Bellaire Road.....Rhinecrand, N. J.
2 BZV W. L. Ewart, Lyon Ave. & Humphrey St.,
E. Elmhurst, N. Y.
2 ADS C. E. Dicke, Highland Way cor. Knollwood Pl.,
Short Hills, N. J.
2 QN Hugo L. Esthers, 131 Underhill Ave...Brooklyn, N. Y.
2 BYR John J. Guarino, 60 W. Grove St....Lynbrook, N. Y.
2 CCL Elmer E. Hueber, 85 Johnson Ave....Newark, N. J.
2 ACW H. L. Brooks, 267 Parkwood Blvd...Schenectady, N. Y.
2 FD John Di Biasi, 33 Sinclair Ave.....Flushing, N. Y.
2 PU Joseph F. Lally, 118 26th St.....Ocstenberg, N. J.
2 HH H. S. Schanck, 132 Maple Pl.....Keyport, N. J.
2 BQ F. Doscher, 144 Fisher Ave....White Plains, N. Y.
2 DC John Stolen, 92 Grand St.....Garfield, N. J.
2 ATL Leo Robert Oulvin, 40 Park St.....Jersey City, N. J.
2 JJ M. J. Bergin, 10154 116th St....Richmond Hill, N. Y.
2 BJL R. W. Arbenman, P. O. Box 136, Rear Ridge Rd.,
Pleasantville, N. Y.
2 AGH Howard E. Bandle, 10 Park Ave.....Caldwell, N. J.
2 BBN John Wilcox, 324 Division Ave.....Carlstadt, N. J.
2 AIS Stevens Radio Club, Stevens Institute of Technology, (Baldwin Guild, Opr.) 521 River St., Hoboken, N. J.
2 WH H. L. Bogardus, 218 Virginia Ave., Jersey City, N. J.

Third District

3 BQA Elmer F. Montange, 6017 Pine Rd....Fox Chase, Pa.
3 BQB H. A. Bradbright, 127 E. Willard St....Phila, Pa.
3 BQC Thomas F. Hounsell, 23 58th St.....Phila, Pa.
3 BQD William A. Ryan, 812 9th St., N. W....Wash., D. C.
3 BQE Frank Stolvagen, Jr., 6317 N. 11th St....Phila, Pa.
3 BQF George F. Warren, Brexbaun Ave.....Margella, N. J.
3 BQG George H. Eckert, 1805 E. Federal St....Balto., Md.
3 BQH August K. Erkels, 26 Alice Ave.....Balto., Md.
3 BQI Edward H. Bimmel, 2027 N. 11th St.....Phila., Pa.
3 BQJ Lansdowne Radio Assn., 14 N. Wyombo Ave.,
Lansdowne, Pa.
3 BQK Lester F. Garve, 81 Bank St.....Easton, Pa.
3 BQL John F. Lauer, Jr., 5600 Cobbs Creek Pkwy, Phila., Pa.
3 BQM Earle M. Fitzkee, 2331 Montgomery Ave., Phila., Pa.
3 BQN Ralph G. Weitzel, 2704 Montgomery Ave., Phila., Pa.
3 BQO Albert King, 209 Rd. Mary St.....Burlington, N. J.
3 BQP Henry M. Conrad, 433 S. 62nd St.....Phila, Pa.
3 BQQ John Rasmussen, 3910 Partridge St....Trenton, N. J.
3 BQR Merlin K. Thompson, 45 Third St.....Steelton, Pa.
3 BQS George K. Vanier, 229 South 4th St....Steelton, Pa.
3 BQT W. F. Smith, Jr., 630 Bellevue Ave., Trenton, N. J.
3 BQU E. R. Poulin, 7 N. Florida Ave., Atlantic City, N. J.
3 BQV Henry S. Palmer, 610 S. Prince St....Lancaster, Pa.
3 BQW H. H. Karmshach, Jr., 407 State St., Trenton, N. J.
3 BQX Henry Weinberg, 3468 Hawthorne Ave., Richmond, Va.
3 BQY Charles A. Harter, Hill Second.....Perusburg, Pa.
3 BQZ Charles J. Bachman, Broad St.....Malvern, Pa.

3 BRA William H. Rushworth, Broad St.....Malvern, Pa.
3 BRB Robert F. Ligan, 509 Second St.....Steelton, Pa.
3 BRC George C. Scott, Jr., Cary St. Road, Richmond, Va.
3 BRD David H. Opperman, Market St.....Camp Hill, Pa.
3 BRE W. D. Conover, 3723 Ventnor St., Atlantic City, N. J.
3 BRF R. S. Williamson, 325 College Ave....Lancaster, Pa.
3 BRG William S. Black, Washington St....Lemoyne, Pa.
3 BRH Stanley Wurz, 138 N. Second St.....Millville, N. J.
3 BRI Charles T. Reed, 1306 Third St.....Harrisburg, Pa.
3 BRJ Frank B. Lancaster, 709 Hudson St....Trenton, N. J.
3 BRK Abraham Bowersoffel, 627 Reily St., Harrisburg, Pa.
3 BRL John L. Wentz, Main St.....Shiremanstown, Pa.
3 BRM Richard H. Brune, 815 Seymour Ave, Trenton, N. J.
3 BRN Vincent Farley.....Malvern, Pa.
3 BRO Everett Axelson, 207 Normal Ave.....Anglesea, N. J.
3 BRP William J. Pearsall, 901 S. 57th St.....Phila, Pa.
3 BRQ Clinton S. Fulton, 713 Ave.....Collingdale, Pa.
3 BRR L. J. Risbon, 3632 W. Cumberland St....Phila, Pa.
3 BRS Samuel Fleischer, 731 E. Union St., Bordentown, N. J.
3 BRT Frank A. Prosser, 622 N. 9th St....Camden, N. J.
3 BRU John C. Gillen, 2322 S. Lee St.....Phila., Pa.
3 BRV C. A. Carstarphen, 709 Fourth Ave...Haddon Hts., N. J.
3 BRW Russell Egert.....Ambulance, Pa.
3 BRX J. A. Billingford, 235 E. Third St.....Media, Pa.
3 BRY H. G. Turbeau, Jr., 1946 Market St.....Phila., Pa.
3 BRZ William T. Betts, Jr., 31 W. Upsal St....Phila., Pa.

3 BSA Camden County Council, BSA, 533 Market St.,
Camden, N. J.
3 BSB Donald J. Detwiler, 1120 Virginia Ave., Wash., D. C.
3 BSC Harry P. Flohr, 1902 N. 11th St.....Phila., Pa.
3 BSD William Tennen, 313 Cherry St.....Trenton, N. J.
3 BSE Clifford S. Nash, 6437 N. Hutchinson St., Phila., Pa.
3 BSF Edward U. Fairmanko, 426 E. 20th St., Chester, Pa.
3 BSG Walter H. Saltze, 115 W. Chelten St....Phila., Pa.
3 BSH John J. Nichols, Mt. Pleasant Ave.....Ambler, Pa.
3 BSI Charles W. Mullen, 6837 Fairmount Ave., Phila., Pa.
3 BSJ Aurelio Taldivia, 3719 Elm Ave.....Balto., Md.
3 BSK F. W. Applegate, 24 Hilbrest St.....Trenton, N. J.
3 BSL John C. K. Reynan.....New Britain, Pa.
3 BSM Mallory Wunder.....Berwyn, Md.
3 BSN John C. Roberts.....Chalfont, Pa.
3 BSO James A. Pearn, 1750 N. Lambert St....Phila., Pa.
3 BSP W. M. T. M. R. Derby, 2721 6th St....Norfolk, Va.
3 BSQ Boy Scouts of America, 24th & West Ave.,
Newport News, Va.
3 BSR Charles H. Kauffman, 1511 9th St.....Reading, Pa.
3 BSS Thomas A. Kellum, 30 Third Ave.....Claymont, Del.
3 BST Leon K. Holland, Pennsylvania Ave.....Bangor, Pa.
3 BSU Harry E. Hantz, 423 Chapel St.....Lebanon, Pa.
3 BSV C. L. Ditchburn, The Cedars, West St....Berlin, Md.
3 BSW L. Burbage Harrison, 211 Main St.....Berlin, Md.
3 BSX William P. Messinger, 12 Seaton St....Steelton, Pa.
3 BSY Herbert Alright, 1903 Front St., N.....Phila, Pa.
3 BSZ Robert George, 1438 N. 40th St.....Phila, Pa.

3 BTA A. C. Whitaker, Jr., 73 No. Pearl St, Bridgeton, N. J.
3 BTB Charles A. Vanlee Veer, Book Road & Poplar
Sharon Hill, Pa.
3 BTC August Wilkening, 6410 Lebanon Ave.....Phila, Pa.
3 BTD Harvey B. Mitchell, 1357 Morris St....Wash., D. C.
3 BTE Thomas P. Stetson, 919 W. Bread St., Quakertown, Pa.
3 BTF W. H. Smith, Jr., 109 W. Kings Hy., Haddonfield, N. J.
3 BTG Arthur J. Gill, 1823 N. 59th St.....Phila, Pa.
3 BTH William E. Rieben, 3439 Cumberland St., Phila., Pa.
3 BTI Russell W. Bry, 1913 N. 17th St.....Phila, Pa.
3 BTJ W. M. Maitland, 1707 Stratford Ave., Melrose Pk, Pa.
3 BTK Joseph K. Reino, 535 S. 42nd St.....Phila, Pa.
3 BTL Paul F. Swartz, 110 Thompson Ave., Audubon, N. J.
3 BTM Albert R. Pettit, 406 N. 6th St.....Camden, N. J.
3 BTN Ernest Kroeger, 1700 Rising Sun Ave., Phila., Pa.
3 BTO John H. Eppinger, 1539 N. 63rd St.....Phila, Pa.
3 BTP Edwin T. Lashey, 2018 Clifmont Ave., Balto, Md.
3 BTQ A. S. Clow, Jr., 52 E. Dela Ave., Pennington, N. J.
3 BTR Richard Doll, 315 Roth Ave.....Hanover, Pa.
3 BTS R. F. Zimmerman, 211 Park St....Waynesboro, Pa.
3 BTT Germantown High School Radio Club, Germantown Ave.
Phila, Pa.
3 BTU William H. Crosby, 4034 Second St.....Phila, Pa.
3 BTV Carl Clure, 705 E. Main St.....Millville, N. J.
3 BTW O. A. Knight, New Cathedral Cemetery, Baltimore, Md.
3 BTX C. L. Moore, 1324 N. 37th St.....Phila, Pa.
3 BTY J. Ray Mowery, Jr., 529 W. Lemon St., Lancaster, Pa.
3 BTZ F. L. Meyers, 256 Atlantic St....Bridgeton, N. J.

3 BUA W. J. Maddox, 30 Franklin St., N. E., Wash., D.C.
3 BUB John J. Mutch, 2721 Fenwick St....Baltimore, Md.
3 BUC Herbert C. Spicer, 611 E. 2nd St....Baltimore, Md.
3 BUD Wm. L. Hamilton, 1400 E. 20th St., Baltimore, Md.
3 BUE Russell B. Pettorf, Wayne Bldg., Waynesboro, Pa.
3 BUF Jas. C. Kline.....Mattawa C. H., Va.
3 BUG Joseph Schember, 2117 N. 9th St.....Phila, Pa.
3 BUH Geo. W. McLaughlin, 1900 N. 30th St....Phila, Pa.
3 BUI Walter J. Hag, 94 Ridgedale Ave., Morristown, N. J.
3 BUJ J. C. Yorio, Jr., Oak Ave....Woodbury Hgts, N. J.
3 BUK Leon Levinthal, 504 Riverside Ave....Trenton, N. J.
3 BUL Thomas F. Olds, 2100 N. 20th St....Richmond, Va.
3 BUM Horace Fletcher, 3010 Cranford St....Phila., Pa.
3 BUN Glenn Hull, 2930 N. 22nd St.....Phila, Pa.
3 BUO Warren B. Talbert, 7034 Hegerman St....Tacony, Pa.
3 BUP Harry R. Sinn, Roosevelt Blvd. & Pitman Sts.,
Bustleton, Phila., Pa.
3 BUQ B. W. Phillips, Jr., 4320 Cedar Ave., W. Phila., Pa.
3 BUR Anderson Offset, 127 Charles St.....Annapolis, Md.
3 BUS W. A. Bregg, 314 New Broadway....Brooklawn, N. J.
3 BUT Eugene C. Brandy, 1701 Catharine St....Phila, Pa.
3 BUU Alfred V. Peter, 1250 S. 53rd St.....Phila, Pa.
3 BUV Edwin Wagner, 216 W. Greenwich St...Bethlehem, Pa.
3 BUW Victor Feinstein, 901 N. 13th St.....Phila., Pa.
3 BUX Kenneth B. Stroud, 1932 Somerset St....Phila., Pa.
3 BUY Lewis E. Knight, 609 Prince St....Alexandria, Va.
3 BUZ Edward G. Peacock, 248 Harper St...Germantown, Pa.

3 BVA Fred Link, 40 Reuter St.....York, Pa.
3 BVB Garland T. Scott, 326 Broad St....Portsmouth, Va.
3 BVC Louis W. Ballou, 110 Florida Ave....Portsmouth, Va.
3 BVD Sherman L. Eaton, 915 Fourth St....Reading, Pa.
3 BVE Howard H. Smith, 1010 N. Park Ave., Baltimore, Md.
3 BVF W. J. Sinatra, Jr., 50 W. Maple Ave, Merchantville, N. J.
3 BVG G. H. Tofel, Jr., 619 S. St. Bernard St., Phila., Pa.
3 BVH Rowe W. Cost, 220 Potomac St....Hagerstown, Md.
3 BVI F. H. Calhoun, 975 Locust Grove, Charlottesville, Va.
3 BVJ V. H. Fager, Jr., 410 N. Second St., Harrisburg, Pa.
3 BVK John Greenes, 413 Franklin St....Hagerstown, Md.
3 BVL T. & P. R. Keck, 1613 Grace St....Richmond, Va.
3 BVM Robert G. Yerex, 2175 E. Lafferty St....Phila, Pa.
3 BVN Haverford College Radio Club, Haverford College, Haverford, Pa.
3 BVO Donald Myers, 5814 "G" St.....Phila, Pa.
3 BVP H. V. Sweeney, 64 Ashland Ave., West Manayunk, Pa.
3 BVQ Homer S. Krenicle, Main St.....Rising Sun, Md.
3 BVR Theodore Leaf, 119 S. 59th St.....Phila, Pa.
3 BVS Charles W. Keegan, 701 Monmouth St., Trenton, N. J.
3 BVT H. Olmstead, 1101 Virginia Ave., S. W., Wash, D. C.
3 BVU Lieut. F. H. Rosenbaum, T-43, Central Ave.,
Camp Meade, Md.
3 BVV J. R. Waugh, Jr., 2200 Arctic Ave....Atlantic City, N. J.
3 BVW A. W. Ward, Jr., 417 Narberth St....Narberth, Pa.
3 BVX William G. Pierce, 34 W. Phil St.....Phila, Pa.
3 BVY Chester Fiark, 643 Sedgwick St.....Phila, Pa.
3 BVZ F. P. Moser, 6029 Quincy St., Germantown, Phila, Pa.

RE-ASSIGNED CALLS

2 DS G. W. K. Shields, 1900 N. 43rd St....W. Phila., Pa.
2 DX G. F. Maitland, Jr., Montgomery Ave....Ardmore, Pa.
2 FF Alfred G. Beck, 629 Royden St.....Camden, N. J.
2 FG Raymond A. Ryder, 2878 Cedar St.....Phila., Pa.
2 GC John F. Williamson, 115 Coulter Ave., Ardmore, Pa.
2 GO Lester F. Schoenfeld, 2137 Diamond St., Phila., Pa.
2 GT Hiram R. Bennett, 63 LaSalle Ave....Norfolk, Va.
2 HA C. Oakford Newman, 6400 Garrison Ave., Balto., Md.
2 HO Eugene S. Gimbel, 1601 Columbia Ave....Phila., Pa.
2 IK R. J. Beacham, Jr., 129 Linwood Ave....Balto., Md.
2 JS M. W. Barrett, Police Headquarters....Norfolk, Va.
2 LW William F. Taylor, 21 Chestnut St....Millville, N. J.
2 MI Lewis K. Covington, Jr., 3632 Hudson St., Phila., Pa.
2 NB Wilbur B. Perine, 1305 "A" St., S. E., Wash., D. C.
2 OH W. Buchman, 102 N. Clinton Ave....Trenton, N. J.
2 OI Horace A. Beale.....Parkesburg, Pa.
2 OL Ronald Rosenbrantz, 3301 Aramingo Ave., Phila., Pa.
2 OO Edward Geyer, 3574 Lancaster Ave....Phila., Pa.
2 OV Boy Scouts, Troop 7, Y. M. C. A. 346 W. Market St.,
York, Pa.
2 OX Paul H. Gibbons, 329 S. Church St., Moorestown, N. J.
2 QZ Emanuel Fuchs, 2313 Clendenin St....Balto., Md.
2 PC Clinton C. Meyers, 1414 McKean St....Phila., Pa.
2 PD Sam H. Levin, 2301 McCulloh St....Balto., Md.
2 PL Stanley G. Plark, 615 W. Sedgwick St....Phila, Pa.
2 PQ Joseph Trundle, 1022 Monroe St., N. E., Wash., D. C.
2 PX Leon Gordon, 5914 Webster St.....Phila., Pa.
2 PZ Earl B. Smith, 219 Rittenhouse St., Wash., D. C.

3 QT James F. McClary, 16 Maple Ave, Flemington, N. J.
3 QQ Irachee C. Blouin, 700 Roosevelt Blvd....Phila., Pa.
3 QT Charles H. Coleman, E. Second Ave., Parkesburg, Pa.
3 QZ Julius L. Grether, 320 Randolph St., Richmond, Va.
3 RB L. C. Quintanilla, 1337 Columbia Rd., Wash., D. C.
3 RM Calman J. Kaminski, 2927 Madison Ave., Balto., Md.
3 RT Adolph Pensel, 1301 W. Lehigh Ave....Phila., Pa.
3 RP John H. Andrews, Lake & Bellona Aves, Govans,
Balto., Md.
3 RQ Robert S. Hall, Charles Lane.....Arlington, Md.
3 RV Continental Electric Co., 903 9th St., N. W.,
Wash., D. C.
3 TF Coleen E. Dyer, Bayou Ave.....Burton, Md.
3 TO Clair L. Wise, 2043 Ave. St.....Phila., Pa.
3 TI John M. Sawyer, Jr., 522 Perry St....Trenton, N. J.
3 TL Kenneth A. Durst, 70 N. West Ave...Bridgeton, N. J.
3 TR George O. Kiler, 717 7th St., S. E....Wash., D. C.
3 TS George S. Abdill, 125 E. Union St., Burlington, N. J.
3 UH Biddle Arthurs, Jr., Alpha Tau Omega House,
Lehigh University, Bethlehem, Pa.
3 UV H. M. Read, Jr., 93 Fairmount Ave., Chatham, N. J.
3 UY H. A. Hastings, 1805 Atlantic Ave...Atlantic City, N. J.
3 VA Roy W. Geiger, 1427 Rowher St.....Phila., Pa.
3 VB Leon Lewis, 643 Green St.....Reading, Pa.
3 VD W. B. Moog, Raritan Rgts U. S. Tower Station, Md.
3 VL J. King, 1237 Hollins St.....Baltimore, Md.
3 VN N. A. Perry, 17 S. Brighton Ave...Atlantic City, N. J.
3 VU Nelson G. Hess, 31 Wilson Ave...No. Plainfield, N. J.
3 VV Frank Tarrell.....Landisville, N. J.
3 VZ C. D. Van Fleet, 207 E. High St...Somerville, N. J.
3 WC Armand Mayer, 1632 Mentor St.....Phila., Pa.
3 WE Jack Sidewater, 1513 St. Bronze Ave....Phila, Pa.
3 WF Charles A. Miller, 605 N. Carey St., Balto., Md.
3 WH Charles J. Ireland, 508 Pine St....Millville, N. J.
3 WK Sidney L. M. Taylor, 17 E. Winona Ave., Norwood, Pa.
3 WQ Walter D. Disney, 1304 Etherbert Ave...Balto., Md.
3 WS Harry J. Conner, 2043 Morris St.....Phila., Pa.
3 WT Maryland National Guard, 1st Observation Squad,
Logan Field, Dundalk, Md.

3 AKP Edward N. Fee, 1407 S. Ithan St.....Phila., Pa.
3 AGO Walter H. Barth, 4532 Thompson St....Phila., Pa.
3 AHO Charles F. Fay, 2570 Lafayette St., East Falls, Pa.
3 AJV Franklin Macfadden, 3428 Queen St., East Falls, Pa.
3 AHP Roland Fowler, 901 Rittenhouse St....Wash., D. C.
3 AHO Guy A. Phillips, 1338 Cotton St.....Phila., Pa.
3 AIT Elmer L. Johnson, 631 Rittenhouse St....Wash., D. C.
3 AKM Geo. L. Oxley, Jr., 1122 Divinity Pl.....Phila, Pa.
3 AKD W. F. Wrenzel, 113 Lawndale Ave., Collingwood, N. J.
3 AKL Henry B. Thompson, 127 W. Durham St., Mt. Airy, Pa.
3 AFQ W. H. Geisshlager, 1074 Willard St.....Phila., Pa.
3 AJO Foundation Freedom, 3rd, 105 Linden St., Richmond, Va.
3 AGN Dexter G. White.....Gwynedd, Pa.
3 AOA Wm. E. Laverty, 1918 Columbia St....Phila, Pa.
3 AMD John E. Mullen, 2903 Congress Rd....Fairview, N. J.
3 BFX N. G. D'Ascenzo, 615 W. Price St., Germantown, Pa.
3 AJI Walter McCreary, 2845 N. Stillman St....Phila., Pa.
3 ARH Mulvaney, B. Graham, 34 N. Wyomnie Ave.,
Lansdowne, Pa.
3 ACV Kerune, Arthur, 1221 Marlborough St., Phila., Pa.
3 BCC Banta, Edwin S., 4634 Chestnut St....Phila, Pa.
3 ALX Borden, Edward W., 310 Lee Ave., Collingswood, N. J.
3 AIK Trefz, Frederick, 2549 Haworth St....Phila., Pa.

Eighth District

8 CIA R. P. Kuntz, Bulican & S. View Aves.....Dayton, O.
8 CIB H. Parkin, 1917 E. Lafayette Ave.....Detroit, Mich
8 CIC R. S. Hull, 530 N. Euclid Ave.....Pittsburgh, Pa.
8 CID E. H. Harbison, Pine Rd.....Berkeley, Pa.
8 CIE L. Farman, 320 N. Jefferson St.....Van Wert, O.
8 CIF K. J. Stansyra, 319 Malber St.....Syracuse, N. Y.
8 CIG E. F. Weinig, 522 Wooster St.....Dover, O.
8 CIH R. Campbell, 124 Tuxedo Ave.....Detroit, Mich
8 CII R. Wurtzl, R.F.D. No. 3.....Ann Arbor, Mich
8 CIJ L. E. Wingert, 75 Putnam St.....Buffalo, N. Y.
8 CIK R. W. Hancock, 337 S. Main St.....Charlotte, Mich
8 CIL G. E. Flower, 2739 Hooker Ave.....Detroit, Mich
8 CIM O. Fryberger, 213 S. Center St.....Phillipsburg, Pa
8 CIN P. J. Wallace, Fallowfield & 5th Ave....Charleroi, Pa
8 CIO F. B. Humphrey, E. Pine St.....Phillipsburg, Pa
8 CIP E. O. Snyder, 1478 Alabama Ave.....Pittsburgh, Pa
8 CIQ R. J. Ross, 910 N. Shamokin St.....Shamokin, Pa
8 CIR R. C. Dixon, 141 Evergreen St.....Millvale, Pa
8 CIS E. F. Steele, 127 Gold St.....Utica, N. Y.
8 CIT G. N. Lemmel, 67 Rich St.....Buffalo, N. Y.
8 CIU M. B. Terrell, 22 E. 9th St.....Holland, Mich
8 CIV R. S. Ireland, 400 E. Melcher St....Johnstown, N. Y.
8 CIW J. M. Holmatt, 390 Adam St.....Youngstown, O. Y
8 CIX G. R. Caller, 445 McKee St.....Monessen, Pa
8 CIY R. R. Ford, 65 Ketchum Pl.....Buffalo, N. Y.
8 CIZ C. A. Hemes, 32 Pearl St.....Gloversville, N. Y.

8 CJA A. Scherzerman, 28 Easter St.....Rochester, N. Y.
8 CJB D. R. Ems, 32 S. 2nd St.....Lewisburg, Pa.
8 CJC P. O. Young, 53 Market St.....Nanticoke, Pa.
8 CJD R. Zavitz, 307 Wight St.....St. Johns, Mich.
8 CJE G. Reinkamp, cor. Dana & Herald.....Cincinnati, O.
8 CJF O. E. Dunlap, Jr., 1029 Cleveland Av., Niagara Falls, N. Y.
8 CJG M. E. Crommes, Sta. H. Military Rd....Buffalo, N. Y.
8 CJH K. W. Cooper, Radford Ave.....Williamson, N. Y.
8 CJI F. J. Remy, 211 Norwood Ave.....Buffalo, N. Y.
8 CJJ H. C. Palmer, 66 Franklin St.....Ogdensburg, N. Y.
8 CJK E. E. Bellman, 161 Baumer St.....Johnstown, Pa
8 CJL H. Benson, 7 High St. Ext.....Bradford, Pa.
8 CJM C. E. Hack, 79 Bennett St.....Buffalo, N. Y.
8 CJN C. M. Kieswetter, 3 Ellison St.....Pittsburgh, Pa
8 CJO H. W. Crowell, 406 N. Cherry St.....Paulding, O
8 CJP J. L. Zimmerman, 2016 Market St....Youngstown, O
8 CJQ R. Weston, 55 North St.....Binghamton, N. Y
8 CJR W. T. Walter, 1331 Fairmont St., N. W....Rockwood, Pa
8 CJS William Storage Battery Co. (by H. E. Leonard),
R. 121st St. & St. Clair Ave., Cleveland, O
8 CJT Y. S. Hawley, 102 South Ave.....Bradford, Pa.
8 CJU F. N. Wright, 132 Portage St.....Kalamazoo, Mich
8 CJV R. McIntire, 6 Morris St.....Ogdensburg, N. Y.
8 CJW R. Williams, 916 W. Church St.....Elmira, N. Y.
8 CJX W. D. Ruer, 350 Graham St.....Pittsburgh, Pa
8 CJY E. A. McElvain, R.F.D. No. 2.....Glenshaw, Pa
8 CJZ W. K. Francis, W. Main St.....Shawnee, O

8 CKA W. A. Fitch, 2702 Beaver St.....Flint, Mich
8 CKB J. C. Eckard, 144 W. Church St....Newcomerstown, O
8 CKC C. Waterstreet, 40 Rapaid St.....Amsterdam, N. Y.
8 CKD A. C. Cummins, 724 Duquesne Ave.....Duquesne, Pa.
8 CKE R. Hirshberg, 111 E. Adams Ave.....Vandergrift, Pa
8 CKF E. E. Jones, 1144 Academy St.....Scranton, Pa
8 CKG T. F. Hoffman, 65 Lafayette St.....Pontiac, Mich
8 CKH R. F. Farmer, 3256 Helen Ave.....Detroit, Mich
8 CKI G. C. Rehn, 448 Perry St.....Pontiac, Mich

8 CKJ L. E. Wise, 364 Norton St.....Pontiac, Mich.
8 CKK A. Starkweather, 181 Washington Ave...Pontiac, Mich.
8 CKL G. W. Westcott, 25 E. Howard St.....Pontiac, Mich.
8 CKM C. B. Ashlin, 419 5th Ave.....Parkersburg, Pa.
8 CKN T. Van Loan, 21 Prospect Ave.....Caldwell, N. Y.
8 CKO S. A. Krull, 2340 Palm Beach Ave....Pittsburgh, Pa.
8 CKP T. Davis, 121 Wheat Ave.....Uniontown, Pa.
8 CKQ Dr. J. B. Koch, 1020 Valley Rd....Charleston, W. Va.
8 CKR F. W. Kateley, 1830 McPherson Ave.....Fremont, O.
8 CKS E. V. Hubbard, 866 Lake St.....Ashtabula, O.
8 CKT D. T. Cook, Jr., 2138 4th St. N. E.....Canton, O.
8 CKU H. Baldwin, 14 Odell St.....Union City, Pa.
8 CKV W. Matta, 1231-1233 Braddock.....Braddock, Pa.
8 CKW F. E. Hart, Jr., 16 Park Pl.....Ballston Spa, N. Y.
8 CKX M. E. Johnson, 93 Sawyer St.....Rochester, N. Y.
8 CKY J. A. Bush, 234 Wright St.....Weston, W. Va.
8 CKZ M. Berman, 2939 Isabella Ave.....Cincinnati, O

8 CLA J. M. Ray, 456 Caitpie St.....Newcomerstown, O.
8 CLB V. Cruikshank .....Plattsburg, N. Y.
8 CLC F. M. Tarbox, 235 S. Hobley St.....Dunmore, Pa.
8 CLD T. A. Reid, 1219 N. Limestone St.....Springfield, O.
8 CLE H. J. Riley, 723 Standish St.....Pittsburgh, Pa.
8 CLF H. G. Kilpatrick, Morton St.....Payne, O.
8 CLG G. Kael, 413 Robin St.....Dunkirk, N. Y.
8 CLH G. J. Emminger, 27 Florence Ave.....Bellevue, Pa.
8 CLI A. D. Kimball, 715 E. Main St.....Bradford, Pa.
8 CLJ A. M. Blessinger, 5813 Aylesboro Ave....Pittsburgh, Pa.
8 CLK F. T. Bricker, Franklin St.....Freeport, Pa.
8 CLL E. S. Lewis, 401 S. Dallas Ave.....Pittsburgh, Pa.
8 CLM J. W. Hill, 101 Lida St.....Mansfield, O.
8 CLN J. A. Louis, 406 Rutger St.....Utica, N. Y.
8 CLO Raymond Vermillion, 227 College Ave....Kent, Ohio
8 CLP Howard B. Young, 389 Eldon Ave....Columbus, Ohio
8 CLQ Frank L. Heald, Jr., 136 California Ave., Chester, W. Va.
8 CLR Chas. A. Claus, 22 S. Main St.....Somerset, Pa.
8 CLS William Hiscock .....Olcott, N. Y.
8 CLT Gerald W. Fox, 605 W. Vine St., Kalamazoo, Mich.
8 CLU Wayne A. Copeland, 51 Center St.....Warsaw, N. Y.
8 CLV Walter J. Zahniser, Franklin St.....Freeport, Pa.
8 CLW Richard W. Hallenbeck, 114 Wood Ave., Syracuse, N. Y.
8 CLX Fred E. Ware, R. F. D. No. 7.....Fulton, N. Y.
8 CLY Richard H. Hutchings, Whitesboro St., Utica, N. Y.
8 CLZ Edmund Weisel, 5158 Lumley St.....Detroit, Mich.

8 CMA Leonard Jascrak, 344 W. Main St...Manticoke, Pa.
8 CMB Robert P. Nick, 128 Edgemoor Lane..Ithaca, N. Y.
8 CMC Dennis B. Long, 67 S. Pearl St...Canandaigua, N. Y.
8 CMD R. A. McCurdy, 160 Frank St.....Warren, Pa.
8 CME Lloyd Lindley, 266 Locust St.....Washington, Pa.
8 CMF Guy H. Shaeffer, 1151 W. North St., Lima, Ohio
8 CMG Chas. D. Fisk, 4721 Commonwealth Ave., Detroit, Mich.
8 CMH Albert Pontchm, Jr., 538 E. Grand Blvd., Detroit, Mich.
8 CMI Chas. C. Whysall, 1098 E. Center St...Marion, Ohio
8 CMJ Rolland D. Sloan, 53 Good Ave.....Buffalo, N. Y.
8 CMK Ernest R. Martin, 318 20th Ave.....Columbus, Ohio
8 CML Smith M. Johnson, S. Main St., Middlefield, Ohio
8 CMM George S. Mann, 119 Temple St...Fredonia, N. Y.
8 CMN Ray Boundy, 51 State St.....Grove City, Pa.
8 CMO John R. Durstine, 107 Burton Ave., Cleveland, Ohio
8 CMP Wm. S. McKenzie, 733 Hubble St....Monroe, Mich.
8 CMQ Eddie Elec. Service Co., R. Paulros, 325 Third St., Chester, W. Va.
8 CMR Theo. G. Rew, 9 Prospect St.....Cobleskill, N. Y.
8 CMS Kenneth Blackburn, 314 Penn St., E...Bedford, Pa.
8 CMT Nat. S. Sherman (portable).....N. Y.
8 CMU Ralph W. Tanner, 981 Brice Ave.....Lima, Ohio
8 CMV Otto R. Curtis, 61 Main St.....Pittsford, N. Y.
8 CMW Howard D. Cochran, Main St....Alexander, N. Y.
8 CMX Ralph H. Sayles, Jr., Huron St.....Milan, Ohio
8 CMY Edwin Schoenherr, 1291 Middle Ave., Elyria, Ohio
8 CMZ Clarence H. Kasten, 418 Rossell St., Ogdensburg, N. Y.
8 CNA H. A. Johnston, 3617 Butler St.....Pittsburgh, Pa.
8 CNB H. C. Fitzgerald, Peach & Cherry Sts., Erie, Pa.
8 CNC Earl McConnell, 815 Bancroft St.....Lansing, Mich.
8 CND John Chidester, 661 W. Pike St...Clarksburg, W. Va.
8 CNE Harold D. Huston, 1709 Suburban Ave., Pittsburgh, Pa.
8 CNF A. Alvin North, Jr., Hidge Ave.....Troy, Ohio
8 CNG Democrat & Chronicle, 39-41 E. Main St., Rochester, N. Y.
8 CNH Clyde G. Bailey, 391 State St.....Conneaut, Ohio
8 CNI Ralph W. Guy, R. F. D. No. 1..Ellwood City, Pa.
8 CNJ C. Van Gorder, 434 Mill St.....Conneaut, Ohio
8 CNK John C. DePue, 145 W. 2nd St...Pt. Clinton, Ohio
8 CNL Eugene Bush, R. F. D. No. 5, Box 2..Holly, Mich.
8 CNM Robt. J. Bashore, R. F. D. No. 3..Paulding, Ohio
8 CNN Theo. Bolton, 19 Fair St.....Cooperstown, N. Y.
8 CNO J. Lynn Anderson, 166 W. Northwood Ave., Columbus, Ohio
8 CNP Ray N. Early, 2217 Perrysville Ave., Pittsburgh, Pa.
8 CNQ Ralph M. Lapham, 19 Grant Ave..Glens Falls, N. Y.
8 CNR Wm. F. Baxter, Main St.....Seven Mile, Ohio
8 CNS Myron Gould, 232 Second St., Cuyahoga Falls, Ohio
8 CNT Frank Werner, 730 Vermont St.....Glassport, Pa.
8 CNU Russell E. Fisher, 77 Elizabeth St....Oneida, N. Y.
8 CNV Wm. D. Bevitt, 206 W. Embargo St...Rome, N. Y.
8 CNW Jas. M. Hourigan, 1324 Letchman Ave., New Kensington, Pa.
8 CNX C. Chas. Johnson, 618 Washington St. E., Syracuse, N. Y.
8 Burton F. Long, 54 Shull St.....Akron, Ohio
8 Hoak, 31 Lincoln Ave.... Ohio
8 R. O. R F D..... St. N. Y.
8 M. J. (322-6 N. 6th St .. Ohio
8 Main St..... Pa.
8 .. .. New Pa.
8 S. St. Ohio
8 1 3 . Pa.
8 O. Ave. N. Y.
8 J. St.. Ohio
8 St. N. Y.
8 Spring & Pa.
8 COM Walter B. Alderfer, 510 E. Ohio
8 CON Milton 4 Penn. Ave. Pa.
8 COO Thos. N. Y.
8 COP Robt. F D. 1 Pa.
8 COQ Harold F. Bur E St. Pa.
8 COR Milton Sayers, Pa.
8 COS Henry C. Mueller, 1 Pa.
8 COT Charles . 102 Ave.. Pa.
8 COU L. D. . N. P No. Ohio
8 COV Chas. Ohio
8 COW A. E. 102 5th Ave..... Pa.
8 COX Ralph E. 60th St. Ohio
8 COY Wm. D. A St.. N. Y.

8 COZ Earl Harinxx, 87 Aberdeen St.....Rochester, N. Y.
8 CPA Fred E. Ackley, 402 S. Market St., Jamestown, N. Y.
8 CPB Jack J. Deuter, 321 S. Rutland St...Watertown, N. Y.
8 CPC Leonard Eldredge .....Sharon Springs, N. Y.
8 CPD Julius C. VanBruggen, 720 N. Westnedge Ave., Kalamazoo, Mich.
8 CPE Maurl H. Wilson, R. F. D. No. 5.....Lima, Ohio
8 CPF E. C. Lanning, 308 Tennessee Ave...Charleston, W. Va.
8 CPG Raymond Beyer, 1907 Whitesboro St.....Utica, N. Y.
8 CPH Wm. R. Grant, 4 Parsons St.....Auburn, N. Y.
8 CPI H. C. Goodrich, 312 Market St....Brownsville, Pa.
8 CPJ Leo E. Oderkirk, R. F. D. No. 3....Medina, N. Y.
8 CPK Wesley D. Richards.....Holland, N. Y.
8 CPL Harold C. Haws.....Holland, N. Y.
8 CPM Wilbur A. Stelzer.....Frankfort, Mich.
8 CPN Wilbur Miller.....DeGraff, Ohio
8 CPO Fred Rova, 101 E. Main St.....Salem, Ohio
8 CPP Robt. W. Stolzenbach, 726 W. Market St., Lima, Ohio
8 CPQ Harold E. Hart, State St.....Scottville, Mich.
8 CPR A. E. Milligan, 87 Green St....Schuylerville, N. Y.
8 CPS Allen W. Palmer, 125 S. Porter St., Saginaw W. Side, Mich.
8 CPT Carlton G. Brown.....Bluff Point, N. Y.
8 CPU D. R. Stevenson, Christian Ave.....Hubbard, Ohio
8 CPV Thos. J. Miller, 1903 S. Erie St....Bay City, Mich.
8 CPW Donald Morrell, 36 Duncan Ave...Washington, Pa.
8 CPX Robt. A. Wells, 216 Prospect St...Watertown, N. Y.
8 CPY Jos. A. Wilson, In care of Crescent Engraving Co., Kalamazoo, Mich.
8 CPZ Edgar W. Stoddard, 1143 Oak St.....Toledo, Ohio
8 CQA S. F. White, 922 Irving Ave.....Syracuse, N. Y.
8 CQB Geo. L. Gelsey, 265 N. 6th St., Steubenville, O.
8 CQC Glenn B. Smith, 621 Bradley St...Watertown, N. Y.
8 CQD Bryan Dickerson, 649 Midland Ave..Syracuse, N. Y.
8 CQE A. F. Worthington, 301 N. Leroy St...Fenton, Mich.
8 CQF Nelson L. Baxter, 319 E. Kennedy St..Syracuse, N. Y.
8 CQG O. B. Goldsmith, 216 Dunn Place, Kalamazoo, Mich.
8 CQH Daryl S. McClung, 1221 9th Ave..Huntington, W. Va.
8 CQI John H. Graves, Maine St.....Oak Harbor, Ohio
8 CQJ Willis W. Murray.....Creston, Ohio
8 CQK Alex Rosalad, 600 DuBois St.....DuBois, Pa.
8 CQL Thos. W. McGary, 27 Highland Ave., Washington, Pa.
8 CQM Harry E. Fraser, R. F. D. No. 5, Pine Lake, Pontiac, Mich.

CHANGES

8 AF Wilbert G. Kiana, 2140 Bapteon Ave., Detroit, Mich.
8 BL Birmingham High School, Cor. Chester & Maple Birmingham, Mich.
8 BS Roy Armstrong, 209 Biddle Ave. N., Wyandotte, Mich.
8 CD Clair White, 113 Mechanic St.....Smethport, Pa.
8 CG Carlton Hughes, 104 Geneva Ave....Detroit, Mich.
8 DO Nelson C. Nichols, 7735 Dorman Rd. Cleveland, Ohio
8 DT Russell M. Ireton, 226 Stark St....Saginaw, Mich.
8 EM Roy Clayton Doane, 343 Parkdale Ave..Buffalo, N. Y.
8 EJ Trade High School, Cor. Neilston & Spring, Columbus, Ohio
8 EQ Harold D. Davis, Davis St.....Bolivar, N. Y.
8 EZ F. B. O'Boyle, 891 Stanton Ave....Millvale, Pa.
8 FC Sylvester Ford, 904 Forest Ave....Ann Arbor, Mich.
8 GL John E. Walters, 6180 Belvidere Ave..Detroit, Mich.
8 IA Henry B. Joy, 301 Lake Shore Rd., Grosse Pte., Mich.
8 ID John H. Sokutis, Geo. J. Noak, 5800 Broadway Ave., Cleveland, Ohio
8 ID Det. Athletic Club, 241 Madison Ave..Detroit, Mich.
8 IV Gilbert H. Ludlow, 319 W. 2nd St., E. Liverpool, Ohio
8 IX Sylvan Rapaport, 618 S. Chestnut St..Detroit, Mich.
8 IZ Geo. L. Haven, 714 Parker Ave.....Detroit, Mich.
8 JT L. W. Brichta, 3064 Maybury Gd. Ave., Detroit, Mich.
8 KL Jas. B. Carroll, 61 Don Leonard St...Un ontown, Pa.
8 KQ Doran Bros. Elec. Co., 325-329 B. St., Hamilton, Ohio
8 KP Don Geo. McDaniels, 17 Colorado St., Ashtabula, Ohio
8 LO C. A. Nickle, R. F. D. No. 6.....Erie, Pa.
8 LV Willifred Roe, 2040 Fisher Ave.....Detroit, Mich.
8 MV Curtis & Myers Elec. Co., 102 Pipestone St., Benton Harbor, Mich.
8 MD Norman W. Criqui, 280 Blaine Ave..Buffalo, N. Y.
8 PC Henry B. Joy (Yacht SPRAY III)....Detroit, Mich.
8 VP Harold J. Meister, 570 Orchard Ave....Bellevue, Pa.
8 WD Donald L. Wood, 310 Augustine St...Rochester, N. Y.
8 WT Harold M. Leffingwell, 1010 W. Pine St., Lansing, Mich.
8 YK Norbert Schaefer, 38 Broadway Ave., Lancaster, N. Y.
8 YJ Raymond Bidal, 2000 St. Clair Ave....Detroit, Mich.
8 YZ Jacob Minnich, Jr., 412 Main St....Weston, W. Va.
8 WL Geo. L. McLean, 3938 N. Clarendon Ave., Detroit, Mich.
8 AAD Earl G. Benedict, 19 North St....Cobleskill, N. Y.
8 ABI Wm. S. Patton, 210 Linwood Ave....Pittsburgh, Pa.
8 ACF John M. Bambart, 812 Sherman Ave., Steubenville, Ohio
8 ADL Fred L. Brener, 89 S. Judson St., Gloversville, N. Y.
8 ADE Carlton Davis, 233 Pearl St.....Coldwater, Mich.
8 AEE Osborn F. Myrick, 318 Tompkins St....Olean, N. Y.
8 AFV Geo. Wm. Troutwine, 236 W. Fulton St., Gloversville, N. Y.
8 AFL Chas. G. Roberts, 157 Park St.....Buffalo, N. Y.
8 AFP Morgan Jones, 123 Railroad St.....Wanamie, Pa.
8 AGP Archie M. Adams, 1028 W. Spring St....Lima, Ohio
8 AGS Chas. M. Ross, 2830 Burwood Ave....Norwood, Ohio
8 AHQ Noble A. Hunter.....Capac, Mich.
8 AIF Wm. F. Allan, 40 Tremaine St....Kenmore, N. Y.
8 AJQ Donald A. Yontz, Main & Railroad Sts., Frewville, N. Y.
8 AJV William Jackson, 80 Burlingame Ave..Detroit, Mich.
8 AJY Thos. M. Ryan, 216 Tompkins St.....Olean, N. Y.
8 AKF Dwight E. Williams, 2147 Hubbard Ave., Detroit, Mich.
8 Bolden, 404 Erie St.....Painesville, Ohio
8 p R. Terr. St. Park.....Dawson, Pa.
8 W Ave. Ext., Irwin, Pa.
8 R. St.....Owosso, Mich.
8 1 St., Johnstown, N. Y.
8 A Ave., Cleveland, Ohio
8 Ave.... Ponda, N. Y.
8 Ave., Pittsburgh, Pa.
8 Ave...Columbus, Ohio
8 Ave., Detroit, Mich.
8 .....Norristown, Pa.
8 nd St., Palatine Bridge, N. Y.
8 97th St.....Cleveland, Ohio
8 1 m St...Buffalo, N. Y.
8 J. Edward and m....Canonsia, N. Y.
8 Dean A .....Holland, N. Y.
8 Vern M. 120 Water St.....Sandusky, Ohio
8 Walter 2025 Bway St.....Dormont, Pa.
8 2060 Crozier Ave...Detroit, Mich.
8 21 VanAlstyne
8 AVN M. 512 Ave.
8 AVO J 2207 Ave.
8 AVR . 50 St.
8 AJJ 5 E. St.
8 BAR 67 Ave.
8 BEK St. Ohio
8 BOG W J Pa.
8 BHR N. Y.
8 BIH 512 Ave. N. Y.
8 BKW 25 Pa.
8 BKY A. S. ..

8 BDT Wm. C. Bolden, 820 W. College Ave., State College, Pa.
8 BPC H. M. FitzSimmons, 24 Wise Ave..Mansfield, Ohio
8 BPD Burdette Haler, 696 Chestnut St.....Irwin, Pa.
8 BRA Jos. M. Herrmann, 128 Welton Rd..Conneaut, Ohio
8 BRP A. Arbuthnaukas, P. O. Box 351.....Wanamie, Pa.
8 BRU C. G. Sensenich, Oak St.....Irwin, Pa.
8 BTH Walter C. Neumann .....North Branch, N. Y.
8 BYD L. Grabenstieder, 2767 Observatory Road, Cincinnati, Ohio
8 BXO W. L. Zimmerman, Livingston St.....Akron, Ohio
8 CBK Chas. L. Terrel, 413 Vine St.....Marion, Ohio
8 CGR Raymond A. Ransom, 69 Porter Ave..Wheeling, W Va

REGULAR LIST

8 AA C. Wolensky, 324 Lehigh Ave.....Palmerton, Pa.
8 AB J. L. Ball, 818 Wall St.....Port Huron, Mich
8 AC A. L. Kent, 189 Court St.....Binghamton, N. Y.
8 AD N. P. Bodien, 170 E. Ferry St.....Buffalo, N. Y.
8 AE G. Armstrong, 1905 E. 90th St.....Cleveland, O
8 AF S. Feldman, 1612 E. 66th St.....Cleveland, O.
8 AG L. M. Gove, 312 Parker Ave.....Toledo, O
8 AH A. Ball, W. Liberty St.....Hubbard, O.
8 AI J. G. Johnston, 2240 Lamman Ave.....Toledo, O.
8 AJ R. R. Bellinger, 12 Thomas St.....Waverly, N. Y.
8 AK J. H. Muldane, 1222 Blaire Ave.....Cambridge, O.
8 AL W. E. Wachal, 2118 Tuscarawas St.....Canton, O
8 AM E. G. Immel, 7556 Richmond Ave.....Detroit, Mich
8 AN K. Nishanan & C. Mathers, 8921 Otsego Ave., Detroit, Mich
8 AO E. H. Clark, 90 Spokane Ave.....Detroit, Mich
8 AP F. Bench, 576 Alger St.....Detroit, Mich
8 AQ G. S. Atkinson, 3700 McGraw Ave.....Detroit, Mich
8 AR E. P. Tuch, 346 Ferndale Ave.....Detroit, Mich
8 AS E. E. Wiesnie, 406 Buston Blvd. W.....Detroit, Mich
8 AT E. J. Dickerson, 8128 Dexter Blvd.....Detroit, Mich.
8 AU F. O. Murphy, 150 Bagarth Ave.....Detroit, Mich
8 AV J. J. Baxter, 1548 Robinwood Ave.....Lakewood, O
8 AW J. R. Bartrumer, 99 Harvard Pl.....Buffalo, N. Y.
8 AX W. A. Nealen, 1604 St. Claire St.....Cleveland, O
8 AY F. Marsal, 1567 Lakeland Ave.....Lakewood, O.
8 AZ L. C. Dunn, 1683 Amherst Ave. .....Cleveland, O

8 BA E. E. Kesler, 965 Muldrew Ave.....Detroit, Mich
8 BB N. P. Mason, 56 Schinerhaff St.....Plattsburg, N. Y.
8 BC M. M. Burton, 906 N. Alvord St.....Syracuse, N. Y.
8 BD R. S. Carpenter, 14234 Detroit Ave.....Lakewood, O.
8 BE J. J. Francis, 6220 Superior St.....Cleveland, O.
8 BF G. Waldmeyer, 811 E. Kingsley St....Ann Arbor, Mich
8 BG J. F. Griffin, 1030 Bank Bd.....Cleveland Heights, O
8 BH J. E. Adams, 189 Fougeres St.....Buffalo, N. Y.
8 BI A. G. Peaples, 1502 E. 80th St.....Cleveland, O.
8 BJ R. F. Burnhalmans, 2381 Cleveland Ave..Detroit, Mich.
8 BK Cleveland Radio Research Laboratory (operator, A. P. Tyler, 2049 E. 79th St., Cleveland, O.
8 BL M. F. Jamison, 145 W. College St.....Oberlin, O.
8 BM G. McGarrett, 55 Carter Ave.....Buffalo, N. Y.
8 BN H. Moriarity, 1818 Lawrence Ave.....Toledo, O.
8 BO R. E. Chagin, 220 Helen Ave.....Detroit, Mich.
8 BP C. Partridge, 821 Simons St.....Saginaw, Mich.
8 BQ R. M. Wallace, 234 Vine St.....Milton, Pa.
8 BR C. M. Wilcox, 131 S. Fabrique Ave....Lansing, Mich.
8 BS N. D. MacConnell, 14606 St. Clair St....Cleveland, O
8 BT F. B. Falkner, 819 Coal St.....Wilkinsburg, Pa.
8 BU J. L. Russell, 1041 E. 83rd St.....Cleveland, O.
8 BV R. C. Bishop, 412 Locust St.....Lockport, N. Y.
8 BW A. C. Young, 1311 Abbott Rd.....Buffalo, N. Y.
8 BX F. A. Wilson, Jr., 406 Hampton St...Wilkinsburg, Pa
8 BY F. A. Kmill, 98 Chapin Ave.....Buffalo, N. Y
8 BZ O. R. Flower, 66 Hosmer Ave.....Detroit, Mich.

8 CA W. A. McKelvey, 803 Trumbull Ave.....Detroit, Mich
8 CB A. F. Kraus & Co., 680 McDougall Ave..Detroit, Mich
8 CC W. Galloway, 118 W. Main St.....Xenia, O
8 CD L. L. Charnicky, 9004 Eagles Ave.....Cleveland, O.
8 CE C. J. Durazzi, 2304 Tampa Ave.....Cleveland, O.
8 CF C. H. Katzenberger, 124 W Main St....Greenville, O
8 CG E. A. Pinson, 728 7th St.....Niagara Falls, N. Y
8 CH P. A. Riley, 317 Main St.....Greenville, Pa
8 CI C. T. Hevlit, 7842 Westmoreland St....Nelsonia, Pa
8 CJ F. J. Scaplehn, 810 10th Ave.....Port Huron, Mich
8 CK E. E. Vancher, 507 Monroe St.....Jamestown, N. Y
8 CL S. S. Bignell, 304 Union St.....Hamburg, N. Y
8 CM C. R. Rice, 318 Putnam St.....Marietta, O.
8 CN R. W. Bumbleman, 325 Cleveland St...Detroit, Mich.
8 CO R. Leidh, 18 Devlin St.....Pittsburgh, Pa.
8 CP G. Palmer, 206 E. 13th St.....Holland, Mich.
8 CQ F. M. Tarbox, 120 E. Grove St.....Dunmore, Pa.
8 CR Crosley Mfg. Co., 5723 Dacey Ave.....Cincinnati, O.
8 CS W. J. Scripps, 1064 Trumbull Ave.....Detroit, Mich.
8 CT R. L. Hamblin, No. Main St.....Jamestown, N. Y.
8 CU R. Kinne, 2084 E. 79th St.....Cleveland, O.
8 CV C. E. Urban, 36 Watsonia Blvd.....Pittsburgh, Pa.
8 CW S. S. Copp, 107 McDaniel St.....Dayton, O.
8 CX W. Kunkelman, 211 Beach Ave..Cambridge Springs, Pa.
8 CY F. C. Mart, 541 Stanwood Pl.....Clifton, O
8 CZ D. G. Hopkins, 118 Clinton St.....Greenville, Pa

8 DA R. Reich, 24....Cleveland Heights, O
8 DB G. R. Sem, 1 ..... Pa
8 DC J. W. Wright, S. ountain Ave O
8 DD A. W. Palmer, S. Porter St..... West Side.
8 DE F. C. Potts, 1231 Middle St.....Sharpsburg, Pa
8 DF Cleveland Tenlet Club .....Cleveland, O
8 DG F. D. Johnston, 1326 Hill St.....Ann Arbor, Mich
8 DH W. T. Shearer, 281 16th St.....Conneaut, O
8 DI W. S. Burkhart, Jr., Cherry Hill.....Reading, O
8 DJ R. W. Waller, 318 Well St.....Cambridge, O
8 DK M. M. 2634 Dennis St.....Cincinnati, O
8 DL N. D. 2626 Dennis St.....Cincinnati, O
8 DM P. L. Hester, E. Boulevard.....Cleveland, O
8 DN R. Pharo .....
8 DO E. E. Hamm, 2378 Concord Ave.....
8 DP R. F. Weinig, 822 Wooster Ave.....Dover, O
8 DQ E. L. Hunter, 2307 Cliff. Ave N. S. Pa
8 DR J. 226 Locust St..Edgewood Pa.
8 DS F. 2606 Main St.... Pa.
8 DT F. J 1 Walnut St..... Pa.
8 DU F. H. Dutton, 61 McMillan Ave.... Ich
8 DV E. Ahrend, 2326 Penna Ave.....Monessen, Pa

8 BW	J. Penberthy, 486 Palis. Ave.	Detroit, Mich.
8 BX	H. J. Walsh, 2910 Gladwin Ave.	Detroit, Mich.
8 BY	Lo G. E. Bush, 92 Walnut St.	Binghamton, N. Y.
8 BZ	R. Greenawalt, 316 E. Tyler St.	Van Wert, O.
9 BA	G. A. McIntosh, 1388 Elm St.	Detroit, Mich.
8 BB	R. M. Blair, 2020 Ironton Ave.	Norwood, O.
8 BC	V. M. Locsi, 35 Hubbard Ave.	Columbus, O.
8 BD	C. Bongiorno, 174 Glasgow St.	Clyde, N. Y.
8 BE	J. Ross, 92 Hobart St.	Rochester, N. Y.
8 BF	A. G. Hoch, 410 Fairview St.	Mannington, W. Va.
8 BG	F. J. Marshall (operator, N. Bell), 817 Delaware Ave.,	Toledo, O.
8 BH	M. W. Harmer, 9½ Cleveland Pl.	Jamestown, N. Y.
8 BI	A. L. Frankel, 1 Solar Terrace	Rochester, N. Y.
8 BJ	F. G. Schleicherbach, 533 E. University Ave.,	Ann Arbor, Mich.
8 BK	S. S. Greenwood, 227 Augustine St.	Rochester, N. Y.
8 BL	T. Myers, Jr., 41 Michigan Ave.	Buffalo, N. Y.
8 BM	R. J. Beam, 1900 Nelson St.	Utica, N. Y.
8 BN	S. B. Gould, 4128 Wilys Parkway	Toledo, O.
8 BO	S. S. Clark, 713 E. Maiden St.	Washington, Pa.
8 BP	L. H. H. Poe, 406 Davis St.	Elmira, N. Y.
8 BQ	W. A. Copeland, 51 Center St.	Warren, N. Y.
8 BR	L. A. Weston, 899 Lincoln Ave.	Detroit, Mich.
8 BS	R. F. Belyea, 90 Washington St.	Warren, N. Y.
8 BT	F. C. Lee, R. F. D. No. 3	Stanley, N. Y.
8 BU	J. M. Kerstetter, 623 Carlton St.	Toledo, O.
8 BV	Lo R. M. Lerlesdan, 163 Grant Ave.	Vandergrift, Pa.
8 BW	G. S. Crump, 11 Oregon Ave.	Crafton, Pa.
8 BX	A. North, Jr., 302 S. Market St.	Youngstown, O.
8 BY	H. K. Burns, 111 W. John St.	Martinsburg, W. Va.
8 BZ	T. A. King, Island Park, Raleon and Stillwater Sts.,	Dayton, O.
8 FA	A. M. Stellwagen, 312 E. Jefferson St.	Ann Arbor, Mich.
8 FB	R. C. Devlaney, 1224 Davis St.	Pittsburgh, Pa.
9 FC	D. L. Wood, 310 Augustine St.	Norwood, N. Y.
8 FD	R. B. McCommon, 308 N. Market St.	E. Palestine, O.
8 FE	A. E. Benson, 196 Equinox St.	Buffalo, N. Y.
8 FF	L. A. Bainbower, 2017 Peach St.	Erie, Pa.
8 FG	A. N. Hudson, 406 Park Ave.	Fulton, N. Y.
8 FH	W. I. Perdrige, 2018 S. Wash. Ave.	Saginaw, Mich.
8 FI	H. L. Le Vasseur, 1013 Prospect St.	Lansing, Mich.
8 FJ	G. D. Bower, 534 4th St.	Marietta, O.
8 FK	N. E. Collins, 1432 W. 54th St.	Cleveland, O.
8 FL	W. W. Hunter, 2170 W. 95th St.	Cleveland, O.
8 FM	R. S. A. A. Munch, 105 Hamister St.	Pittsburgh, Pa
8 FN	W. C. Babcock, 113 Hood St.	Penn Yan, N. Y.
8 FO	C. E. Webster, 60 Bowman Court	Lockport, N. Y.
8 FP	F. G. Brian, 901 Forest St.	Marion, O.
8 FQ	F. A. Baumgarten, 225 Melrose St.	Pittsburgh, Pa.
8 FR	W. T. Fraser, 43 Glenwood Ave.	Buffalo, N. Y.
8 FS	H. J. Van Kamp, 2015 Mohrow Ave.	Cincinnati, O.
8 FT	L. E. Parsons, 420 Lake St.	Troy, O.
8 FU	W. E. Durham, Fort St., Public Library	Bellaire, O.
8 FV	C. W. Thorpe, 26 Grove St.	Cohasset, N. Y.
8 FW	S. E. Brigham, 141 Main St.	Oneonta, N. Y.
8 FX	R. F. Thoreau, 4708 McClellan Ave.	Detroit, Mich.
8 FY	W. L. Leatherman, 703 W. Main St.	Van Wert, O.
8 FZ	G. W. Van Kirk, 190 S. Wash. Ave.	Wilkes-Barre, Pa.
8 GA	F. E. Booth, 875 Alger Ave.	Detroit, Mich.
8 GB	A. C. McKinley, 515 N. State St.	Marion, O.
8 GC	F. Bova, 101 E. Main St.	Salem, O.
8 GD	S. P. Bauer, 116 East St.	Arcanum, O.
8 GE	M. Gould, 232 S. 2nd St.	Cuyahoga Falls, O
8 GF	C. E. Pickett, 24 Church St.	Hornell, N. Y.
8 GG	R. H. Sadler, 20 Normandy Ave.	Rochester, N. Y.
8 GH	R. S. Wade, Ridge St.	Richmond, Mich
8 GI	G. Kirby, 587 Franklin Ave.	Columbus, O.
8 GJ	C. F. Engler, 310 Hiltz Ave.	Bellevue, O.
8 GK	E. C. Brooks, Walnut St.	Lowellville, O.
8 GL	J. Pfaff, Jr., 3051 E. Hancock Ave.	Detroit, Mich.
8 GM	R. C. Pfeifer, 225 Broad St.	Bellevue, O.
8 GN	V. L. Winn, 607 Highland St.	Mansfield, Pa.
8 GO	E. Wendell, R. Green St.	Greece, N. Y.
8 GP	J. E. Law, Jr., 210 Sycamore St.	Clarksburg, W. Va.
8 GQ	J. A. Perry, Defiance College	Defiance, O.
8 GR	G. Norris, 1754 Brush St.	Detroit, Mich.
8 GS	C. S. Miller	Olivet, Mich.
8 GT	L. E. Hirsch, 1000 Park St.	Columbus, O.
8 GU	E. A. Sweney, 1256 Wayland Ave.	Norwood, O.
8 GV	A. N. Edwards, 848 S. Main St.	Middletown, O.
8 GW	W. L. Shaffer, 84 St. Louis Ave.	Youngstown, O.
8 GX	E. W. Thatcher, 363 Elm St.	Oberlin, O.
8 GY	L. D. Comon, Jr., Chardon Rd.	Euclid, O.
8 GZ	Detroit Radio Laboratories, 3661 Grathot Ave.,	Detroit, Mich
9 HA	E. L. Finch, 2407 Florence Ave.	New Castle, Pa.
8 HB	C. O. Biddison	Columbiana, O.
8 HC	F. J. Allen, 14 Garnet Lane	Wilkes-Barre, Pa.
8 HD	A. L. Miller, N. Bway	Spencerville, O.
8 HE	E. Gaylord, 2326 Bostord St.	Cuyahoga Falls, O
8 HF	C. A. Helmer	New Berlin, N. Y.
8 HG	F. D. Brown, 221 E. Northward Ave.	Columbus, O.
8 HH	N. Bowman, 421 Ashland Ave.	Detroit, Mich.
8 HI	M. A. Barnum, 136 Bath St.	Elyria, O.
8 HJ	J. J. Young, 717 W. Gray St.	Elmira, N. Y.
8 HK	F. E. Herron, 7714 Reandre St.	Pittsburgh, Pa.
9 HL	D. T. Willard, 9th St.	Elizabeth, Pa.

Ninth District

9 BWL	Joseph E. Tomlinson, Grade School,	Melvin St., Gibson City, Ill.
9 BWV	Joseph E. Davidson, N. Polk St.	Albany, Mo.
9 BWW	Harold Jones, 823 East Washington St.,	Wash., Iowa
9 BWX	Warren G. Bleak, 4020 Hooker St.	Denver, Colo.
9 BWY	Richard Wagner, 645 S. Main Ave.,	Sioux Falls, S. Dak.
9 BWZ	Harold F. Woodbury, 219 Wingate St.,	W. Lafayette, Ind.
9 BXA	Raoul F. Fisher, 919 E. Vine St.	Denver, Colo.
9 BXB	Vernon Curtiss	Madison, Minn.
9 BXC	John W. Albert, 604 S. Cherry St.	Jefferson, Iowa
9 BXD	Frank G. Denton, Main St.	Rankin, Ill.
9 BXE	Leslie E. Simpson, 803 E. Walnut St.,	Bloomingdale, Ill.
9 BXF	Harold Young, 320 S. Second St.	Frankfort, Ind.
9 BXG	Gerald C. Horn, 1021 Church St.	Champaign, Ill.
9 BXH	Robert L. Montgomery, 225 N. Gilpin St.,	Denver, Colo.
9 BXI	Theodore Hoegmann, 61 S. Harrison St.,	Kansas City, Kans.
9 BXJ	Harold Cerny, 1511 8th Ave.	Belle Plaine, Iowa
9 BXK	Charles E. Rabenecker, 720-30th St.,	Louisville, Ky.
9 BXL	James O. Barnes, 222 W. Maple Ave.	Ottumwa, Iowa
9 BXM	Leonard Warren, 2441 Race St.	Denver, Colo.
9 BXN	James Vacra, 518 W. Erie St.,	Spring Valley, Ill.
9 BXO	Cecil W. Dorsett	Harper, Kans.
9 BXP	Walter K. Robinson, Gale St.	Williamsfield, Ill.
9 BXQ	Howard M. Williams, 2207 W. Lake Place,	Denver, Colo.
9 BXR	Gordon E. Prickett, 494 Addison St.	Elgin, Ill.
9 BXS	Harold Hufnagle	Fremont, Ind.
9 BXT	Elvin B. Chapman	Giltner, Nebr.
9 BXU	John R. Bredeken	Hills, Minn.
9 BXV	Oswald H. Johnson, 918 19th St.	Racine, Wisc.
9 BXW	Harold Goldwasser, 1020 S. Broadway	St. Louis, Mo.
9 BXX	Ross D. Whipple, 515 Illinois Ave.	Ottawa, Ill.
9 BXY	Marshall W. Ayer, 610 N. 21st St.	Lincoln, Nebr.
9 BXZ	Fred Schneller, 227-8th St., S. W.	Mason City, Iowa
9 BYB	Milo Sullins, 2630 Harriet Ave.,	Minneapolis, Minn.
9 BYC	Leo G. Wiese, 1214 Seventh St.	Perry, Iowa
9 BYD	John H. Henderson, Jr., 408 W. Ashland Ave.,	Indianola, Iowa
9 BYE	Rexford H. Kundiger, R. No. 4, Box 9,	Oshkosh, Wisc.
9 BYF	Tyrrie and Holmig, 1527-8th St.	Peru, Ill.
9 BYG	John C. Bonney, 911 Pine St.	Boulder, Colo.
9 BYH	Dale V. Diefenderfer, 619 Hawthorne Ave.,	S. Milwaukee, Wisc.
9 BYI	Orland B. Danning, 237 Water St.	Elkhart, Ind.
9 BYJ	George W. Kovell	Amherst Village, Wisc.
9 BYK	William A. Coverdale, 7340 Clyde Ave.,	Chicago, Ill.
9 BYL	Clyde Crabtree, 908-15th St.	Winfield, Kans.
9 BYM	Stuart F. Smith, 580 Washington St.	Marseilles, Ill.
9 BYN	Samuel G. Read, 205 N. High St.	LaGrange, Ind.
9 BYO	William L. Zednik	Wilber, Nebr.
9 BYP	Frank E. Guider, 227 Maple St.	Joplin, Mo.
9 BYQ	Louis Sacks, 4815 S. 26th St.	Omaha, Nebr.
9 BYR	Carl P. Berg, 518 N. Third Ave.	Maywood, Ill.
9 BYS	Wilson N. Browning, 1124 Vine St.	Newport, Ky.
9 BYT	Elmer F. Marchino, 405 Depot St.	Vincennes, Ind.
9 BYU	Clarence E. Kelsey, 801 S. Durbin St.,	Bicknell, Ind.
9 BYV	Leonard M. Torrence, 628 Market St.,	Iowa City, Iowa
9 BYW	Benhart O. Tweet	Radcliffe, Iowa
9 BYX	Henry J. English, 844 W. College Ave.,	Jacksonville, Ill.
9 BYY	Raymond F. Hargmann	Sauk Center, Minn.
9 BYZ	Raymond E. Brown, 207 Cole St.	E. Peoria, Ill.
9 BZA	Joseph D. Jones, 832 Madison St.	Gary, Ind.
9 BZB	Howard A. Wilhelm, Jersey Ridge Rd—R. R. No. 4, Box 24,	Davenport, Iowa
9 BZC	Walter J. Cahill	Plainview, Nebr.
9 BZD	S. M. and C. C. Wenz, 4038 Magnolia Ave.,	Chicago, Ill.
9 BZE	Lathrop Smith, 207 W. Court Ave.	Winterset, Iowa
9 BZF	Henry C. Smith, R. F. D. No. 1,	Jamestown, N. Dak.
9 BZG	Everett A. Lolley, 601 E. Main St.	Manchester, Iowa
9 BZH	F. B. Houston, 529 S. Ball St.	Webb City, Mo.
9 BZI	Robert W. Thielke	Aehler, Iowa
9 BZJ	Millard J. McCord, Main St.	Beaver Crossing, Nebr.
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9 BZP	Henry P. Michiels, 6448 N. Clark St.	Chicago, Ill.
9 BZQ	Dale R. Lambert, 219 N. Vail St.	Geneseo, Ill.
9 BZR	R. B. Mossman, 711½ W. 3rd St.	Davenport, Iowa
9 BZS	Leo F. Doerkel, 1332 22nd Ave.	Rock Island, Ill.
9 BZT	John C. Saidla, 8 Douglas St.	Darlington, Ind.
9 BZU	Arthur J. Revell	Scammon, Kans.
9 BZV	H. J. Graybill, 744 Cutler Grove Ave.,	South Bend, Ind.
9 BZW	Floyd B. Harvest, 1008 N. Moffat Ave.	Joplin, Mo.
9 BZX	Riley H. Sneeleker, 1008 Ohio St.	Connersville Ind.
9 BZY	Carl C. Yoakley, 1234 S. 4th St.	Springfield, Ill.
9 BZZ	D. W. Imel, 901 W. Chestnut St.	Independence, Kans.
9 CAA	Charles R. Stedman, 1641 Albion St.	Denver, Colo.
9 CAB	M. M. Nelles, 702 2nd St., N. W.	Madison, S. Dak.
9 CAC	Oren R. Gambill, 502 16th St.	Independence, Kans.
9 CAD	Clayton A. Doolin, 521 W. Wood St.	Decatur, Ill.
9 CAE	Marion Canham	Cabery, Ill.
9 CAF	William R. Calver, Jr., Box 16.	Westervelt, Ill.
9 CAG	Charles S. Lang	Monticello, Iowa
9 CAH	Edward Wickland, 7223 Greenwood Ave.	Chicago, Ill.
9 CAI	Andrew M. Harvey Jr., R. F. D. 9.	Delevan, Wisc.
9 CAJ	Kenneth Wolfe, 210 S. Helen St.	Pipestone, Minn.
9 CAK	F. V. Goodwin, 1721 Williams St.	Great Bend, Kans.
9 CAM	Thorin P. Sulner, 615 4th Ave.	Belle Plaine, Iowa
9 CAL	Theodore A. Klein	Winnebago, Minn.
9 CAN	New Tulor Township High School,	Kenilworth, Ill.
9 CAO	George W. Chamberlain	Rock Port, Mo.
9 CAP	Albert C. Wacks, 109 E. 80th St.	Paris, Ky.
9 CAQ	John H. Lawrence	Springfield, S. Dak.
9 CAR	Richard P. Ballou, 1701 N. 6th Ave.	Ft. Dodge, Ia.
9 CAS	Wiley E. Miles, Box 182	Lewellen, Nebr.
9 CAT	Glenn B. Winkler, 1301 E. Maple St.	Columbus, Kans.
9 CAU	John G. Sinclair, 2017 Washington Ave.	Alton, Ill.
9 CAV	Stanley C. Quinn, 410 S. 9th St.	Brainerd, Minn.
9 CAW	Clifford P. Alsop, 423 Clark Ave.	Effingham, Ill.
9 CAX	Bob Oleil, 407 Douglas St.	Bloomington, Ill.
9 CAY	James Corridori, 105 E. Cahokia St.	Centralia, Ill.
9 CAZ	Malcolm L. Melville, Turner Ave.	Glenn Ellyn, Ill.
9 CBA	E. W. Clark, 547 W. Wash'n St.	Winchester, Ind.
9 CBB	Donald Redmond, 1150 Bertch Ave.	Waterloo, Iowa
9 CBC	Ellis L. Torres, 422 N. Main St.	Mt. Pleasant, Iowa
9 CBD	A. B. Kinney, Argentine Rd, Box 7a.	Roselale, Kans.
9 CBE	Earl H. Craven, 519 Grand St.	Grand Junction, Colo.
9 CBF	Alf M. Myhre, 120 4th St.	Stillwater, Minn.
9 CBG	James R. Carter	Marshall, Ind.
9 CBH	Wesley A. Kaufer, R. F. D. 1	Jamestown, N. Dak.
9 CBI	Enid Hamilton	Forrest, Ill.
9 CBJ	Fred W. Oster, 1207 Washington St.	Muscatine, Iowa
9 CBK	J. Harland Plat	Clay Center, Nebr.
9 CBL	Marion F. Reed	Clay Center, Nebr.
9 CBM	M. E. Weymouth, 417 N. Richmond Ave.	O-k Pk. Ill.
9 CBO	William E. Flores, 408 Franklin St.	Kirksville, Mo.

CALLS RE ISSUED

9 GQ	V. A. Nissen, Jr., 61 Washtenaw St.	Chicago, Ill.
9 MP	Cleveland High School, Virginia St.	St. Louis, Mo.
9 MB	H. H. Powell, 3122 Sheridan Road	Chicago, Ill.
9 ABP	Robert J. Woolsey, 3741 Broadway	Chicago, Ill.
9 ATT	Francis P. Pardig, 7310 Kenwood Ave.	Chicago, Ill.
9 BEH	John M. Weaver, 611 E. Howard St.	South Bend, Ind.
9 BKL	Leo Jeffries, R. No. 2	Jamestown, N. Dak.
9 BNA	Laurence E. Tyrrell, 2302 E. 5th St.	Muscatine, Ia.
9 BUO	Maurice S. Speer	Fairfield, Nebr.

BROADCASTING

KSD	Pulitzer Printing Company (The Post Despatch),	12th and Olive Sts., St. Louis, Mo.
KGA	Young Men's Christian Assn.	Lincoln and 16th Aves., Denver, Colo.
WEY	The Conradio Co., 1725 Fairmont Ave.	Wichita, Kans.
WLW	St. Louis University, Grand & Pine Sts.	St. Louis, Mo.

EXPERIMENTAL

9 XA	The United Telephone Co.	Monroe, Wisc.
9 XB	City of Chicago, 614 City Hall Bldg.	Chicago, Ill.
9 XC	The Colorado College	Colorado Springs, Colo.
9 YF	North Dakota State Normal School.	Mayville, N. Dak.
9 CNF	Maurice McLeod, 1020 Elgin Ave.	Forest Park, Ill.
9 CNG	Malcolm W. McRae, 106 S. Sabonek St.	Urbana, Ill.
9 CNH	John Donald Burke, 1011 Bush St.	Chicago, Ill.
9 CNS	Carroll A. Wilson, 4632 N. Kenny St.	Chicago, Ill.
9 CNT	Arthur W. Pike, 218 N. Grove St.	Owatonna, Minn.
9 CNU	Melvin T. Anderson, 620 Wolfe St.	Muscle, Ind.
9 CNV	Louis R. Hosking, 396 Cherokee Ave.	St. Paul, Minn.
9 CNW	Allan E. Gower, 102 Morgan St.	Tracy, Minn.
9 CNX	John Joseph King, 203 Main St.	Frankfort, Ky.
9 CNY	Otto Richardson, 115 S. Riverside Drive.	Aimes, Iowa
9 CNZ	Harry Overturf, 1623 N. Carolina Ave.	Mason City, Ia.
9 CCA	J. B. Swanson, 5122 Sheridan Road	Chicago, Ill.
9 CCB	Wilbert V. Newell, 207 E. Stafford St.	Stafford, Kans.
9 CCD	H. J. Parish, 627 Jackson St.	Milwaukee, Wisc.
9 CCE	Carl F. Williams, 940 11th St.	Boulder, Colo.
9 CCF	Edward M. Toellner, 209 N. Francis St.	Madison, Wisc.
9 CCG	W. E. Mueller, 349 National Ave.	Milwaukee, Wisc.
9 CCH	Thadeus Hein, 800 8th Ave.	Milwaukee, Wisc.
9 CCI	Wesley Campbell, 2929 Drexel Blvd.	Chicago, Ill.
9 CCJ	Rodney Schreiber, 1368 Ogden St.	Denver, Colo.
9 CCK	Leffingwell Drug Co., Main & Chge Sts.	Evanston, Ill.
9 CCL	Adna Joseph Spillman	Buffalo, Kans.
9 CCM	Myren Jennings Earl	Dana, Ill.
9 CCN	Paul Djork, 323 E. 10th St.	Lockport, Ill.
9 CCO	Everett E. Gray, Main St.	Fulton, Ind.
9 CCP	Michael Brazil, R. F. D. No 4.	Wagon, Minn.
9 CCR	Jerry Jansta, 1400 Marquette St.	Racine, Wisc.
9 CCS	Merwin Lewis, 212 E. Rutledge St.	Yates Center, Kans.
9 CCT	Charles C. Nagel	Clay Center, Nebr.
9 CCU	Raymond Schultz	Henry, Ill.
9 CCV	Ed. Barrieklow	Courtland, Kans.
9 CCW	C. W. W. Scott, 6029a Washington St.	St. Louis, Mo.
9 CCX	Raymond Pfaterer, 220 Reed St.	Evansville, Ind.
9 CCY	L. B. Vennard, Third St.	Wessington Springs, S. Dak.
9 CCZ	A. Verne Roberts, 1241 Perry Ave.	Wichita, Kans.
9 CDA	E. Potaski, Jr., 1122 Milw'k'e Ave.	S. Milwaukee, Wisc.
9 CDB	Earl R. Pickard	Leon, Ill.
9 CDC	Thomas S. Berry, 108 W. Ashland St.	Indianola, Iowa
9 CDD	Kenneth Dragoo, 407 Willow St.	Normal, Ill

CALLS REISSUED

9 AR	Fred L. Damarin, 2219 W. 79th Ave.	Chicago, Ill.
9 CH	New Trier Radio Club, Winnetka Ave.	Winnetka, Ill.
9 HU	L. D. Smith, 5116 Harriet Ave.	Minneapolis, Minn.
9 JK	Phillip S. Westcott, 959 39th St.	Milwaukee, Wisc.
9 JM	F. Babcock, Inc., 4115 Irving Park Blvd.	Chicago, Ill.
9 JS	Richard Smith, 3108 S. 19th St.	Omaha, Nebr.
9 JZ	Waukegan High School, Jackson and Washington Sts.,	Waukegan, Ill.
9 KT	Paul E. Johnson, 2309 E. 26th St.	Minneapolis, Minn.
9 KE	Frank Herbert Fanning, 301 Holt St.	Ashland, Ky.
9 NU	Henry C. Thompson, 4133 DeTonty St.	St. Louis, Mo.
9 OP	T. H. Mains, Y.M.C.A. Main St.	South Bend, Ind.
9 AAH	Merle A. Plummer, 417 W. 8th Ave.	Cedar Rapids, Ia.
9 ACR	Carl R. Thornrose, 1742 Clarmont Ave.	Chicago, Ill.
9 AKT	Lloyd E. Beranek, 6742 Lakewood Ave.	Chicago, Ill.
9 AFM	Arthur Long, 1187 S. Gunderson St.	Oak Park, Ill.
9 BVA	Nelson O. Warner, 2301 Maple Ave.	Berwyn, Ill.
9 CAN	Waldo Veeley Eaton, 6217 Douglas St.	Omaha, Nebr.
9 CBX	F. W. Wodrich, Jr., 2237 Judson Ave.	Evanston, Ill.
9 DBB	Ernest John Stringer, 6331 E. 63d St.	Chicago, Ill.
9 DBI	Rudolph Stoltze, Jr., 1220 Liversey St.	Chicago, Ill

SPECIALS

9 DON	Russ D. Saragusa, 1617 Morse Ave.	Chicago, Ill.
9 TJ	DePauw University, College Ave.	Greencastle, Ind.
9 YU	Doane College	Crete, Nebr

BROADCASTING

KSD	The G. F. Ahlrich Marble & Granite Co.,	N. Tejon St. Colorado Springs, Colo.
WAH	Midland Rad'o Co., 20 S. Main St.	El Dorado, Kans.
WBL	T & H Radio Co., 601 S. Anthony St.	Anthony, Kans.
WCE	Findley Electric Co., Inc., 212-16 S. 5th St.,	Minneapolis, Minn.
WCK	Stix-Baer-Fuller, Washington St.	St. Louis, Mo
WDT	(WDY) J. O. Yelser, Jr., 5422 Cass St.	Omaha, Nebr.
WGF	The Reg. & Tribune, 713 Locust St.	Des Moines, Ia.
WGT	The Fair, State, Adams & Dearborn Sts.	Chicago, Ill.
WDZ	James L. Bush, Star Store Bldg.	Tuscola, Ill.
WEH	The Benwood Co., Inc., 1116 Olive St.	St. Louis, Mo.
WKH	The Midland Refining Co., Norfolk Ave. & 4th St.,	Norfolk, Nebr.
WHA	Arrow Radio Lab'to'y, 1127 Arrow Ave.	Anderson, Ind.
WPE	Central Radio Co., Inc., 575 Grand Ave.,	Kansas City, Mo.
WRM	University of Illinois	Urbana, Ill.
WTG	Kansas State Agr. College, C-30,	Denison Hall, Manhattan, Kans.
WAAK	St. Louis Radio Assn., 311 Locust St.	St. Louis, Mo.
WAAP	Union Stock Yards & Transit Co.,	944 Exchange Ave., Chicago, Ill.
WAAH	Commonwealth Electric Co., Inc.,	101-4 Sixth St., St. Paul, Minn.
WAAI	Pullman Fund Creek Co.	Pike, Ky.
WAAK	Global Bros. Department Store, Grand Ave.,	Milwaukee, Wisc.
WAAL	Minnesota Tribune Co. & Anderson Beamish Co.,	54 S. 6th St., Minneapolis, Minn.
WAAN	Univ'ty of Missouri, 606 Ninth St., S.	Columbia, Mo.
WAAP	Otto W. Taylor, 18 W. Cooper, Jr. in care of United Elec. Co.)	401 N. Roosevelt St., Wichita, Kans.
WAAW	Omaha Grain Ex., 19th & Harney Sts.	Omaha, Nebr.
WAAZ	The Hollister-Miller Motor Co., Inc.,	14-16-18 E. 6th Ave., Emporia, Kans.
WBAA	Purdue University	W. Lafayette, Ind.
WBAK	Sterling Elec. Co., 61 S. 7th St.	Minneapolis, Minn.
WBAX	Bradley Poly. Institute	Institute Pl., Peoria, Ill.
WBAN	The Dayton Co., Nicollet Ave & 7th St	Minneapolis, Minn.

CHANGE OF ADDRESS

9 DG	Papini & Haupt, 31 Morgan St.	Chicago, Ill.
9 DR	Donald C Wallace, 1230 Stevens Ave., Apt. 11,	Minneapolis, Minn.
9 FD	John Potter, 1026 Thompson St.	Lafayette, Ind.
9 FY	Burnham S. Bush, 912 S. Second St.	Champaign, Ill.
9 HX	H. J. Goddard & E. S. Leavensworth, Main St.,	Ellendale, N. Dak.
9 ACP	Donald E. Hooker, Box 164.	Carpentersville, Ill.
9 AXP	Morris MacCabee, 2300 Magnolia Ave.	Chicago, Ill.
9 AYM	Arthur Long, 1187 S. Gunderson St.	Oak Park, Ill.
9 DAK	Julius E. Millar, 703 W. Green St.	Urbana, Ill.
9 DML	K. B. Dokas, 522 S. 6th St.	Minneapolis, Minn.
9 DYL	Elmer J. Jaeger, 858 19th St.	Milwaukee, Wisc.

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